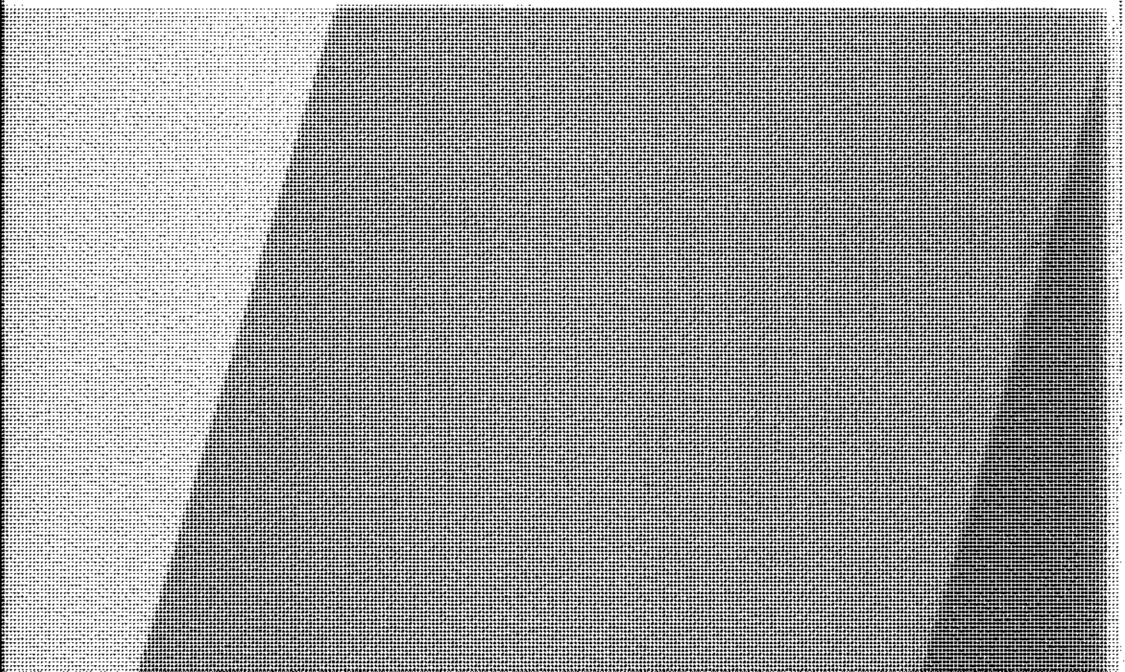
Situation Conformity and Service Orientation in Irrigation Management

Walter Huppert



Situation Conformity and Service Orientation in Irrigation Management

Basic Concepts

Walter Huppert

Deutsche Gesellschaft für
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FOREWORD

The management of irrigation systems has emerged as an important topic in international development cooperation. The deteriorating food situation in many developing countries, which are forced to spend an ever-increasing share of their foreign exchange earnings on the import of foodstuffs, the economic plight of those smallholdings which, as a resnlt of poor irrigation management, suffer production losses, and the significant environmental damage bronght about by incorrect application of irrigation techniques will all compel those involved to focus future efforts more sharply on irrigation management.

There is a general consensns among experts in the field that improved management might succeed in reactivating a major proportion of the abandoned or poorly-utilized land nnder irrigation throughout the world. Since this amounts to an area of some 45 million hectares, it represents a production potential of enormous dimensions.

What can be done to improve irrigation management?

The time has come to say good-bye to pnrely technical approaches in the design of irrigation systems. The value of an irrigation scheme is determined by the way in which it is utilized by man. People are thus the crucial variable in the agricultural irrigation equation. This factor must be taken into account in the future planning and construction of irrigation systems.

The principles according to which irrigation measures are designed and managed can be highly diverse in character.

The problems currently being encountered iu the irrigation field demonstrate that the question of how to improve irrigation management demands fresh answers. They show that radical changes are required in our conceptual approaches to irrigation systems and their design.

It was this pressing need for fresh ideas and innovative conceptual approaches to irrigation management which prompted the GTZ to embark on this predominantly couceptual publication.

The book breaks new ground by

- taking a categorical line in favour of introducing recent management theory approaches into the discussion of irrigation management,
- attempting to adapt these approaches to characteristic features of irrigation, and
- placing special emphasis on the management of services in irrigation.

The present publication is thus desigued to help foster understanding of the strategic concepts and working aids for irrigation management which have recently been or are currently being developed at the GTZ, and which are oriented along similar lines.

If it helps to create an openness in the reader's mind towards the need for reorientation in the management of irrigation systems alluded to above, it will have served its purpose. In view of the demands placed on us by the the ueed for food security and enviroumental protectiou, it is an openness we cannot afford to do without.

Dr. Ekkehard Clemens

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

Some of the major problems of irrigated agriculture in third world countries lie in the field of management. Donor organizations and local administrations active in the irrigation sector concur in this appraisal of the increasingly critical situation during the last decade.

In terms of development cooperation practice, this conclusion entails an urgent need for recommendations and guidelines to promote better solutions in this area.

The importance attached to improvements in the management of irrigation systems is documented by the foundation of an international research institnte devoted specifically to this question, which commenced operations in 1984 ("International Irrigation Management Institute" (IIMI), Colombo, Sri Lanka).

The widely acknowledged need for improved solutions to irrigation management problems is, however, matched by an eqnally evident conceptual gap, especially in two areas:

1. "Irrigation systems" are extremely heterogeneous. Hence, technological and organizational design concepts vary widely, and systems operate under a great diversity of objectives and environmental constraints.

   Consequently, management experience and insights cannot be transferred uncritically from a specific irrigation system to a different context. It will be apparent that the same management principles cannot be pursued both in small village community systems oriented partly towards subsistence farming, and in large-scale irrigation systems designed exclusively to produce cash crops.

   Contingency approaches to managemeut question the general validity of postulates concerning management principles. Principles and guidelines for management must be adapted in conformity with the situation, i.e. they must be compatible with the actual situational constraints.

   The aim should therefore be to achieve **situation conformity** in the management of irrigation systems.

   This raises the question of which patterns of management action come closest to achieving situation conformity under differing sets of constraints. Virtually no orienting guidelines or text books answering snch qnestions are currently available for development cooperation practice in the irrigation sector. Contingency management approaches have hitherto received little attention in irrigation literature, with the exception of a few studies on comparative organizational research.

2. Irrigation systems managed as large production-oriented units by a management responsible for the entire operation, as was often the case in the colonial period, are nowadays seldom encountered, and still more rarely created. "Closely-supervised production", in which water users have the *de facto* status of paid agricultural labourers, is virtually incompatible with modern policy orientations in development cooperation. The influence of target-group-oriented development concepts has shifted the accent towards irrigation organizations performing a **service function** for the benefit of more or less independent farmers and water users.

This service function may manifest itself in many variants specific to the situation. Irrigation organizations can perform a wide variety of possible service tasks, from the simple supplying of water to cover plant water needs to "service packages" providing extension-intensive services.

In practice, however, management recommendations rarely take the service function of irrigation organizations into account. The author is not aware of any analyses of service management in irrigation based on more recent management theory insights in this field.

The present study aims to contribute to reducing the conceptual gap in irrigation referred to above. It concentrates on the two above-mentioned aspects of situation conformity and service management, and attempts to present a conceptual framework of reference for irrigation system management based on recent management theory approaches.

The book develops a conceptual framework oriented particularly towards systems, contingency and process approaches in management theory and towards recent insights in service management.

Extensive use is made of contingency approaches developing ideal types of situational configuration, of the kind subscribed to by HILL, FEHLBAUM and ULRICH and by ULRICH and FLURI in the German-speaking, and by KAST and ROSENZWEIG in the Anglo-American literature.

These approaches identify antithetical idealized types of situation, and assign idealized management action models to them on the basis of defined goals. A "fit" between goals, situational constraints and management action variables is assumed. This congruence is, however, only partly based on empirical results. To a great extent, it is supported by non-empirical analyses of cause-effect relationships between the situation, management action and resulting outcomes.

These methodological shortcomings must be accepted in view of the present far from advanced state of comparative organizational research in the irrigation field, and of the urgent need for practical guidelines noted above.

Situation conformity in management can therefore be approached in real terms by an attempt to achieve congruence between goals, situational constraints and management action through reference to ideal types of situational configuration and corresponding management models. The difficulties currently entailed by such an undertaking result from the virtual absence in management theory of contingency management approaches expressly incorporating the service aspect.

The approach developed by HILL et al. also assumes that there is no essential difference between the production of material goods and the provision of services. The present study demonstrates that such differences do exist, and describes a continuum between "pure" production of goods and "pure" provision of services. HILL et al.'s approach is extended to allow for these differences.

Using this procedure, four ideal types of situational configuration with four corresponding model types of management action have been identified.

It must be emphasized that ideal types are not hypotheses, i.e. they do not claim to present a system of established interrelationships.[1] Their function is rather to allow thinking about real situations to be guided by a concept free from contradictions.[2]

In this sense, the ideal types developed in the study allow the above-mentioned continuum from pure manufacturing to pure services to be integrated within a consistent framework of ideas concerning irrigation management. This provides a conceptual basis for classifying irrigation with its partly manufacturing and partly service features and for throwing into relief the management-action-relevant contingent differences between irrigation systems or subsystems. A conceptual base of this kind has not previously been available in irrigation literature.

The discussion of **applications** in Chapter 5, which expressly disclaims any attempt at exhaustiveness, shows good agreement between the available empirical results and causative relationships presented in the literature and the framework which has been developed.

The hope is therefore that the management knowledge which exists in practice, and which lies buried in case studies and project reports, can be ordered and exploited more successfully than hitherto. It may be suspected that the stock of knowledge and experience is enormous.

If it proves possible to order the spectrum of irrigation management situations more satisfactorily on the basis of a conceptual framework of the kind suggested here, there will be increased opportunities for "learning by experience" from practical work.

If ideal typologies may also be regarded as a form of heuristics for the generation of hypotheses, as emphasized by STAEHLE,[3] then further sophistication and refinement of the approaches presented here may be expected to help guide future research into the management of irrigation.

The fundamental problem of a lack of situational orientation and a lack of transparency in the manufacturing and services continuum in management is not confined to irrigation. Potentially, therefore, comparable conceptual approaches may prove applicable to other fields of development cooperation.

1 STAEHLE (1985), p. 543.
2 Ibid.
3 STAEHLE (1985), p. 543.

INTRODUCTION

The interest taken in the management of irrigation systems in developing countries has increased greatly in recent years,. This is clearly indicated by the numerous international conferences and workshops devoted to irrigation management questions,[1] the foundation of the International Irrigation Management Institute (IIMI) in Sri Lanka in 1984 and the growing range of irrigation management training opportunities.[2] In the Federal Republic of Germany, an inquiry into training deficits in the irrigation field couducted by the German Association for Water Resources and Land Improvement (DVWK) in 1984 revealed particular interest in management-related questions.[3] German technical cooperation also currently accords high priority to this topic iu its conceptual work in the irrigation sector.[4]

The growing emphasis on management concerns may partly be ascribed to the general decline in available resources for development projects in many third-world countries. In this situation, increased emphasis on management-related and organizational measures is seen as a response to the dilemma of having to achieve urgently-needed growth in output despite scarcer resources.

One sign of the importance recently attached to such aspects is the choice of "development management" as the keynote theme of the World Bank's World Development Report for 1983.[5]

Iucreasing attention to irrigation management questions is, however, also partly a response to growing awareness of the gap between expectation and achievement in irrigation[6] during the last decade, despite considerable financial expenditures related to this sector.[7]

REPETTO[8] notes that:

> *"Despite the high priority and massive resources assigned to water resource development, the performance of large public irrigation systems has fallen short of expectations... Important performance measures, such as acreage irrigated, yield increase and efficiency in water use, are typically less than projected when investments were made..."*

In this context, efforts in the management field are seen as an important step towards solving problems in the irrigation sector.

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1 In the recent past, for example, the International Commission on Irrigation and Drainage (ICID) conference on the Management of Irrigation in Ft. Collins, USA, in 1984; the International Irrigation Management Institute (IIMI) workshops in Kandy, Sri Lanka, on Selected Issues in Irrigation Management in July 1985 and on Farmer Managed Irrigation Systems in Katmandu, Nepal, in August 1986. The Irrigation Symposium arranged by the German Association for Water Resources and Land Improvement (DVWK) in Berlin in April 1989 was also concerned with the topic of Irrigation Management.

2 Internationally, management courses are being organized by, for example, the C.E.F.I.G.R.E. (Centre de formation internationale a la gestion des ressources en eau; international water resource management training centre, France), Utah State University and the Mananga Agricultural Management Centre, Swaziland.

3 Personal conversation with Dr. Dirksen, General Director of the DVWK

4 Cf. HUPPERT (1984)

5 World Bank (1983)

6 FAO estimates indicate that approximately 50 % of the world's irrigated areas are producing severely depressed yields. Cf. ZONN (1979), p. 29. According to World Bank figures, the effective irrigated area in a number of African countries had scarcely increased during the 1970's, despite substantial investments, because areas previously opened up for irrigation had meanwhile been abandoned or required reclamation work. WORLD BANK (1981), p. 76.

7 YUDELMAN estimates annual investment by third-world countries in the irrigation sector during the late 1970's at US$ 10 - 15 billion. YUDELMAN (undated), quoted in REPETTO (1986), p. 3.

8 REPETTO (1986), p. 3

It is the author's hope that this book may help to stimulate improved concepts for the solutiou of these problems.

PART A: RATIONALE

1. DEFINITION OF THE PROBLEM AND OBJECTIVES OF THE BOOK

1.1 Definition of the Problem

"*A comparison of the topics for which there is a large body of academic research and teaching with the concerns of practice frequently reveals discrepancies between their practical importance and the degree of theoretical attention they receive.*"[1]

In the author's view, this statement is especially applicable to the management of irrigation systems.

The importance of irrigated agriculture for world food supplies is indicated by the fact that the 18 % of world agricultural acreage opened up for irrigation produces no less than 33 % of global crop yields.[2] Moreover, the irrigated sector represents one of the most important fields of international development aid in terms of the financial resources employed.[3]

Since the end of the 1970's, the significance of irrigated agriculture has stood in sharp contrast to a growing awareness of its problems.

Problem analyses and commentaries from important development aid organizations engaged in the irrigation field point to management as a primary focus of irrigation problems.[4]

Despite the steadily growing international literature on irrigation, there is a continuing lack of general, comprehensive studies of irrigation system management based on more recent approaches in management science. Standard works on irrigation fail to consider management questions, or touch on them only marginally.[5]

Taking into account both the problematical situation in irrigation outlined above, and the importance of irrigation for world food supplies, this must be regarded as a serious deficit, attributable in part to the following factors:

1) In both industrialized and developing countries, irrigation systems have long been planned and conceived as **technical installations.** Only recently has there been an awareness of their nature as complex systems entailing close interaction between technical design and the social system which operates, maintains and uses them.

   The border zone between engineering and the social sciences, to which questions of irrigation system management must partly be assigned, is, however, frequently regarded as a form of "interdisciplinary no man's land".[6]

1 SCHEUCH (1982), p. V, author's translation.
2 YUDELMAN (in preparation), quoted in REPETTO (1986), p. 3
3 Between 1976 and 1980, the irrigation sector received some 20 % of all development aid resources in the agricultural field. Cf. OECD (1983), p. 25. Official commitments by bilateral and multilateral donors for irrigation projects in developing countries at the end of the 1970's were in excess of US$ 1.5 billions annual, reaching a peak of US$ 2.2 billion in 1980. Although the level of commitments has since fallen - e.g. to US$ 1.2 billion in 1981 - the irrigation sector still claims a substantial portion of total agricultural aid. Cf. OECD (1983).
4 Cf. inter alia OECD (1983), BERRY et al. (1980), STEINBERG et al. (1983) and HUPPERT (1984)
5 Cf. for example ACHTNICH (1980), WITHERS et al. (1978) or POIREE and OLLIER (1971)
6 CHAMBERS (1980) in COWARD (1980), p. 29

2) On the world scale, irrigation systems are operated in many different technical and organizational forms and under widely differing constraints. Generalized management recommendations therefore frequently fail due to their limited applicability.

   The attempt to formulate management principles and use them as generally valid guidelines for management activities in differing irrigation systems under differing constraints can be dysfunctional in its effects: management behaviour which is adequate in one set of circumstances may turn out to be completely inappropriate in another.

   So far, however, scarcely any conceptual studies on the contingency management of irrigation systems have been available.[1]

3) Problem analyses of irrigation indicate that too little attention is paid to the rôle of peasant water-users as the target group for irrigation schemes.[2] This means that the service function of irrigation agencies on behalf of their water-users receives insufficient emphasis.

   Irrigation projects in which "supervised production" is the chief mode of cultivation and in which overall responsibility is assigned to a state or para-state organization - with correspondingly little importance attached to the service function - are nowadays rarely implemented in the third world.

   To date, there has been an almost total lack of studies devoted to service management in irrigation.[3]

   These factors must be seen as bearing a large measure of responsibility for the conceptual deficits in relation to irrigation management problems referred to above.

   The absence of adequate conceptual bases for situational differentiation of management behaviour and for service management in irrigation **defines the problem** to be tackled in the present study.

1 Cf. Section 2.3.3
2 This point is underlined by USAID and GTZ, among others. Cf. BERRY et al. (1980), STEINBERG (1983) and HUPPERT (1984). It was also stressed by the "water resources" working group of the conference on "Agricultural Production - Research and Development Strategies for the 1980's" in Bonn in 1979.
3 Cf. Section 2.3.5

1.2 Objectives and Methodology

1.2.1 Objectives

The objective of this book is to contribute to redncing the conceptual deficit in relation to irrigation system management described above.

The book attempts to develop a conceptual framework for irrigation management oriented on recent theoretical management approaches. Problems of contingency and service management behavionr in irrigation will be in the foreground of this framework.

The term "conceptual framework" should here be understood as implying a cohereut system of general management-relevant statements on irrigation systems which may serve as a basis for interpreting differing management problems in differing irrigation systems.

The development of such a framework is intended to contribnte to:

- developing improved guidelines for irrigation management practice;
- organizing the extensive existing empirical knowledge of irrigation management ou an improved conceptual basis, so that it can be structured more logically and utilized more effectively;
- providing a guide to further research on irrigation management.

1.2.2 Definition of Terms

The presentation of methods and procedures used here is preceded by a definition of the terms "management" and "irrigation system", to clarify the range of objects dealt with in this book. A distinction is also drawn between the terms "irrigation project" and "irrigation system".

The terms "situation" and "service" are discussed in Sections 2.2.4.2 and 2.2.5.2 respectively.

A. The Term "Management"

Generally speaking, two components are associated with the term "management", especially in German-speaking countries: on the one hand the performance of object-related tasks of management and administration, and ou the other hand the performance of people-related tasks generally described as "man-management".[1]

In Anglo-Americau management literature, both a fuuctional aud an institutional meaning are associated with the term "management".[2]

Management in its fuuctional sense may be defined as follows:

> "*Management is the performance of management functions for the development and guidance of goal-oriented social systems and/or their sub-systems.*"[3]

1 The latter are referred to as "*Menschenführung*" in German management literature . Cf. STAEHLE (1985), p. 51.
2 Ibid., p. 40
3 Adapted from ULRICH (1984), p. 98, author's translation

"*Development*" in this sense denotes activities directed at "*creating* [the system or snb-system] *in the first place and ... maintaining it as a viable whole*".[1] "*Guidance*" is the process of "*maintaining control of* [the system or snb-system] *in such a way that it assumes any desired state*".[2]

Management in the institutional sense denotes "*that group of persons entitled to issue instructions to others*".[3]

The often widely-differing definitions of management found in the literatnre partly reflect the influences of various management theories or viewpoints.[4] The precise significance of the term as used in this book will therefore be defined more closely after the theoretical priuciples on which it is based have been described iu greater detail (cf. Sectiou 2.3.1).

B. The Term "Irrigation System"

References to irrigation systems in the following text are to be understood in the sense of the system approaches explained in more detail in Sections 2.2.4.1 and 2.3.2. Anticipating a little, a system may very generally be defined as a structured whole composed of elements aud sub-elements interacting with one another.[5]

Irrigation systems constitute[6]:

- open systems, i.e. they maiutain relationships with their systems environments;
- socio-technical systems, i.e. systems in which processes involving a division of labour are carried out by hnman-beings using technical aids[7];
- purpose- and goal-oriented systems, in which the supply and use of water for plant cultivation constitute primary system purposes;
- systems of an organizational character, i.e. systems "*structured by authorized persons in a conscious, active development process and in pursuit of set purposes and goals*".[8]

The precise dividing line between the irrigation system and its system environment and the criteria for the formation of sub-systems will depeud ou the particular concerns of the observer. It is for this reason that such widely-differing descriptions of the irrigation system and its snb-systems are encountered.[9]

C. The Term "Irrigation Project"

There is widespread agreement that "project" as used in management terminology denotes measures characterized by their limited duration, their uniqueness and their clearly defined, pre-determined objectives.[10]

1 ULRICH (1984), p. 99
2 Ibid., p. 100
3 STAEHLE (1985), p. 53
4 STAEHLE (1985), p. 53
5 Adapted from HILL et al. (1981), p. 21 and ULRICH and FLURI (1984), p. 21
6 Cf. Section 2.3.2.2
7 ULRICH and FLURI (1984), p. 18
8 HILL et al. (1981), p. 25, author's translation
9 Cf. WALKER (1981), p. 30 ff., for the creation of irrigation sub-systems in the literature
10 Cf. e.g. STAEHLE (1985), p. 462, ULRICH and FLURI (1984), p. 119 and KIESER and KUBICEK (1983), p. 143

In the conrse of snch measures, a "project team" or "task force", which may be drawn from various hierarchical levels and/or specialized departments of the parent organization, pursues clearly specified "operationalized" sub-objectives nnder time and cost constraints.[1]

The complex, highly innovative and generally also labour-intensive task of setting np a new irrigation system usually exceeds the capacity of the responsible agency's normal operation (especially in developing countries). The development of irrigation systems is therefore almost always regarded as an autonomous task of limited duration, at least partially detached from the parent organization, and therefore constituting a "project". This **"irrigation project"** is then freqnently supported by external donor organizations in terms of financing and expert personnel.

The chief task of an irrigation project of this kind is not irrigated agricultural production as snch, which constitutes one of the principal objects of the future irrigation system, but the development and construction of the irrigation system itself. Its primary objectives are therefore oriented towards system development rather than production.[2]

The above definition by no means always implies, however, that an irrigation project will be devoted to the overall development of an irrigation system. The measures involved may well be limited to sub-components of the irrigation system.

It is of importance that *"limited duration and uniqueness ...* [are] *the crucial characteristics of a project. They represent project tasks as opposed to long-term 'normal tasks' and their organization"*.[3]

1.2.3 Methods

As a result of the problem complex outlined above, those responsible for development cooperation in the field of irrigated agriculture find themselves called on to urge the adoption of improved management concepts in the tbird world irrigation sector. Concrete steps in this direction are, however, hampered by the extraordinary heterogeneity of irrigation systems and the varying national, regional and local conditions uuder which they operate. In development cooperation practice, management recommendations have so far essentially been made without any qnalification to conform with specific situational constraints.[4] Following the "classic" management theory approaches, management principles are thus assumed to have a general validity which they do not, in fact, possess.

This book therefore concentrates on more recent "contingency" approaches to management theory.[5] Contingency approaches are a product of systems theory, which assumes an intensive interaction between open systems and their environments, resnlting in an adaptation of the system to the "situation" (cf. Section 2.2.4.2). Contingency approaches are therefore often seen as a part of systems theory.[6]

1 STAEHLE (1985), p. 462
2 Cf. Section 4.4.2.2
3 HILL et al. (1981), p. 202, author's translation
4 Cf. e.g. DOPPLER (1985) and GTZ (1987)
5 Cf. STAEHLE (1985), p. 88
6 Cf. e.g. LUTHANS (1976) and CARLISLE (1973, 1976), quoted in STAEHLE (1985), p. 87

Essential to contingency approaches is their postulate that there are no generally valid principles in management, but that recommended actions must be altered to conform with the particular situation. This means that a classic management proposition to the effect that "a conrse of action *x* is best suited to achieving an objective *y*" must be snpplemented by the condition: "provided that a contingency *z* applies".[1]

One possible method of inferring propositions contingent on the particular situation is to describe ideal configurations of sitnational constraints and to assign to them ideal patterns of management action attributes.[2] Intermediate points on the continuum of situations can then be related to "intermediate" patterns of management behaviour.

A disadvantage of this method is that intermediate points on the continuum between the two extremes can frequently be defined only imprecisely or as treuds.[3] At the present far from advanced stage of empirical situational research[4], and in view of the variety of different situational configurations in the irrigation sector, it nonetheless offers a pragmatic alternative for postulating situation-oriented propositions on irrigation management.

An approach of this type frequently cited in the German literature has been described in respect of the organization function by HILL/FEHLBAUM and ULRICH.[5] In its basic orientation, this approach stems from the work of the Americans BURNS and STALKER[6] and was transposed to cover the whole of management by ULRICH and FLURI.[7] KAST and ROSENZWEIG present an analogous management approach.[8]

The arguments presented in this book follow on from these approaches. In addition, new studies on service management have been considered. It is shown that the approach developed by HILL, FEHLBAUM and ULRICH needs to be extended to cover significant service-related aspects. A suggested method of expanding the above-mentioned approaches to include services and thus making them applicable to irrigation is presented and justified.

In accordance with the special nature of service management, not two but four ideal types of situational configuration are described and related to irrigation.

On this basis, four ideal patterns of management behaviour are then distinguished. These four extreme situations and related management models indicate the corner points of a "contingency field" in irrigation management which may serve as a rough guideline for situation-adapted management action in practice. Rough though such a contingency guideline may be, it represents an advance towards situational compatibility in irrigation management, since it is certainly preferable to the complete neglect

1 ROBBINS (1984), p. 39
2 Cf. inter alia STAEHLE (1984), p. 93 and ULRICH and FLURI (1984), p. 170
3 Cf. the criticism of this method by KIESER and KUBICEK (1983), p. 54 ff. These authors therefore expressly favour an empirical orientation. Relationships between the variables "situation", "organizational structure" and "the behaviour of the members of the organization" should be determined by empirical study. Cf. KIESER and KUBICEK (1983), p. 63 ff. On this basis, the authors develop a conceptual framework for designing the structure of organizations, i.e. for the management function "organization". Cf. ibid. STAEHLE, however, criticizes the fact that this conceptual framework rests on empirically quite inadequate data. STAEHLE uses the example of KIESER and KUBICEK's study to point out the problems involved in employing an exclusively empirical approach to establish a conceptual framework, in view of the far from unambiguous empirical data currently available. Cf. STAEHLE (1985), p. 98.
4 Especially in regard to irrigation. Cf. BOTTRALL's pioneering study (1981).
5 HILL et al. (1981)
6 BURNS and STALKER (1961), inter alia quoted in STAEHLE (1985), p. 87
7 ULRICH and FLURI (1984)
8 KAST and ROSENZWEIG (1982), p. 486 ff.

of situational differentiation in management approaches which is the current norm in this field.

In this context, it should be emphasized that objectives and situational constraints may restrict the scope of management behaviour, but do not finally determine it. Despite the influence of the situation, the manager, as the agent, retains substantial freedom to shape events (cf Section 2.2.3 B).

1.2.4 Procedure

The following section of this book (Part B), presents the principles on which the development of the conceptual framework is based.

In Chapter 2, the current state of management theory and its previous treatment in irrigation literature are discussed.

Section 2.2 first provides a brief resnmé of the development of management theory, including a consideration of services as an object of management theory.

Section 2.3 leads on from this to present the most important management theory approaches, on which the conceptnal framework is to be based.

Part C of the book describes the fundamental features of a conceptual framework for a contingency-dependent and service-oriented irrigation management.

Section 3.2 first considers the management-related contingency factors in irrigation. Section 3.3 discusses the formation of ideal types of situational configuration. Following a presentation in Section 3.3.2 of HILL, FEHLBAUM and ULRICH's approach to situational differentiation as applied to the production of material goods[1], Section 3.3.3 snggests a means of broadening this approach to cover the provision of services.

In Section 3.3.4, the four resulting ideal situational configurations are transposed to the field of irrigation.

Chapter 4 presents situation-adapted system models for irrigation, modifying the input-transformation-output model in accordance with the ideal types of situational configuration referred to above.

Part D of the study indicates the practical consequences entailed in orienting management action towards the four ideal situation types.

The implications for the management functions "planning" (Section 5.2), "controlling" (Section 5.3), "organizing" (Section 5.4) and "leading" (Section 5.5) are then discnssed, with references to the four basic configurations in each case.

1 HILL et al. (1981), p. 202

PART B: PRINCIPLES

2. MANAGEMENT SCIENCE AND IRRIGATION

2.1 Introduction

Increased attention has been paid to studies of irrigation management, especially since the middle of the 1960's.

Initially, "farm water management" was credited with great importance and substantial problem-solving potential.[1]. It was anticipated that a study of these hitherto much-neglected aspects would lead to improved integration of the water users in the irrigation system as an organizational whole.

At the beginning of the 1980's, however, the focus of interest in the international irrigation community turned increasingly to questions of main system management, or to integrated management approaches emphasizing the interaction between the main system and final distribution system.[2]

The period since the beginning of the 1980's has also been marked by intensive discnssion of organization and management questions extending beyond the field of water management. The World Bank and the FAO have set important standards, each producing an extensive stndy on this topic.[3] In its programme of research and training, the newly-established "International Irrigation Management Institute" (IIMI), already referred to above, expressly emphasizes management areas other than water management, which in its opinion are significant for the functioning of irrigation systems (in particular, these are *"management of the design process in irrigation"; "management of people"; "management of farm inputs"; "management of financial resources")*.[4]

In Germany, Walker's study[5] in particular has provided fundamental impulses in respect to a comprehensive view of irrigation system organization.

The expectations currently associated with the improvement of irrigation management are correspondingly high. The World Bank's pioneering study on irrigation project management[6], already noted above, goes so far as to anticipate a "water revolution" stemming from efforts in the management area, with effects comparable to those of the "green revolution".[7]

Other observers attempt to dampen snch management enphoria[8]:

> *"Disappointing operating performance stems from many sources and not just management. There are shortfalls in finance, poor condition of some infrastructure, faulty liaison with farmers and insufficient institutional support. Studies have revealed sub-optimal performance in area cultivated, intensity of land use, crop yields and environmental impact, particularly in health and soil salinity, and all this cannot be laid at the door of management."*

1 Cf. inter alia FAO (1980)
2 WADE (1982 b) considers the backgrounds for such shifts of emphasis in the Far East, detecting important causes in World Bank policy towards India.
3 Cf. BOTTRALL (1981) and SAGARDOY et al. (1982).
4 IIMI (1984) Program Paper for Presentation with the 1985 IIMI Budget", Mimeo
5 WALKER (1981)
6 BOTTRALL (1981)
7 Ibid., p. 24.
8 CARRUTHERS (1983), p. 54

In the discussion which follows, a presumption that efforts in the management sector alone are capable of solving the complex problems of irrigation in developing countries is expressly avoided. Rather, it is assumed that improved management oriented on more recent management theory approaches may frequently make a significant contribution to such a solution.

2.2 Observations on Management Science

2.2.1 Introduction

It is not my intention in this book to discuss in detail the most important approaches to the theory of organization and management. For this purpose, reference should be made to the relevant literature.[1]

A brief glance at fundamental theoretical approaches may nonetheless appear helpful, since management exercises in irrigation are faced with the problem of having no established management theory to fall back on.[2] It must be assumed that different lines of research, schools of thought and approaches exist, emphasizing various sub-aspects in response to differing problems. The functions of the different management theory approaches have been likened to a "spotlight effect": "*Among the multifarious aspects, a few particular features are singled out and presented in a special light*".[3]

The variety of different lines of research makes it all the more difficult to gain an overall view of the status and trends of the management theory discussion. This variety is reflected in the widely differing presentations of management theory developmeut.

KOONTZ, who organized an important symposium on the state of management research at the University of California in 1962, significantly chose to present a uow much-quoted article entitled "*The Management Theory Jungle*" (1961) as the basis for discussion.[4]

KIESER and KUBICEK come to the following conclusion

> "*Most authors surveying the state of organization research note one primary phenomenon: Babylonian confusion*".[5]

This state of affairs is still further complicated by fact that, owing to the persistently one-sided conceutration of industrial managemeut science in the German-speaking community on economic considerations, to the exclusion of behavioural science

1 Cf. for example KIESER and KUBICEK (1978) Vol. 1 and 2, including the literature cited there, and STAEHLE (1985), p. 12 ff.
2 Following SCHANZ (1979), a "*theory*" may be described as a "*system of nomological hypotheses, i.e. as a set of propositions at least one of which passes the logical and empirical tests of spatio-temporal invariance (fundamental law)*". SCHANZ (1979), quoted in HASITSCHKA and HRUSCHKA (1982), p. 2. The existence of such basic laws in the social sciences is, however, judged with some scepticism. Cf. KIESER and KUBICEK (1978 a), p. 64. KIESER and KUBICEK emphasize that in the social sciences the existence of "*empirical regularities capable of being interpreted causally*" must be assumed. Allowing for this limitation, they consider it essential for instrumental propositions to be based on propositions about such relationships if they are to be regarded as possessing a theoretical foundation. KIESER and KUBICEK (1978 a), p. 64. STAEHLE subscribes to the view that, although management research is currently making unmistakable attempts to meet these tests, there is still a large gap between such aims and actual performance. STAEHLE (1985), p. 58. The term "management theories" can therefore so far be used only in a restricted sense.
3 KIESER and KUBICEK (1983), p. 34
4 STAEHLE (1985), p. 36
5 KIESER and KUBICEK (1978), p. 1, author's translation

aspects, developments in organization and management theory in the German-speaking and Anglo-American spheres have to some extent diverged.[1]

Recently, a consensus has begun to emerge to the effect that, since the 1960's and especially since the middle of the 1970's, the "period of variety" has increasingly been replaced by an "integration phase".[2] Particularly under the influence of the systems approach discussed in more detail below, an attempt is being made to integrate the propositions of various schools and lines of research.

Allowing for the above-mentioned lack of uniformity between the approaches in the literature, the following section addresses certain important focuses of development in management science, in extremely abbreviated form, and with no claim to exhaustive discussion and appraisal.

2.2.2 "Classic" Approaches

A. "Scientific Management"

The origins of "scientific management" are to be found at the turn of the century, especially in the contributions of the American engineer Frederick TAYLOR.

"Scientific management" does not represent a management theory approach iu the proper sense, but rather a methodology for the organization of productive labour.[3] With its pragmatic orientation towards increasing the productivity of labour, "scientific management" was intent on discovering the "one best way" of performing a job, especially by means of time and motion studies. This permitted a standardization of procedures and a correspondiug selection, training and payment of workers, especially in mass production.[4]

B. Administrative Approaches (Anglo-American Management Science and Organization Theories in Business Administration)

The stress placed by "scientific management" on the productivity of labour was transferred from administrative approaches in the production engineering sphere to the field of administration. Anglo-American management science and subsequently German organization theory present the organization as a system for fulfilling tasks and treat techno-economic functioning as the main problem.[5] These approaches develop generally valid principles and "design guides" for the best possible structures and the most rational possible procedures within organizatious. Amongst other features, they indicate fundamental principles of organization, e.g. structural characteristics such as horizontal and vertical differentiation, span of control, formation of departments, etc., or structural alternatives such as unilinear and multilinear organization, functional or divisional organizational structures etc. (cf. Section 5.4).

1 Cf. STAEHLE (1985), pp. 82 ff.
2 Cf. for example ROBBINS (1984), p. 35; HODGETTS (1981), p. 18/19 and STAEHLE (1985), p. 34
3 KIESER and KUBICEK (1983), p. 38
4 It should be noted that TAYLOR'S notions continue to affect industrial practice up to the present day, e.g. in the Federal Republic of Germany, in the methods-time measurement studies of the Association for Work Timing Studies, Refa, e.V. Cf. STAEHLE (1985), p. 34.
5 KIESER and KUBICEK (1978), Vol. 1, p. 124

The French engineer FAYOL, regarded as the founder of "management science", thought that the five basic management functions (planning, organizing, leading, coordinating and controlling) were universally recognizable in all organizations.[1]

C: Bureaucratic Approaches

Max WEBER (1864-1920) concerned himself with questions of organization at roughly the same time as the adherents of Scientific Management and the administrative approaches. He regarded organizational questions not from the viewpoint of the production engineer, but from the sociological standpoint. His interest lay in comparative historical analysis of forms of social organization and rule.[2] In this context, he represented bureaucratic rule as the purest form of legal rule.

WEBER described an "*ideal type of bureaucracy*", embodying the highest possible efficiency and simultaneously representing one category of legal rule.[3]

According to WEBER, this ideal type of bureaucracy is partly characterized by such features as division of labour, hierarchical structure (official hierarchy), control by civil servants in compliance with technical rules and standards and an administration based on filing and documentation ("*Aktenmäßigkeit der Verwaltung*").[4]

As part of his analysis of bureaucracy, WEBER created a terminology which has powerfully influenced organization research as a whole.[5]

More recent developments in the bureaucratic approach have dealt with such aspects as the dysfunctionality of bureaucracies (e.g. lack of flexibility, depersonalization of relationships, the shift of attention from the ends of the organization to its means, etc.).[6]

Importance and Criticisms of the Classic Approaches

The classic approaches to organization and management theory outlined in abbreviated and highly simplified form above continue to represent an important basis for management concepts.

Significant criticisms of the approaches described under the heading (A) and (B) are directed primarily at their failure to take adequate account of the environment and internal influences within the organization, and at their virtually total neglect of important factors in human behaviour.[7]

The term "*mechanistic models*" has therefore been used in association with the classic approaches, and they have been criticized for conceiving "*organizations without people*".[8]

1 STAEHLE (1985), p. 18
2 KIESER and KUBICEK (1978), p. 41
3 HILL et al. (1981), p. 415
4 STAEHLE (1985), p. 19/20. A detailed discussion of these features may, for example, be found in KIESER and KUBICEK (1978), pp. 91 ff., and in HILL et al. (1981), p. 416
5 KIESER and KUBICEK (1978), p. 84
6 Cf. the American organizational sociologists MERTON, SELZNICK, GOULDNER, quoted for example in STAEHLE (1985), p. 21.
7 HILL et al. (1981), p. 417.
8 KAST and ROSENZWEIG (1981), p. 71.

2.2.3 Extension of the Classic Approaches

A. Motivational Approaches

As a reaction to criticism levelled at the classic approaches, the "human relations approach" and other more recent motivational approaches conceive of the organization as a system governed by human interactions and behaviour patterns.[1] Attention accordingly centres on problems of the satisfaction and motivation of the staff of the organization, and their relationship to productivity.

Socio-psychological and sociological aspects, especially in relation to small groups, are strongly emphasized.

Importance and Criticisms

Motivational approaches are highly important as reactions to the "mechanistic models" of the classic approaches, and have resulted in greater concern for human values and behaviour patterns within the work process in industrialized countries.

Criticism is directed mainly against their sometimes one-sided emphasis on psychological aspects, frequently underestimating economic and technical factors.[2] In practice, this has often led to a "comprehension gap" between behavioural or motivational approaches, with their psychosocial orientation, and managers, who must take account of economic and technical factors.[3]

B: Decision-Oriented Approaches

a) Quantitative Approaches

Quantitative management concepts are to be regarded less as theoretical approaches than as management "technologies".[4]

The development of statistics and computer science have led to a dramatic increase in the popularity of quantitative approaches, contributing to an improvement in management decision-making and monitoring functions. "Operations research" and "management science" provided a series of methods for optimizing management decisions (e.g. linear programming, critical path method, simulation models, etc.).

Importance and Criticisms

Owing to the considerable potential influence of such models and concepts on management decision-making and monitoring functions, there was a positive euphoria in relation to quantitative approaches in the 1960's and early 1970's.

The often complex design requirements for quantitative models often served to dampen management enthusiasm, however, and have considerably restricted practical application.[5]

1 KIESER and KUBICEK (1983), p. 41.
2 HILL et al. (1981), p. 423.
3 ROBBINS (1984), p. 40.
4 KIESER and KUBICEK (1983), p. 44.
5 ROBBINS (1984), p. 35.

b) Behavioural Decision-Oriented Approaches

Behavionral decision-making theory sees the organization as a system in which the decisions of individuals must be coordinated towards achievement of the organization's objectives. "*Organizational and other influencing factors are contrasted with potential behavioural responses in decision-making processes.*"[1]

The above approaches to organization and management theory are of normative character, i.e. they postulate the form which management activities should take in order to attain objectives efficiently. They assume "rationality" on the part of the decision-makers, implying that each decision will be taken exclusively in conformity with the set objectives of the organization, all alternatives being exactly known, unambiguous and unvarying, preferences being taken into account, and no time or cost bottlenecks being encountered, in such a way as to achieve the highest possible efficiency.[2]

Behavioural decision-oriented approaches, by contrast, are of a descriptive nature. They illnminate the world of management "as it really is".[3] They acknowledge the existence of human and organizational factors which substantially restrict rationality in the sense defined above, recognizing, for example, that different decision-makers within an organization pursue "real goals" oriented towards personal interests rather than the set formal goals of the organization.

Such an approach includes the insight that, in reality, decisions remain largely unaffected by optimization processes. In fact, decisions are frequently based on a simplified view of the problems involved and oriented towards solutions which fulfil a catalogue of criteria ("good enough"), yield a quick "pay-off", are associated with the least possible risk and promote the power interests of the decision-maker.[4]

By attempting to provide a picture of the managers' real bebaviour, descriptive behavioural management approaches allow normative concepts to be adapted to real conditions and "realistic" solutions to be selected.

Importance and Criticisms

Leading authors agree in regarding the contribution made by behavioural decision-oriented organization research, especially in its newer and more refined forms, as extremely significant.[5]

In general, there is a trend towards the integration of motivational and decision-oriented approaches to form a comprehensive behavioural school of organization research.[6] Approaches such as the "human resources model" have also been redefined along these lines in the very recent past.[7]

The behavioural approach is criticized for[8]

1 KIESER and KUBICEK (1983), p. 43, author's translation.
2 ROBBINS (1984), p. 40
3 Ibid., pp. 100 ff.
4 Ibid.
5 Cf. e.g. HILL et al. (1981), p. 434 and KIESER and KUBICEK (1983), pp. 72 ff.
6 HILL et al. (1981), p. 434.
7 STAEHLE (1985), p. 35.
8 HILL et al. (1981), p. 434/435.

- taking the individual as its starting point, and thus tending to neglect problems of overall organizational structure,
- by its nature taking little account of pragmatic normative questions of how best to organize the decision-making process.

2.2.4 Attempts at Integration

Since the 1960's, and more emphatically since the second half of the 1970's, there has been a noticeable trend towards the integration of various management approaches.[1] Such efforts are aimed at overcoming the above-mentioned "spotlight effect" of specific management approaches, each of which illuminates only sub-aspects of the management problem.

In this context, the three approaches briefly outlined below appear of particular importance:

2.2.4.1 The Systems Approach

Systems approaches emphasize a "holistic perspective", i.e. they understaud the organization as a whole, as a system composed of numerous interactively linked sub-systems and elements. Due to these interdependences, the system represents more than the sum of its parts.[2] More recent systems approaches lay particular stress on the openness of the system, i.e. the influence of the environment on the system or the mntual interaction between them.[3]

A further significant feature of systems approaches is their interdisciplinary tendency and their attempt to escape from monodisciplinary perspectives.[4]

HILL et al. differentiate between three distinctive forms of systems-oriented thinking[5]:

a) The organizational sociology systems approach;

   Organizational sociology regards the organization as a goal-oriented social system. Its object is to describe the structures and behaviour of such social entities.[6]

b) The systems-theory/cybernetics deductive approach;

   This approach utilizes "*systems theory and cybernetics to exploit the heuristic function of abstract cybernetic structural models*".[7]

c) The integrative socio-technical systems approach;

   This systems approach is used as a general integrative concept, "*which permits the interlinking of*

   - *structural, social and technological aspects,*

1 Cf. ROBBINS (1984) pp. 35 ff. and STAEHLE (1985), p. 34 ff.
2 Cf., for example, KAST and ROSENZWEIG (1982), p. 100.
3 Ibid., p. 98.
4 HILL et al. (1981), p. 435.
5 Ibid., p. 435.
6 HILL et al. (1981), p. 437.
7 Ibid., p. 440 (author's translation); Heuristic models may be regarded as analogue models which attempt to use the alienation effect of thc analogy to discover new relationships. HILL et al. (1981), p. 48.

- *micro- and macroanalysis, i.e. analysis at all levels (individual, group, total system, super-system)".*[1]

This approach attempts to combine the analytical advantages of the systems approach with an empirical sociological approach.[2]

Importance and Criticisms

Systems approaches have recovered their topicality, especially in recent years, because they do not focus exclusively on the achievement of goals but, due to their demand for system stability and sustainability, include the resources for goal attainment in their analysis and evaluation.

General criticism of the systems approach relates chiefly to the difficulties of direct operationalization of systems considerations and to the fact that it does not focus on internal or external influencing variables impinging on management.

The systems theory/cybernetics approach is criticized for lacking an empirico-inductive research base, resulting in an inadequate relation to actual practice.[3]

Judgments on the socio-technical systems approach, which originated among a group of social psychologists at the English Tavistock Institute, remain contradictory. Criticism of the approach[4] concentrates particularly on the inadequate distinction between normative and descriptive concepts.

HILL et al., on the other hand, consider it a positive aspect of the integrating concept of the socio-technical system

> *"that, for the first time in the development of organization theory, it lends equal weight to both sociological and psychological and to internal and external (environmental) relationships, and presents an appropriate concept at least for the systematization of existing knowledge".*[5]

2.2.4.2 The Contingency Approach

A logical deduction from open systems approaches, which assume a powerful influence of the internal and external system environments on system design, is that adequate management action is heavily dependent on the particular **situation**, i.e. on the totality of the prevailing constraints on that action.[6]

Situational approaches or contingency theories[7] are therefore regarded by many authors as an element of systems theory and not as an autonomous approach.[8] The dominant influence of the contingency approach on management thinking during the last decade *(vide infra)* has, however, led most others to consider them separately.

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1 Ibid., p. 443.
2 Ibid., p. 443.
3 HILL et al. (1981), p. 443.
4 A comprehensive critique of the socio-technical approach appears, for example, in SILVERMAN (1970) quoted in LOCKET and SPEAR (1983).
5 HILL et al. (1981), p. 445, author's translation.
6 STAEHLE (1985), p. 77.
7 The terms are generally used synonymously. Cf. STAEHLE (1985), p. 88.
8 Cf., for example, HILL et al. (1981).

Contingency approaches are intended to move away from any claim that management recommendations can possess general validity and to develop situation-related alternatives for action. Approaches of this type are also referred to as "if-then" approaches, because they attempt to use if-then statements to analyze relationships between situational variables and particular management concepts and techniques within the context of objectives.[1]

Contingency approaches thus occupy an intermediate position between two extreme standpoints[2]:

a) that the same or similar management principles are valid in all situations;
b) that each organization is unique and situationally specific, and that therefore management action within each organization must be devised individually, with no possibility of "lessons being learned".

Importance and Criticisms

Contingency approaches are represented in almost every more recent management textbook, and many organization scientists[3] share the view that contingency theory constitutes *"the most powerful orientation in organization theory today"*.[4]

Criticism arises chiefly from a frequently-encountered and mistaken "contingent determinism", which assumes that the situation not only constrains management action, but in practice determines it.

Newer, behaviourally-oriented contingency approaches therefore expressly emphasize the fact that *"the reality of purposeful, communicative (and not merely reactive) managerial action"*[5] intervenes between the IF component (contingent variable[s]) and the THEN component (e.g. characteristics of organizational structure, style of leadership, method of controlling, etc.).

Criticism is also levelled at the previous tendency for contingency approaches to treat management as static, largely neglecting dynamic phenomena of organizational development.

More recent approaches therefore attempt to problematize the contingency variables themselves and to include in the concept a potential for modifying these variables to influence attainment of a desired future situation.[6]

The concept of **strategic management** and an organization capable of adapting to progress must be accorded special importance in this context.[7] This concept does not content itself with trying to adapt the system to its external and internal environment, but also encourages progressive development of the organization. An explicit attempt is made to achieve progress in satisfying the needs and interests of those affected by the organization and its actions through planned organizational change.[8]

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1 STAEHLE (1985), p. 88.
2 Cf. KAST and ROSENZWEIG (1982), p. 115.
3 STAEHLE (1985), pp. 38-39.
4 KHANDWALLA (1977), quoted in STAEHLE (1985), p. 38.
5 STAEHLE (1985, p. 101), author's translation.
6 Ibid., p. 102.
7 ANSOFF (1979) is regarded as the standard work on this topic. Cf. also KIRSCH et al. (1979), pp. 315 ff.
8 KIRSCH et al. (1979), p. 345.

2.2.4.3 The Process Approach

The process approach sees management as a process, i.e. as a sequence and mutual interaction of different management functions. This process is aimed at attaining given objectives in an efficient manner, through the work and cooperation of members of the organization.[1]

Although FAYOL originally defined five fundamental management functions (planning, organizing, leading, coordinating, controlling), there is some difference of opinion as to the number of management functions which may be regarded as adequate.[2]

Importance and Criticisms

KIRSCH et al. stress the fact that the process approach basically represents no more than a list of important, recurrent management tasks (functions, sub-processes) and a terminological definition of such tasks. To this extent, it forms a useful taxonomic framework, but not a theoretical concept.[3]

The importance of the process approach therefore partly lies in its function as an integrative framework for an overall presentation of the topic "management".[4] Most comprehensive treatments of management are now based on a framework of this type.[5]

2.2.5 Services as a Topic of Management Science

2.2.5.1 Introduction

The service sector in the industrial countries has grown steadily in recent years. At present, some 55 % of the workforce in the Federal Republic of Germany and some 70 % of that in the USA are employed in service vocations.[6] To date, however, the pronounced and growing importance of services has scarcely been mirrored at all in management literature; even new standard works on management contain hardly any special discussion of "service management".[7]

KLAUS states that[8]

> "*German business administration and American management science ... have both devoted only occasional attention to the specific problems of services and service management. The relatively small number of relevant publications, professorial chairs and specific training opportunities demonstrates this.*"

1 KIESER and KUBICEK (1983), p. 44.
2 MINER (1971), who has collated references to the management functions in the literature, lists the following: "*planning, organizing, commanding, coordinating, controlling, investigating, communicating, securing efforts, formulating purposes, staffing, directing, leading, motivating, innovating, representing, decision-making, activating, evaluating, administering*". Cf. KIRSCH et al. (1979), p. 31.
3 KIRSCH et al. (1979), p. 35.
4 Cf. STAEHLE (1985), p. 34.
5 Cf. e.g. ROBBINS (1984), KOONTZ, O'DONNELL and WEIHRICH (1986) and HODGETTS (1981).
6 KLAUS (1984), p. 467.
7 Standard treatises on management such as STAEHLE (1985), HILL (1981) and KAST and ROSENZWEIG (1982) - to name but a few - do not even include the terms "service management" or "service" in the index.
8 KLAUS (1984), p. 467, author's translation.

SCHEUCH detects the reasons for such "neglect" of aspects of service management in the extraordinary heterogeneity of the service sector.[1] In his view, this results in "*doubts as to the transferability of general postulates to different types of business and application*".[2]

In the view of KLAUS, the limited attention to service management aspects in management literature may be ascribed to the continuing assumption that there are no fundamental management-influencing differences between the provision of services and industrial production.[3] This assumption is, however, increasingly being questioned.[4]

In recent years, various authors have begun to devote more attention to the special features of services and their specific management requirements.[5]

2.2.5.2 The Definition of the Term "Services"

The above-mentioned heterogeneity of services makes it difficult to define the term in such a way as to include the diverse forms of service. Consideration of the definition, characteristics and classification of services therefore takes up much space in the still somewhat narrow range of general literature on services (i.e. that not devoted to specific service industries).[6]

QUINN and GAGNON define services as follows:[7]

> "*Services in truth comprise all economic activities whose principal output does not consist in a visible product. The benefit to the customer is created from resources which cannot be inventarized - comfort, security, flexibility - and the output is consumed as soon as it is produced*".

KOTLER's definition of the term is that[8]:

> "*A service is an activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product*".

Common to both these attempts at a definition of services is that they emphasize the intangibility of the service.[9] In addition, a series of other features distinguishing services from material goods are named. Table 2.2-1 collates the most frequently mentioned distinguishing features.

1 SCHEUCH (1982), p. V.
2 SCHEUCH (1982), p. V, author's translation.
3 KLAUS (1984), p. 468.
4 Cf. ibid.
5 Cf. especially CZEPIEL et al. (1985) and the references quoted, together with newer works such as MILLS (1986).
6 One of the few German language publications on services devotes no less than 60 pages to questions of terminology and the typification of individual services. Cf. SCHEUCH (1982), pp. 2-62.
7 QUINN and GAGNON (1987), p. 74., author's translation
8 KOTLER (1982), quoted in COWELL (1984), p. 23.
9 COWELL (1984), p. 24.

TABLE 2.2-1
Comparison between Goods and Services
(Source: KLAUS (1984), p. 469)

Goods	Services
tangible, visible	intangible, invisible
storable	non-storable
the object of the production process is the property of the producer	the object of the production process is not the property of the producer
technology is capital- and/or material-intensive	technology is labour-intensive
production is geographically independent of the point of consumption	production is at the point of consumption

Despite the distinctions listed in the table, such descriptions of typical features present the service as a **product** not essentially differing from the results of the industrial manufacture of goods.[1]

The terminology used in the discussion of services is confused by the fact that some authors fundamentally call into question the nature of services as a product,[2] whereas others point out that the dividing line between the manufacture of goods and the provision of services is becoming increasingly blurred.[3]

VOSS et al. argue in favour of abandoning any sharp distinction between the production of goods and the provision of services, and instead regarding "pnre manufactnring" and "pure service" as two ends of a continunm.[4]

VOSS et al. denote as "pnre manufacturing" a productive activity in which there is very little direct contact with the customer, as for instance in mining, agriculture and the creation of large engineering structures. The term "pnre service" is understood by these authors to apply to activities with a high level of direct customer contact, such as medical care and legal advice.[5]

Organizations whose activities may be assigned partly to the category of goods as described in *Table 2.2-1*, and partly to the category of services (e.g. restaurants and repair workshops) can he situated on a continuum between pure manufacturing and pure services.

In such a view, the outputs of a service-providing activity are no longer referred to as "services", but as "service packages" containing different service components (cf. Section 4.3.2.2).

1 KLAUS (1984), p. 469.
2 Ibid., p. 470.
3 QUINN and GAGNON (1987), p. 79.
4 VOSS et al. (1985), p. 2.
5 Ibid., p. 2, drawing on CHASE (1978).

The nearer an organization is to the pure services end of the continuum described above, the more it will be dominated by activities distinguished by the following features:[1]

a) human beings constitute the active and/or passive participants in the service-providing process;
b) the provision and consumption of the service take place in an interactive process, with changing rôles for the participants;
c) subjective factors and contingency variables strongly influence the course of the service interaction and thus the efficiency and effects of the service-providiug process.

From the point of view of management, this means that such services can no longer be designed and monitored through mauagement methods of the kind which are adequate at the other end of the continuum.[2] Where human beings are the object of the service-providing process, the conditions which apply are different from those under which "*goods and data form the main tools and the main objects of the production process*".[3]

2.2.5.3 Service Management and Management Science

The specialities of "pure" services referred to above, and the continuum between the provision of services and the manufacture of goods have (as noted above) so far scarcely been touched on in standard management literature. The implicit assumption is that services are of an inherently similar character to goods. A growing body of service management literature not dealing with specific service industries is, however, now beginning to be concerned with snch aspects.[4]

There have so far been only tentative attempts at transferring contingency approaches to the services sector in the sense in which it is defined above.[5]

2.3 Elements of a Conceptual Framework for the Management of Irrigation Systems

2.3.1 Introduction

The above review of current management science approaches suggests the usefulness of basing a conceptual framework for irrigation management on systems, contingency and process approaches, witb special emphasis on aspects of service management.

As already indicated, contingency approaches originate from a systems philosophy which stresses the interaction between the system and its environment. To this extent, therefore, the two approaches are fully compatible.

1 KLAUS (1984), p. 470.
2 Ibid.
3 KLAUS (1984), p. 470, author's translation.
4 Cf. for example CZEPIEL et al. (1985) and the literature quoted, together with MILLS (1986) and VOSS et al. (1985).
5 KLAUS, for example, presents some contingency views relating to the provision of services. The manufacture of goods as embodied in the goods-services continuum is included in this treatment only insofar as "quasi-industrial services" are involved. Cf. KLAUS (1984), p. 470.

As also noted above, process approaches constitute an ideal structural framework permitting a comprehensive presentation of the extensive management field. In conformity with the new GTZ project management concept[1], and supported by a large section of more recent management literature, the process approach has therefore been chosen as the presentational scheme for the conceptual framework developed here.

For all the reasons given above, this integration of three approaches (the systems, contingency and process approaches), far from being a meaningless juxtaposition of various incompatible theories, represents an organic whole, and one which, moreover, permits the inclusion of elements drawn from other management approaches and schools of thought should the problem in question require it.[2]

An essential element in the contingency framework described below is that the guidelines for management action which it aims at providing must not be understood in a deterministic sense. The factors or sets of factors in a given situation should be regarded as influencing variables which significantly constrain management action but in no sense tie it down completely. Despite all the influence exerted by the situation, the manager retains his freedom of purposeful action.[3]

On the basis of systems, contingency and process approaches, the definition of management attempted in Section 1.2.2 A can now be refined; **management** may be nnderstood as

> **the process of performing leadership functions in conformity with a given situation in order to develop and guide goal-oriented social or socio-technical systems and/or their subsystems.**

2.3.2 Irrigation and the Systems Approach

2.3.2.1 Introduction

The "water resources" working group of the October 1979 Bonn conference on "Agricultural Prodnction - Research and Development Strategies for the 1980's" (jointly organized by the BMZ, GTZ, DSE and Rockefeller Foundation) states in its conclusions and recommendations that:[4]

> *"... water projects are incorrectly planned and appraised, taking no account of agricultural, economic and social systems of which they form only one component. Technology is divorced from other relevant subject disciplines, such as agronomics, agricultural economics and sociology. The indivisible interaction of all the components of irrigated agriculture is only too frequently neglected. The network of social and economic interrelationships within which irrigation systems exist is often ignored. The working*

1 GTZ (1987).
2 On the basis of such a perception, the framework developed here has expressly been designed to allow incorporation of elements from other management approaches. An eclectic concept of this kind, juxtaposing elements from various theories, is entirely in accord with more recent trends in management theory. In view of the multiplicity of different management approaches indicated above, an eclectic understanding of management is often emphasized to the point at which various authors present "eclectic approaches" as independent management theories (e.g. STAEHLE [1985], p. 36 and HODGETTS [1981], p. 21). The eclectic manager is put forward by HODGETTS as a model for "modern" management. Cf. HODGETTS (1981), p. 21.
3 STAEHLE (1985), p. 101.
4 LEVINE et al. (1979), author's translation.

> *group therefore sees the necessity for a new, comprehensive concept which regards irrigated agriculture and irrigation and drainage projects as integral components of complex systems."*

These demands underline the significance of a holistic view of irrigation and the importance of interdisciplinary approaches.

Two further reasons for employing a systems-oriented conceptual framework for irrigation may be added:

- Depending on the task concerned, systems considerations enable the complexity of "irrigation" as an object of investigation to be reduced, while continuing to place special emphasis on interrelationships and dependences between individual system components.
- *"The systems approach provides an abstract, interdisciplinary terminology, which is not burdened by preconceptions or a priori assumptions about reality"*.[1]

It therefore contributes a language which facilitates mutual discussion of irrigation problems between the different subject disciplines concerned.

2.3.2.2 Irrigation Systems as Socio-Technical Systems

Irrigation systems are socio-technical systems, i.e. tbey embrace both social and technical system components and subsystems.[2]

The essential attributes of socio-technical systems include:

- close interrelationships between structural, social and technological features[3];
- openness of the systems to their system environments;
- an emphasis on conversion processes in which inputs imported from the system environment are transformed in a conversion process (throughput) and exported to the system environment as outputs.[4]

In a complex irrigation system, numerous transformation processes may be assumed to exist, for example[5]:

- **technical** transformation processes
  (e.g. distribution of water from its point of supply to the plant);
- **human** transformation processes
  (e.g. in-service training of workers);
- **financial** transformation processes
  (e.g. investments);
- **informational** transformation processes.

In an irrigation system, however, the technical transformation process, and in particular the process of snpplying and distributing water and applying it to the field, is often

1 HILL et al. (1981), p. 18, author's translation.
2 Cf. Section 2.2.4.1.
3 HILL et al. (1981), p. 443.
4 Cf. STAEHLE (1985), p. 142.
5 STAEHLE (1983), p. 39.

of special importance. Depending on the situation in question, this conversion may therefore often be regarded as the **dominant** transformation process.[1]

Our understanding of such input-output transformation models needs, however, considerable sitnational differentiation:[2]

Different systems may display differing degrees of openness to their environments.[3] As environmental inflnences on the system diminish or as its autonomy grows, it can increasingly be regarded as a "closed" system.[4]

Cybernetic views assume that a system of this kind can be "steered" towards a predetermined objective, if system output is continually adapted to a desired objective via an information feedback loop. In this way, attainment of the system objective can gradually be optimized.[5]

This form of closed information loop may be presented in simplified form as follows:

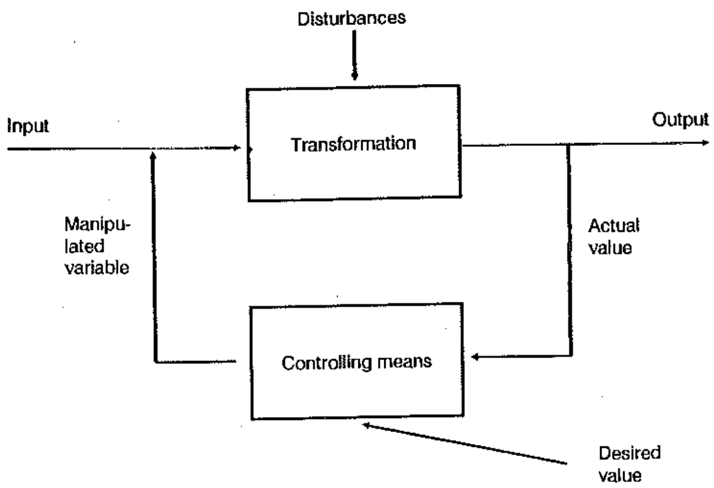


Fig. 2.3-1: Diagram of a Closed System
Source: ULRICH and FLURI (1984), p. 124

In open systems, there are limitations on the feasibility of snch "closed-loop control", since on the one hand, a frequent alteration or adaptation of objectives must be

1 STAEHLE (1983), p. 39.
2 Cf. the remarks in Chapter 4.
3 Some authors, e.g. KAST and ROSENZWEIG (1982), p. 102, therefore see a continuum between open and closed systems.
4 HILL et al. (1981), p. 339.
5 DE GREENE (1973), p. 42.

anticipated, owing to the multifarious environmental influences involved.[1], while on the other hand the principle of **equifinality** applies.[2] This means that no fixed, invariable input-output relationships exist:

> *"there is no simple one-to-one relationship between variations in inputs and outputs, because different combinations of inputs may result, depending on the technological system, in similar outputs, and different products may result from similar inputs."*[3]

2.3.2.3 Irrigation Subsystems

For the understanding of complex systems, it is important to define system components or subsystems which may be considered separately in order to reduce the complexity of the system under examination. Subsystems may be defined in various ways, depending on the problem or perspective concerned.

Of the various suggested options for defining subsystems in irrigation[4], categorization according to subject criteria is often useful. On this basis, one must distinguish between[5]:

- the physical subsystem (here interventions are centred on water resource management/hydraulic engineering),
- the biological-agricultural subsystem,
- the economic subsystem,
- the social subsystem,
- the management subsystem.

From an organizational viewpoint, it is often useful to distinguish between:

- the subsystem of the irrigation authority ("parent organization"),
- the subsystem of the irrigation agency "subsidiary organization"),
- the subsystem of water nsers.

In the development cooperation context, these are snpplemented by the subsystem of the donor agency ("donor system").

It is important that there should be different ways of looking at an irrigation system and that preference can be given to other alternatives for the definition of subsystems if this facilitates understanding of the system for the purpose of systems analysis.

2.3.2.4 Systems Perspectives in Irrigation - the *Status Quo*

A consideration of the *status quo* in current irrigation practice in the developing countries supports the view that the majority of irrigation projects are treated as closed

1 Cf. observations in Section 4.4.2.
2 Cf. KAST and ROSENZWEIG), p. 102.
3 DE GREENE (1973), p. 45.
4 Cf. particularly WALKER (1981), pp. 30 ff.
5 The classification largely corresponds to the main topical subdivisions of an irrigation feasibility study. Cf. MANN et al. (1982), p. 27 and LOWDERMILK et al. (1983), p. 41.

systems, i.e. they are seen from an engineering closed-loop control perspective. This viewpoint is usnally adopted irrespective of the intensity of environmental influences.[1] An attempt is made to establish firm desired valnes (usually in the form of desired yield per ha) regardless of conditions in the system environment. Political, economic and socio-cultural influences in the system environment are regarded as distnrbances needing to be corrected on an *ad hoc* basis.

System development is essentially confined to the mntnal adjustment of objectives, resources and system design, scarcely any systematic analysis of conditions in the system environment being attempted.[2] Consideration of subsystems is largely dominated by the analysis of the physical and technical system, i.e. matters of concern to engineers.[3]

A demand for systems-oriented approaches in irrigation is, however, increasingly being voiced in recent snbject literature. WALKER, for example, in his stndy of the Organization of Irrigation Systems, explicitly adopts systems approaches.[4] The well-known "Water Management Synthesis Project" also places great emphasis on the systems philosophy in its irrigation guidelines.[5] CHAMBERS and CARRUTHERS, who in a recent study stress the open-system character of complex canal irrigation systems, may here be taken as representative of other anthors who accentuate the systems viewpoint.[6]

It is of special importance for practice that the recently-fonnded "International Irrigation Management Institute" (IIMI) in Sri Lanka likewise expressly regards irrigation management from the open-systems viewpoint.[7]

2.3.3 Irrigation and the Contingency Approach

The nnmber of case studies in irrigation literature is legion. Project descriptions and analyses of the specific problem situations of individual irrigation projects, with appropriate recommeudations for mauagement, snffice to fill volumes. Nonetheless, such analyses are of only limited ntility for the general practice of irrigation management, due to the fact that the problem complex analyzed iu each instance, and therefore the consequences entailed, are applicable only to the project under review.

The response in practice generally consists of two opposed approaches[8]:

i) The conventional concept implicitly followed in irrigation management practice has so far adopted the attitude taken by the "classic" management scieuce approaches (cf. Section 2.2.2). It presumes that very much the same or similar management principles apply to all irrigation projects.

1 This impression is forced on the observer, when even in least-developed countries with no irrigation tradition, the same planning procedure is used as in threshold countries with a long-standing irrigation tradition. Cf. the planning requirements of the World Bank quoted in Section 5.2.2.4.2.
2 An effort is currently being made to introduce changes in this respect within the framework of the GTZ "Project Management Concept". This concept develops tools which may facilitate consideration of environmental constraints in project planning. Cf. GTZ (1986), p. 55.
3 Cf. WALKER (1981), pp. 9 ff.
4 Cf. WALKER (1981), pp. 25 ff.
5 Cf. LOWDERMILK et al. (1980) and LOWDERMILK et al. (1983).
6 CHAMBERS and CARRUTHERS (1985), pp. 12 ff.
7 Cf. IIMI (1985), Research Paper No. 1.
8 Cf. KAST and ROSENZWEIG (1982), p. 115.

ii) The other approach, already outlined above, regards each irrigation system as a uniqne, sitnationally-specific entity, and demands that management approaches shonld also be considered and designed individnally in each case, without reference to lessons learned elsewhere.

Contingency approaches occupy an intermediate position. They assnme that different real situations reqnire differing management approaches, bnt attempt to identify relevant contingency factors and to estimate their effects on management action. In this way they attempt to establish a basis for the situational differentiation of management recommendations.

This constitntes a considerable step forward towards a management concept capable of being adapted to a particular situation.

The importance of contingency analysis for irrigation is therefore being accorded increasing emphasis.[1] STEINBERG, for example, points to important contingency factors which he sees as exerting a powerful inflnence on "water management".[2] He therefore examines varions irrigation system typologies, conclnding that the majority of them are hardly appropriate for the conceptnalization of management requirements.[3]

In the fundamental World Bank study on irrigation project management already quoted above, BOTTRALL expressly refers to the importance of contingency factors for the organization and management of irrigation systems, at the same time noting how little account is taken of them in current practice.

> *"We would argue, therefore, that the sooner guidelines can be developed which take account of these factors, the better - however imperfect or oversimplified they may appear to be initially."*[4]

WALKER expressly includes contingency approaches in his analysis of irrigation system **organization.**[5] He illustrates the importance of the contingency approach for irrigation and discusses different irrigation typologies iu detail. In addition, he provides a detailed analysis of empirical findings on "if-then" relationships between different contingency variables (human systems, rights of ownership and use in water and land, technology and size of the irrigation orgauization) aud the organizatioual structure of irrigation systems.

So far as the author is aware, no conceptual study of the **management** of irrigation systems expressly based ou contingency approaches is yet available. This book attempts to contribute towards filling that gap.

The nature of contingency variables and their influence on irrigation management, together with typical basic situational configurations inferred from them, are dealt with individually in Chapters 4 and 5.

1 Cf. DOPPLER (1984), p. 18.
2 STEINBERG et al. (1983), p. 13.
3 Ibid.
4 BOTTRALL (1978), quoted in WALKER (1981), p. 304.
5 Cf. WALKER (1981), pp. 211 ff.

2.3.4 Irrigation and the Process Approach

2.3.4.1 Introduction

As already noted above, the process approach describes "management" as a process, i.e. as a - by no means rigid - sequence in which various management functions are performed.

This "cycle" of management functions is not so much a temporal as a logical sequence of tasks. The various management functions are interlinked and they are often discharged simultaneously.[1]

Management's basic tool for discharging these functions is **decision-making.** This task mnst be performed in the exercise of all management functions and is thus not regarded as a separate management function by many authors.[2]

> *"Decision-making is an immanent characteristic of management. Not infrequently, therefore, management is virtually equated with the implementation of decision-making processes."*[3]

In line with this view of decision-making tasks, the following observations assume that management action in irrigation is based on the functions of planning, organization, leading and controlling discussed in greater detail below.

The sequence of different phases in the development of an irrigation system is also based on a process approach. Irrigation systems are thus expressly regarded as transformable systems.[4]

There is an extensive but far from unified literatnre relating to the sub-division of development processes in organizations.[5] Conclusions regarding the seqnence of phases in the development process frequently presume that the sequence is rigidly fixed. In the development of an irrigation system, for example, a preparatory, planning, implementation and operation phase are generally assumed. As with the management function cycle, however, a strict time seqnence dividing the development process into the above phases does not exist in the real situation.[6]

The process approach as it relates to development phases is further complicated by another factor: it will be apparent from the definition of the term "project" presented in Section 1.2.2 C that an irrigation project and an irrigation system may be at different stages of their development. This is, for example, the case when certain project measures which themselves belong to the **planning phase** are carried out during the **operation phase** of an irrigation system.

Such observations on development processes in irrigation show that **contingency-oriented** management demands dynamic adaptation to changing situational constraints at various stages of development.

1 GTZ (1987), p. 2.4.
2 Cf. for example ROBBINS (1984), p. 92; STAEHLE (1985), p. 51; ULRICH and FLURI (1984), p. 40.
3 ULRICH and FLURI (1984), p. 40.
4 Cf. KIRSCH et al.(1979) on the topic of planned organizational transformation of organizations.
5 A comparison of different phase concepts appears in KIRSCH et al. (1979), pp. 38-39.
6 Cf. KIRSCH et al. (1979), pp. 36 ff.

It also means that situational constraints need to be problematized and that in the long term management must endeavour to modify constraints so as to obtain a desired future situation.[1]

2.3.4.2 Management Functions in Irrigation

Attempts to develop a clear system of basic management functions take up much space in management literature.[2] Nonetheless, there is agreement neither as to the taxonomy nor as to the number of management functions which may meaningfully be chosen.

In the English-speaking sphere, the management functions selected are generally variations on the classic basic management functions defined by FAYOL[3] and cited in Section 2.2.2 (B) (i.e. planning, organizing, leading, controlling).[4]

In the German-speaking management literature, this concept was long contrasted with a sub-division of management functions into two categories: on the one hand the **object-related** management functions (planning, organizing, controlling) and on the other the **people-related** functions ("leading, man-management"). This "dualist" view of management[5] is, however, nowadays freqnently yielding to simultaneous consideration of both components.[6]

In this newer approach, *"all tasks of a non-implementational nature necessary to the definition and realization of the objectives, structure and procedures of the organization"* are designated **management functions.**[7]

According to ULRICH and FLURI, these are distinguished from **implementational functions** by the fact that, in the case of the latter, *"the essential decisions as to objectives, measures and resources have already been made and have to be followed"*.[8]

The distinction frequently encountered in management literature between routiue and non-routine or problem-solving tasks indicates, however, that the dividing line between management and implementational functions is frequently somewhat fluid.

A clear trend is observable in the identification of management functions in specialist irrigation literature; initially, the term employed was "water management". This emphasized object-related tasks associated with the input "water". In general, both management and implementational tasks entailed in the physical distribution of water from its source via the distribution system to the plant were embraced by this term.

In this tradition, for example, SCHAAK, who, as the official reporter on the 12th congress of the "International Commission on Irrigation and Drainage" (ICID), in

1 This type of normative view of contingency management is cssential if efforts at conforming with the situation are not to resnlt in a justification of *status quo* structures. Cf. STAEHLE (1985), p. 100.
2 Cf. STAEHLE (1985), p. 40.
3 Translator's note: FAYOL's terms are "prevoir, organiser, commander, coordonner, contrôler".
4 The so-called POSDCORB concept, originating with GULICK and based on the functions "planning, organizing, staffing, directing, coordination, reporting and budgeting" has enjoyed great influence. Cf. STAEHLE (1985), p. 43.
5 STAEHLE (1985), p. 52 provides an overview of important German-speaking authors representing this view.
6 STAEHLE (1985), p. 53.
7 ULRICH and FLURI (1984), p. 37, author's translation.
8 Ibid., p. 37.

1984 summarized 72 papers from 24 countries on the topic "water management factors", defined "water management" as follows:[1]

"Water management as it pertains to irrigation encompasses all aspects of providing the right amount of water at the proper time and place. This entails effective management and coordination from the supply sources through the distribution system and to the farm field."

A second group of authors also regards the object-related functions of water distribution as central to the management of irrigation systems, but expressly stresses the importance of person-related aspects. This group includes LEVINE[2], COWARD[3] and recently MARTIN et al.[4] COWARD distinguishes the following "irrigation management activities"[5]: *"water allocation, system maintenance, conflict management"*.

With BOTTRALL's fundamental study, already referred to above[6], there is a move in the direction of general management science. BOTTRALL models his approach on that of DRUCKER, defining the formulation of objectives, planning and budgeting, operational planning, leading and controlling as important management functions in irrigation, but adding the following *"specialized activities"*[7]:

- water distribution,
- system maintenance,
- agricultural extension,
- watercourse improvement and advisory services,
- management support activities: finance, personnel and controlling.

LOWDERMILK (1985) explicitly argues in favour of a new view of "irrigation management", since not only must water be distributed, but *"people, credits, inputs, outputs, price policy, other services for farmers ... must be managed in the true sense of good management"*.[8] LOWDERMILK then concludes that *"management includes planning, setting objectives, coordinating, integrating, controlling and evaluating ..."*.[9]

Here, LOWDERMILK is following the view of management functions presented in the literature.

This view of management functions is also applied to the management of irrigation systems in the present book.

On the model of the sub-divisions often used in the literature[10], four basic management functions are defined:

1 SCHAACK (1984), p. G38.1.
2 LEVINE (1979), p. 5.
3 COWARD (1980).
4 MARTIN et al. (1986).
5 Op. cit., p. 19
6 BOTTRALL (1981).
7 Ibid., p. 122 ff.
8 LOWDERMILK (1985), p. 2.
9 Op. cit., p. 15.
10 To be found among others in STAEHLE (1985), ULRICH and FLURI (1984) and ROBBINS (1984).

Planning

The task of planning is to concretize the general objectives of the organization, establish sub-objectives and determine the resources and activities necessary and appropriate to their attainment[1] (cf. Section 5.2).

Organizing

The organizing function consists of developing formal structures[2] enabling the activities of members of the organization to be continuously directed towards the envisaged objectives[3] (cf. Section 5.4).

Leading

The leading function consists in exercising **personal** influence on the behaviour of individuals or on the interaction within and between groups, aimed at jointly attaining certain objectives[4] (cf. Section 5.5).

Controlling

The controlling function consists in continuous monitoring and adjustment of all activities of an organization in line with pre-determined plans and standards[5] (cf. Section 5.3).

2.3.5 Service Management and Irrigation

In the 1960's, the objectives of irrigation projects in developing countries conformed to the general orientation of development policy towards growth. They were accordingly aimed primarily at export promotion and hard currency income or at import substitution. Large-scale irrigation projects on the colonial model continued to enjoy priority, closely-supervised production was the predominant form of agriculture, and increased income and social improvements for the rural population were expected to accrue from general "trickle-down" effects (e.g. Helmand Valley Project, Afghanistan; Mwea Settlement Project, Kenya; Managil Extension, Sndan and projects in Mexico).[6]

In the 1970's - especially following McNamara's 1973 speech in Nairobi - a shift in development policy accents occurred; in addition to purely growth objectives, distribution aspects and the criteria of increased income and job security for the rural population received increasing attention.[7] This generally resulted in approaches stemming from a "basic-needs strategy", emphasizing need- and target-gronp-orientation, with a stronger bias towards rural development and measures concentrated on smallholdings and on mobilizing the capacity for individual initiative and self-help among the rural poor.

1 Modelled on ULRICH and FLURI (1984), p. 92.
2 Cf. Section 5.4.1 for an explanation of the term "formal".
3 KIESER and KUBICEK (1983), p. 1, author's translation.
4 Modelled on ULRICH and FLURI (1984), p. 139 and on STAEHLE (1985), pp. 535-536.
5 STAEHLE (1985), p. 373
6 Cf. BERRY et al. (1980), p. 8.
7 Cf. AYRES (1983), pp. 7 ff.

The implication for irrigation was that - in addition to the previous exclusive concentration on the (agricultural) commodity-producing function - greater emphasis had *de facto* to be placed on the service function of irrigation organizations for smallholders and water users.

In the author's view, research and practice in irrigation management have succeeded only to a limited extent in adjusting to this change in emphasis:

- Irrigation management research continues to coucentrate on "water management" as the dominant conversion process in the production of goods by irrigated agriculture.

  Investigation of "water management" as the management of a service or "service package"[1] has usually been lacking, as has general consideration of service management in irrigation organizations.

- In recent years, observations on the rôle of the farmer in irrigation schemes in developing countries have increasingly tended to stress the **participation** of water users and water user's groups.[2] Participation in this context is often used to denote the involvement of such groups in *"planning and decision-making processes, and their receiving their share of the results and benefits"* of irrigation activities.[3] It will, however, be apparent that participation in this sense cannot determine the relationship between the irrigation organization and the water users under all sets of circumstances.[4]

The suspicion mnst be that study of the continuum ranging from "pure" productiou of goods to "pure" provision of services (cf. Section 2.2.5.2) in irrigation has tended to concentrate almost exclusively on the pure production end of the spectrum.

Implicit demands for greater attentiou to the service function of irrigation organization have, however, been increasingly evident in the very recent past. SALDANHA, for example, speaks expressly of "beneficiaries" and "beneficiary organizations" in relation to water users and water users' organizations.[5]

A service orientation in irrigation is snbscribed to most forcefully by the interdisciplinary research team based at Cornell, Colorado State and Utah State Universities. The Water Management Synthesis Project based on this team's work focuses its snggested solutions on studies of the irrigation farmer as the "farmer-client".[6] It thus expressly accentuates the service relationship in irrigation. Only limited conclusions are drawn for service-oriented irrigation system management, however.

As far as the author is aware, there has hitherto been no application of more recent research on service management to the irrigation management field.

1 Cf. Section 4.3.2.2.
2 Cf. FAO (1985) and UPHOFF et al. (1985).
3 GTZ (1987), p. 7.6
4 Cf. the remarks in Section 5.5.3.3.2.2.
5 SALDHANA (1985) in ODI (1985), p. 7.
6 Cf. SKOGERBROE et al. (1980).

PART C: DEVELOPMENT OF THE CONCEPTUAL FRAMEWORK

3. IRRIGATION AND THE SITUATION

3.1 Introduction

The framework of reference to be developed in this book is intended to contribute to creating a conceptual foundation for management action in irrigation more closely adapted to situational constraints than has hitherto been the case.[1]

In line with the contingency approaches to management science outlined above, it is assumed that propositions concerning ends-means relationships in management are scarcely meaningful nnless related to a defined situation, i.e. without "situational differentiation".[2] Contingency management therefore demands coordination between the goals, situational constraints and chosen means of management action (cf. Fig. 3.1-1).[3]

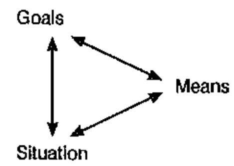


Fig. 3.1-1: The Variables of Contingency Management
Source: adapted from HILL et al. (1981), p. 29

This process of coordination assumes that there must be a "fit", i.e. a high degree of congruence between goals, chosen means and situational coustraints for effective management action to take place.

This demand for a situational fit[4] is in line with the so-called "congruence hypotheses" subscribed to among others by MINTZBERG, MORSE and MORSE and LORSCH[5], and by HILL et al. or ULRICH and FLURI in the German-speaking literatnre.[6]

1 In current irrigation theory and practice, no situational differentiation of management approaches founded on corresponding basic concepts can be assumed. Cf. the remarks in Section 4.1.
2 HILL et al. (1981), p. 28.
3 As indicated in Fig. 3.1-1, there is an interrelationship between goals and situational constraints, because modified goals result in modified situational constraints. Cf. Section 3.2.1. HILL et al. also point out that goals ("value premises") and constraints ("fact premises") cannot always be differentiated clearly. Cf. HILL et al. (1981), p. 141.
4 Cf. HILL et al. (1981), p. 332.
5 Cf. e.g. MINTZBERG (1983), p. 122; MORSE (1970) and MORSE and LORSCH (1970), quoted in HILL et al. p. 332. These congruence hypotheses represent the principle of congruence between the situational constraints and the organization, as well as between different situational constraints. Congruence hypotheses stem mainly from the "fit-efficiency hypothesis" of LAWRENCE and LORSCH, where congruence between the (sub)system and the (sub-)environment is seen as a prerequisite for effective organizational action. The fit-efficiency hypothesis is now disputed, owing to its limitation to environmental variables. Cf. STAEHLE (1985), p. 485.
6 Cf. HILL et al. (1981) and ULRICH and FLURI (1984).

The observations below are modelled on fit hypotheses of this kind.

3.2 Contingency Factors in Irrigation

3.2.1 Introduction

Following HILL, FEHLBAUM and FLURI[1], "contingency factors" as referred to below are to be understood as those variables influencing management action, but which management

a) cannot manipulate in the short term[2],

b) does not regard as goals for itself (e.g. objectives of the organization).

Other terms often synonymous with "contingency factors" are "organizational constraints", "components" or "influencing variables" or - in the Anglo-American literature - "contingency variables".[3]

Only factors **relevant** to management action are of interest in contingency approaches. These include[4]

i) Factors whose ability to explain structural differences or differences in management behaviour can be demonstrated empirically.

"Explaining" here is to be understood less as the proving of a cause-effect relationship than "*in the statistical sense as a reduction of variance*" in structural or behavioural characteristics regarded as dependent variables.[5]

ii) Factors whose influence on organizational structure or management behaviour can be explained by non-empirically-based analysis.[6]

Contingency factors should not, however, be understood as determinants of management behaviour. Although the sitnation may largely constrain the manager's potential for action, it is assumed, as indicated above, that it does not in the final resort determine such action.

In accordance with the above definition, goals and strategies pursued by the manager himself are not regarded as contingency factors. **Predetermined** goals and strategies, towards which the manager must orient his actions, without being able (in the short term) to modify them, are, by contrast, definitely to be regarded as contingency factors.[7]

It is of importance to recognize that varying goals and strategies may also cause varying contingency factors to influence management actions.[8]

1 HILL et al. (1981), p. 319.
2 Unlike HILL et al., who demand general non-manipulability, this definition requires contingency factors to be non-manipulable in the short term, i.e. they may well be susceptible to deliberate modification over the long term. This re-definition appears important, since otherwise contingency considerations might be used to justify *status quo* structures. Cf. STAEHLE (1985), p. 99.
3 Cf. KIESER and KUBICEK (1978b), p. 106.
4 Ibid.
5 Cf. KAISER and KUBICEK (1978 b), p. 106.
6 Ibid.
7 Goals as defined in Section 4.4.2.1 should not be confused with tasks, which are frequently referred to as "material goals" or simply as "goals" in organizational sociology. Cf. KIESER and KUBICEK (1983), p. 245.
8 Cf. HILL et al. (1981), p. 333.

Likewise of significance is the fact that factors which cannot be influenced at a certain management level, and are therefore to be regarded as contingency variables in the above sense, may well be susceptible to manipulation at a higher level of the system. Any analysis of contingency factors must therefore relate to a defined level of management.[1]

Unless stated otherwise, reference below is always to the management level at which ultimate responsibility for management of the system is located.[2]

3.2.2 The Meaning of Particular Contingency Factors

There has been no lack of attempts to identify specific contingency factors influencing the management functions of planning, organizing, leading and controlling.[3]

Initially, contingency approaches attempted to describe the situation of organizations by means of a single variable. Interest was focused chiefly on the system environment, the size of the organization or the technology employed.[4] The fact that influences on organization could be demonstrated empirically for each of these factors showed that no single factor was decisive; rather, the situation needed to be described in terms of a whole series of factors.[5]

Contingency approaches now generally adopt this form of "multicausal" understanding of the situation.

KIESER and KUBICEK additionally argue in favour of regarding the term "situation" as an open concept "*to which we assign concrete connotations in accordance with the problems we have to solve and the knowledge we possess in each case.*"[6]

The infinite number of influencing variables of a situation which this presupposes implies a similarly unlimited number of possible management action situations. It is therefore important to reduce this variety to a practicable level for application-oriented management planning.[7]

A review of the most important influencing variables associated with various management functions in the literature [8] permits the following conclusions:

1) Particularly relevant influencing variables of the situation are:

- the system environment,
- the size of the organization,
- the type of task/technology,
- the human capabilities.

1 Ibid., p. 324.
2 Cf. Section 3.2.4.2 for the term "ultimate responsibility" and its meaning.
3 Cf. historical accounts of the contingency approach in STAEHLE (1985) and KIESER and KUBICEK (1983).
4 KIESER and KUBICEK (1983), p. 212.
5 KIESER and KUBICEK (1983), p. 108.
6 KIESER and KUBICEK (1983), p. 217, author's translation.
7 STAEHLE (1985), p. 97.
8 Cf. HILL (1981), STAEHLE (1985), ROBBINS (1984), KIESER and KUBICEK (1983) and HODGETTS (1981).

2) The organizational structure is generally regarded as an important mediating variable of the situation. This means that the situational constraints influence the design of the organizational structure and that this in turn has a feedback effect on the planning and leadership behaviour and on the controlling function of management.[1]

A more detailed discussion of the dependent variables, i.e. those features of the individual management functions influenced by the above-mentioned contingency factors, appears in Chapter 5.

Some basic characteristics of organizational structure, i.e. the "mediating variables" mentioned above, will, however, be referred to earlier, as part of the discussion of contingency factors (cf. Section 3.2.4).

3.2.3 Contingency Factors Specific to Irrigation

There have not been many previous attempts to identify management-relevant contingency factors in irrigation. Steps in this direction have recently been taken by BOTTRALL (1981), WALKER (1981), ABERNETHY (1984) and STEINBERG (1983).

An extensive general list of influencing factors has been presented by ABERNETHY[2] (cf. *Table 3.2-1*). ABERNETHY stresses that he regards this list as in no way exhaustive[3], following the "open" concept of the situation subscribed to by KIESER and KUBICEK (cf. Section 3.2.2). A similarly extensive list of management-relevant influencing variables is presented by BOTTRALL, with reference to a comparative study of four large canal systems in Taiwan, Pakistan, India and Indonesia.[4]

A practicable method of narrowing selection to the most important factors or factor categories emerges from the analyses of BOTTRALL (1981) and WALKER (1981), who refer to the mediating variables of organizational structure discussed above.

BOTTRALL identifies the following inflnencing variables in relation to irrigation organization:[5]

- size,
- technology,
- human capabilities,
- stability of decision-making environment,
- social culture,
- objectives, strategies and key activities.

1 In relation to planning, this is, for example, apparent from KÖHLER's research programme (1982). Cf. STAEHLE (1985), p. 389. There is special emphasis on the relationship between situational constraints, structural features and the controlling function in HORVATH and GAYDOUL (1978) and GAYDOUL (1980), cf. STAEHLE (1985), p. 391. The effect of organizational structure on leadership behaviour is indicated by, among others, OSBORN-HUNT (1975). Cf. STAEHLE (1985), p. 624.
2 ABERNETHY (1984), p. 14.
3 Ibid.
4 BOTTRALL (1981), p. 41/42.
5 BOTTRALL (1981, p. 70.

TABLE 3.2-1: Contingency Factors Influencing Management Actions in Irrigation Adapted from ABERNETHY (1984), pp. 13 ff.

A) ENGINEERING FACTORS

- Density of channel network
- Frequency of flow controlling structures
- Quality and quantity of flow-measuring facilities
- Amount of short-term storage within the system
- Ratio of water available to crop water requirements
- Ratio of canal capacity to average demand
- Quality of internal communications (i.e., how nearly up-to-date is the manager's information about flows within the system)
- Whether farmers get water on demand, or according to some imposed schedule
- Sedimentation
- Seepage
- Effective rainfall
- Weed growth

B) AGRICULTURAL FACTORS

- Size of land holdings
- Quality of land levelling
- On-farm irrigation technique
- Tillage practice
- Soil type
- Crop types
- Availability of labour and other farm power

C) SOCIO-ECONOMIC FACTORS

- Size of farmer groups
- Quality of communication between management and farmers
- Mode of system organization (state or private; compulsory or voluntary)
- Method of financing management activities
- Institutional arrangements for supervising work of water-control staff
- Land tenure system
- Degree of uniformity of holdings
- Reliability of future water deliveries
- (In new schemes) system of settler selection

Similarly, WALKER emphasizes the following components of the situation in irrigation organizations:[1]

- the human sub-system,
- property and water- and land-use conditions,
- technology,
- size of the irrigation organization.

If, following the above definition of contingency factors, it is assumed that objectives, strategies and key activities may only to a limited extent be regarded as influencing variables of the situation, there is broad agreement between these two lists.

STEINBERG[2] has also provided an important contribution to the discussion of management-relevant influencing variables in irrigation.

In addition to other factors already present in BOTTRALL's and WALKER's lists, STEINBERG stresses the importance of the structural variable "*locus of* [ultimate] *responsibility*".[3]

STEINBERG points out that this factor, which describes the allocation of ultimate responsibility[4] to the different system levels named in Section 2.4.2.3, substantially influences the selection of system-appropriate management approaches in irrigation.

In line with the general discussion on relevant contingency factors in management outlined in Section 3.2.2 and the specific irrigation considerations indicated here, the range of possible influencing variables considered below has largely been restricted to five factors:

- the system environment,
- the locus of ultimate responsibility,
- technology and tasks,
- the size of the irrigation organization,
- the human sub-system.

These contingency factors are studied in greater detail in the following sections.[5] Although the individual factors are considered in isolation, it shonld be assumed that a number of these factors may have reciprocal effects on one another and that the factors interact multicausally to influence management behaviour in the way outlined above.

3.2.4 The Structure of the Irrigation Organization - Preliminary Remarks

3.2.4.1 General

Section 5.4 contains a detailed discussion of the management function "organizing", i.e. the design of the organizational structure.

1 WALKER (1981), p. 240.
2 STEINBERG (1983).
3 Cf. Section 3.2.4.2 on the term "nltimate responsibility".
4 Cf. remarks in Section 3.2.4.2.
5 Conditions relating to the ownership and use of land are not dealt with in a separate section, but referred to under the heading of customer-related contingency factors (cf. Section 3.2.8.4).
The "social culture" factor referred to by BOTTRALL is discussed in relation to the system environment (cf. Section 3.2.5).

Owing to the significance of organizational structure as an influencing variable noted above, however, some observations summarizing the essentials of organizational structure need to be made at this point.

In Section 5.4.1, the design of organizational structure is regarded as including two primary aspects: "differentiation" and "coordination". Initially, the tasks to be fulfilled[1] must be divided into sub-tasks and allotted to certain positions ("differentiation").[2] In order to orient the activities of these relevant position-holders towards a common objective and ensure the efficient implementation of tasks, management must ensure that task-fulfilment measures are appropriately coordinated with one another ("coordination").[3]

The formal structure of an organization may thus be regarded as the total system of rules and regulations ensuring differentiation and coordination, and hence directing the performances and behaviour of members of the organization towards goal achievement.[4]

In the organization literature, opinions are divided as to which dimensions of organizational structnre are most important.[5]

Following both KIESER and KUBICEK and STAEHLE, we may differentiate between the following structural dimensions:[6]

a) **Specialization**, i.e. the form and extent of division of labour in which different kinds of sub-task are performed ("horizontal differentiation")[7] (cf. Section 5.4.2);

b) **Configuration**, i.e. the type and extent of hierarchization of the organization, e.g. number of hierarchical levels, number of staff supervised by a manager etc. ("vertical differentiation");[8] (cf. Section 5.4.3).

1 For the term "task" cf. observations in Section 3.2.6.2.1.
2 HILL et al. (1981), p. 28. Cf. also KIESER and KUBICEK (1981), p. 81.
3 Cf. HILL et al. (1981), p. 28.
4 KIESER and KUBICEK (1983), p. 22.
5 WEBER (1921) defines the following five dimensions:
specialization,
standardization,
formalization,
decision-centralization,
configuration.
Most statements on structural dimensions are influenced by WEBER's bureaucracy model (cf. Section 2.2.2C) and by the work of the ASHTON group, which carried out extensive empirical investigations into organizational structures in the 1960's. Cf. STAEHLE (1983), pp. 135 ff.
6 Cf. STAEHLE (1983), p. 137 and KIESER and KUBICEK (1983), pp. 77 ff., closely based on the dimensions defined by WEBER.
7 KIESER and KUBICEK (1983), p. 81.
8 STAEHLE (1983), p. 137

c) **Delegation** of authority,[1] i.e. vertical allocation of (especially) the power to make decisions and issue instructions and of the associated responsibility[2] (cf. Section 5.4.4);

d) **Coordination**, i.e. coordinating processes involving division of labour and orientation of these diverse activities towards the objectives of the organization[3] (cf. Section 5.4.5);

e) **Formalization**, i.e. the extent to which formal and formalized rules determine organizational behaviour[4] (cf. Section 5.4.6).

ROBBINS subsumes Dimensions (a) and (b) under the concept of the "complexity" of an organization.[5]

If complexity and formalization are each described iu terms of a "high-low" continuum, two extreme, opposed variants of organizational structure will result:

- the bureaucratic or **mechanistic structure**, exhibiting high complexity and formalization;[6]
- the **organic structure**, with low complexity and low formalization[7].

This continuum from mechanistic to organic structures[8] is of particular importance for the analysis below. The influence of the contingency factors described in the following sections (system environment, technology, etc.) on the mediating variable of organizational structure can be described in terms of this continuum.

3.2.4.2 The Locus of Ultimate Responsibility

Organizational structure as a mediating variable of the situation is of particular significance in regard to management action in irrigation.

Of primary importance in this context is the localization of ultimate responsibility for system management at a particular system level.[9] This refers particularly to the distribution of tasks, authority and responsibility between the irrigatiou agency and the water users.

STEINBERG assigns predominant importance for management behaviour in irrigation systems[10] to the question of where ultimate responsibility is located - he speaks

1 Cf. Section 5.4.4.
2 HILL et al. (1981), p. 124.
3 KIESER and KUBICEK (1983), p. 81.
4 HILL et al. (1981), p. 25. Cf. Note ... in Section ... on the distinction between the terms "formal" and "formalized"
5 ROBBINS (1984), p. 165.
6 Numerous authors follow WEBER's concept of the *"ideal type of bureaucracy"* in ascribing a low level of delegation to bureaucratic or mechanistic structures, i.e. a high degree of centralization of decision-making powers. Following MINTZBERG, in the context of this book, structures with a high degree of complexity and formalization will generally be regarded as bureaucratic or mechanistic. Cf. MINTZBERG (1983), p. 36.
7 ROBBINS (1984), p. 174.
8 The description of these two diametrically opposed structural systems originates in the work of BURNS and STALKER, who analyzed the influence of the system environment on organizational structure in British industrial companies over a period of years. Cf. STAEHLE (1985), p. 477 and the observations in Section 3.2.5.3.
9 It may be assumed that ultimate responsibility includes "leadership responsibility" and "responsibility for taking action". Whereas the latter may be delegated, leadership responsibility is retained by the delegator. This means that *"he is responsible for presenting his subordinates with clearly-defined tasks, issuing them with unambiguous instructions and regularly controlling their activities."* KIESER and KUBICEK (1983), p. 161, author's translation.
10 STEINBERG (1983), p. 15.

in this context of the "locus of responsibility" or "locus of management", a view which is subscribed to by other authors.[1]

Following STEINBERG, the "locus of responsibility" as referred to below is therefore regarded as an important contingency factor.

The importance of this influencing variable stems particularly from the ways in which it determines the status of the water users from the viewpoint of the organization. The locus of responsibility therefore also exerts substantial influence on water user participation, i.e. the part water users play in making decisions relevant to the organization.

If the locus of responsibility lies in the irrigation agency, the water users may be regarded as **members of the organization** subject to directions from the management of this agency. Where the water users have a subordinate status of this kind, they may be granted a greater or lesser degree of participation.

If the locus of responsibility is with the water users,[2] their status is that of **independent users** or participants in the authentic sense, able to insist on non-manipulative recognition of their needs.[3]

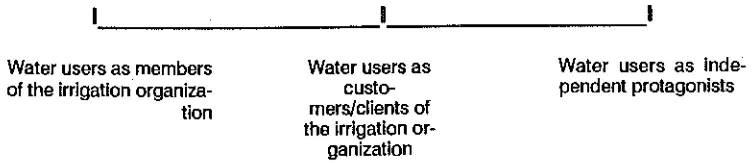
Greater difficulties are presented by the splitting of responsibility between agencies and water users frequently encountered in the irrigation field. Here, it is no longer possible to speak of delegated responsibility in the sense of the structural dimension referred to above. One principle of delegation as more closely defined in Section 5.4.4 is that, even when tasks authority and responsibilities are delegated, ultimate responsibility should remain with the delegating manager.[4] In this case this does not apply. Rather, a genuine division of responsibility must be assumed to have taken place, locating ultimate responsibility for each of the separate fields of work at separate levels.

In consequence, two organizations are formed - the irrigation agency (referred to in the following sections as the "irrigation organization") and the water users' organization. Water users can no longer be regarded as members of the irrigation organizatiou. They are now part, not of this organization's system, but of its system environment.[5] From the viewpoint of the management of the irrigation organization, they enjoy the full status of customers or clieuts who may participate iu various ways iu implementational tasks. The ultimate responsibility for designing the system rests with irrigation

1 e.g. by THORNTON (1975), quoted in WALKER (1981), p. 91.
2 In extreme cases, this may even be a single operator of an irrigation system, cf. "individual irrigation" as described by STEINBERG (1983), p. 15.
3 KIRSCH et al. (1979), p. 298. KIRSCH et al. contrast authentic participation with:
- pseudo-participation, not envisaging any consideration of participants' values and needs, in which "participation" is intended solely to persuade the participants to identify with management decisions;
- participation in the sense of a human resources strategy, where opportunities of participation are intended to mobilize the knowledge potential of the managed, without entailing consideration of their needs;
- participation in the sense of a social value strategy, in which participants are included with the aim of taking their values and needs into account, bnt the knowledge required by the participants is simultaneously underestimated. Decisions cannot then be effectively addressed to their values and needs.
4 ROBBINS (1984), p. 217.
5 As customers/clients, the water nsers may conceivably be seen as "partial" employees of the organization. Cf. observations in Section 5.5.3.3.2.

organization management, as do the corresponding decision-making powers. Opportunities for authentic water user participation are therefore restricted.[1]

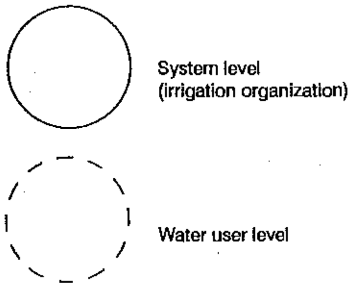
Water user status thus constitutes the following continuum (discussed in greater detail in Section 4.4.3):



In simplified terms, four basic configurations for the locus of ultimate responsibility may be distinguished:

a) The segregated form of organization

This may be symbolized as

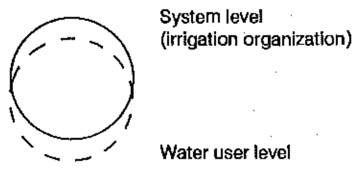


In the segregated form of organization, the irrigation organization's task consists exclusively in supplying water (generally at the main and secondary canal level). This means that management responsibility for all other concerns of the water users in relation to agricultural production is located entirely outside the system, in practice forming part of its system environment.

In such cases, water users are to be regarded as customers with virtually no participation in the technical conversion process performed by the organization (water supply).

b) The integrated form of organization

Symbolically:



1 Unless provided for by representation on the decision-making bodies of the irrigation organization.

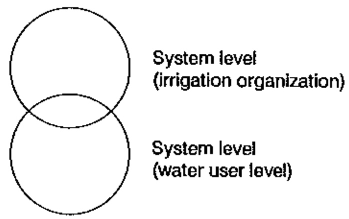
In this instance, ultimate responsibility for attaining prescribed objectives and overall goals is located wholly at the system level, i.e. it devolves on the irrigation organization management. Settlement projects, involving "closely-supervised production", are an example.

Nonetheless, as indicated by experience on the Mwea project in Kenya[1], the organization cannot assume responsibility for all the concerns of the settlers or water users without turning itself into a welfare agency and stifling all initiative on the part of the irrigation farmers themselves. Responsibility for certain water user concerns must therefore remain outside the system, and management must take this fact into account in its decisions.

The water users may nevertheless essentially be regarded as members of the system.[2]

c) Split responsibility

Symbolically:



Here, too, responsibilities are divided between the system level and water user level, but there are considerable overlaps. This will, for example, be the case if the irrigation organization is responsible for the main and secondary system, while simultaneously supporting water users via an agricultural advisory service, providing them with inputs, etc., without the farmers having production obligations in the sense indicated above. SAGARDOY (1982) describes such systems as "multi-purpose water management organizations".[3]

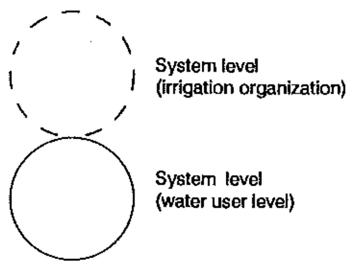
In systems of this type, the water users enjoy the status of customers or clients of the irrigation organization. In practice, however, split responsibility frequently entails considerable problems of demarcation.

Eggers cites a study of 49 irrigation systems in North Eastern Thailand, part of which involved determining where responsibility for tackling certain operation and maintenance problems lay.[4] For a large proportion of problems encountered within their own area of responsibility, the water users regarded not themselves but the irrigation organization as responsible.[5]

1 Cf. CHAMBERS and MORRIS (1973).
2 Cf. Sections 3.2.8.2 and 4.4.3.3.
3 SAGARDOY et al. (1982), p. 24. Cf. Table 5.4-1.
4 EGGERS (1982).
5 Ibid. p. 9

d) Government-initiated or government-supported community systems

Symbolically:

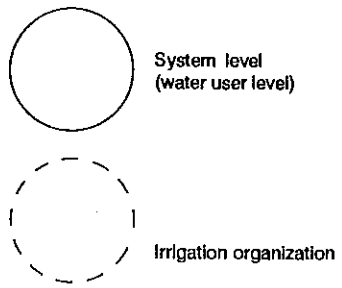


Intervention by state irrigation bodies is here confined to supporting and advising water users who operate the system autonomously, or to providing the initial impulse for autonomous initiatives.

In such cases, the water users may be seen exclusively as customers/clients. The transformation process ("the extension") occurs in close interaction with the water users.

e) Community systems and private systems

Symbolically:



In this instance, the community of water users or the private managers of the irrigation system exercise full management responsibility. The influence exerted by an external irrigation authority must be considered as an environmental factor of the system.

3.2.5 The System Environment

3.2.5.1 Introduction

Before specific constraints of the system environment on irrigation systems are discussed in more detail, some explanation of the designation "system environment" itself is necessary. A distinction is drawn here between the term "system environment" and the narrower concept of the "natural environment", which is used below to denote only ecological environmental factors such as climate, water, soil etc.

The precise connotation of the term "system environment" depends on the object under study. Everything external to the system or sub-system under review may be

referred to as the "system environment".[1] Initially, therefore, this terminology is no more than an abstract conceptual aid, dividing the world, as it were, into two parts - the system (or sub-system) and the system environment.[2]. As no such clear distinction exists in the real world, and since each system must be seen as a subordinate part of a larger "supersystem" and each subsystem as part of a system, additional interactions between the system and its environment need to be included in the above concept.[3]

The first problem confronted in considering the system environment is that of distinguishing management-relevant sections of the environment from the infinity of phenomena not belonging to the system.[4] As with consideration of the system itself, the definition of what is to be regarded as the relevant system environment depends on the particular questions to be answered.[5]

A sub-division of the system environment frequently referred to in the management literature originates with DILL[6] and distinguishes between a "task environment" or **"specific environment"** and a **"general environment"**.

This distinction will initially be adopted here and applied to irrigation. It is, however, important to recognize that it yields no more than a list from which sections of the system environment relevant to management may be selected to suit a specific problem situation.

The **general environment** is defined as comprising everything external to the system which is potentially capable of influencing or being influenced by it.[7]

The **specific environment**, by contrast, includes only those components of the system environment which directly affect the performance of the system's tasks.[8]

It will not always be possible to draw a clear, unambiguous dividing line between the general and specific system environments. The two terms do, however, provide an important aid to simplifying extremely complex interrelationships.

3.2.5.2 Types of Environmental Influence in Irrigation

3.2.5.2.1 Introduction

It is in the nature of the topic that there should be widely-differing suggestions for defining the general and specific system environments.[9] The following classification appears appropriate to the field of irrigation:

The general system environment (cf. Section 3.2.5.2.2):[10]

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1 On the one hand, this means that when considering a sub-system we may regard the remainder of the system as part of the system environment. HILL et al. differentiate in this respect between an "external" and an "internal" system environment. (HILL et al. (1981), p. 337). On the other hand, as a result of this approach, parts of the system environment may be viewed in much the same way as a system, if they are particularly important to the observer ("environmental subsystem", cf. GALLOPIN (1981), p. 146).
2 GALLOPIN (1981), p. 139.
3 Ibid., p. 140
4 Cf. STAEHLE (1985), pp. 482-483 and also MASON (1979), pp. 17 ff.
5 Cf. GALLOPIN (1981), pp. 145 ff.
6 DILL (1958), quoted in STAEHLE (1985), p. 482.
7 ROBBINS (1984), p. 51.
8 Ibid.
9 Cf. for example KAST and ROSENZWEIG (1982), p. 134; ROBBINS (1984), p. 55; ULRICH and FLURI (1981), p. 30 or KIESER and KUBICEK (1983), pp. 318 ff.
10 Based on WALKER (1981), pp. 53 ff.

- the general ecological environment or "natural environment" (climate, soil and water resources, etc.);
- the political/administrative and legal environment,
- the economic and agro-economic environment;
- the technological environment:
    - the biological-technological environment (agriculture),
    - the mechanical-technological environment,
    - the general infrastructure;
- the sociological environment:
    - the socio-economic environment,
    - the institutional environment,
    - the socio-cultural environment.

The specific environment (cf. Section 3.2.5.2.3):[1]

- the procurement system;
- the system of demand and reception;
- the specific inflnences of the political/administrative and legal environments;
- the specific ecological environment;
- the specific socio-cultural and socio-economic environment.

A detailed description of the above-mentioned sectors of the system environment lies outside the scope of the present study. Here, certain aspects illustrating the inflnence of the general system environment on irrigation management will be pointed out iu order to indicate the significance of the various sectors.

The influence of the specific system environment is obvions. The remarks on the general system environment will therefore be followed only by a brief indication of the most important sectors of the specific environment.

3.2.5.2.2 Aspects of the General System Environment

3.2.5.2.2.1 The General Ecological Environment

Of particular importance in terms of the general ecological environment are the general climatic, hydrological, topographic and pedological conditions. These determine system characteristics and management approaches in irrigation iu a variety of ways.

A) General Climatic Conditions

The importance of irrigation and thus the overall goals and necessary management approaches may differ widely according to climatic conditions.

FAO/UNESCO have suggested grading irrigation measnres according to their importance, as follows:[2]

1 Based on WALKER (1981), p. 62.
2 FAO/UNESCO (1973), p. 2.

a) Irrigation in arid zones, where it constitutes the sole or most important means of meeting plant water requirements throughont the year;

b) Irrigation in arid and semi-arid zones as a snpplement to inadequate or irregularly distributed precipitation during the main crop growing season;

c) Irrigation in semi-arid/semi-humid climatic zones, to enable a second crop to be grown during the dry season;

d) Irrigation in semi-humid zones as an insurance against occasional lack of rainfall (yield stabilization);

e) Irrigation in semi-humid zones as a means of optimizing yields and ensuring the necessary regular water supply.

It must be assumed that each of the different grades of importance for irrigation is associated with different goal-orientations, resource availabilities and incentives for potential water users.[1]

It should be noted that the importance of irrigation to agriculture increases with the aridity of the climate, as does the **importance** of **tasks** associated with obtaining and distributing water resources.[2]

B) Hydrological, Topographic and Pedological Conditions

The general ecological environment also largely constrains irrigation management options in terms of the area-wide water regimen and soil resonrces. India may be taken as an example.[3]

The large surface waters in the North of the Indian sub-continent and the Indus-Ganges plain, with its allnvial soils and gradnal relief, represent extremely specific ecological constraints. The large-scale Indian and Pakistani canal systems, with their bureaucratic forms of organization, are technical and organizational concepts formed largely in response to these environmental conditions.

The constraints imposed by the ecological environment in the North of India may be contrasted witb the much more restricted surface and ground water resources in the South. The traditional tank irrigation adapted to the hilly landscape of Southern India and its level upper catchment areas represent more "organic" forms of organizational structure, virtually "predestined" hy the ecological environment.

3.2.5.2.2.2 The Political/Administrative and Legal Environment

It is self-evident that the general political/administrative environment and existing legal conditious may potentially exert a considerable influence on irrigation management.

Of importance appear above all the nature and intensity of government commitment to the agricultural and irrigatiou sector.[4]

1 Cf. Section 3.2.8.4.3.3 "Willingness to Participate".
2 Cf. Section 5.3.2.2.3 for the relevance of the "importance" of a task as a contingency factor.
3 Cf. Levine et al. (1979), pp. 37 ff.
4 Cf. STEINBERG (1983), p. i.

As far as the nature of this commitment is concerned, it may be suspected that, given certain situational constraints, the government's policy towards irrigation will tend to lean heavily in the direction of "construction", with correspondingly little emphasis on management effort. This seems particularly true of countries with a large balance of trade deficit in which agriculture earns a substantial proportion of the gross uational product, water is a scarce productive factor in agriculture, and there is a considerable growth potential for irrigated areas.[1]

Assuming this to be the case, intensification of management effort, usually associated with the need for administrative reforms, may be evaded by stressing constructioual requirements.

The iutensity of government commitment to irrigation cannot be measured by the level of domestic funding alone. An especially important indicator in this respect is the **frequency of personnel transfers.**[2] Frequent personnel changes in the ministry of agriculture, irrigation administration and project management indicate uncertainties in the system environment which may considerably influence the effectiveness of irrigatiou management.[3]

The legal environment, and especially legal security, are of considerable importance for irrigation. Via agricultural legislation (labour laws, land property laws, water laws), it exerts direct effects on the input system of the specific environment. (Cf. Section 3.2.5.2.3A).

Corruption may quite generally be an environmental factor capable of exerting an extremely specific influence on irrigation management.[4] WADE has, for example, indicated that some irrigation engineers in the Iudian canal systems deliberately restrict the predictability of water allocations in order to blackmail recipients into paying a bribe for preferential treatment.[5]

3.2.5.2.2.3 The Economic and Socio-Economic System Environment

The following aspects of the general economic environment may serve to illustrate its influence on management behaviour:

- In countries with a particularly low level of economic development, foreign financial aid for irrigation projects is usually in the form of "soft" credits. In precisely these countries, however, the low opportunity costs for investment capital stand in sharp contrast to the extremely high costs in scarce domestic resources for the operation and maintenance of irrigation systems.[6]

  It must therefore be assumed that an economic environment of this kind exerts considerable pressure towards capital-intensive system design and away from management effort.

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1 WADE (World Bank, Washington) has been investigating interdependences of this nature, as he reported to the workshop on "Selected Issues in Irrigation Management", IIMI, July 1985.
2 Contribution by WADE to the workshop on "Selected Issues in Irrigation Management", IIMI, July 1985.
3 Cf. Section 3.2.5.3 for the term "uncertainty of the system environment".
4 Cf. WADE (1982) and KROPP (1975).
5 Cf. WADE (1982) and WADE (1985).
6 Cf. CARRUTHERS (1983) in OECD (1983), p. 50.

One element of the macro-economic environment with a high potential effect on system design and irrigation management is price distortion in relation to the inputs and outputs of irrigation measures. Such distortions prevent market prices from accurately reflecting actual economic costs. In practice, this manifests itself iu an overvaluation of local currency and unskilled labour (the latter due to the minimal wage level) and an undervaluation of skilled labour and expert know-how. If technical planning and implementation are then oriented on market prices, the inevitable consequences are disproportionately capital-intensive systems and production methods which local management finds it difficult to apply.[1]

3.2.5.2.2.4 The Technological Environment

The "biological-technological environment" is characterized by the general parameters of arable and pastoral farming.

A suitable indicator for the "mechanical-technological enviroument" may be the level of agricultural mechanization. One reasonable approach differentiates between 5 characteristic levels:[2]

Level 1: Manual Labour

Hand tools are used in all areas of agricultural production.

Level 2: Draught Animals

Certain tasks are performed by draught animals whose purchase and upkeep, together with the manufacture of suitable implements, already require a substantial capital. Initially, animals are used to ease the drudgery of laborious or monotonously repetitive tasks, such as cultivation, transport, threshing or raising water.

Level 3: Partial Motorization

Animal power for drawing loads or propelling machinery is replaced by motor power, involving capital expenditure. The intention is to make work easier and eliminate peak workloads. Considerable amounts of manual labour are still required. Completely new working methods (e.g. soil tilling with powered machines) can be employed.

Level 4: Full Motorization

All work needing to be done is performed by powered machines and implements. Human productivity is substantially increased by restricting human work to control functions. In highly-industrialized countries, the rising cost and scarcity of the factor "labour" contributed greatly to full mechanization and is currently lending impetus to the next and probably final stage of mechanization:

Level 5: Automation

In automated production, an extremely high capital investment is used to free human labour. The tasks of the remaining workers are restricted to supervision and administration. Automated production creates only few other jobs providing scope for productive activity."

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1 Ibid.
2 HOLTKAMP et al. (1983), pp. 10-11.

It may be suspected that a large discrepancy between the technology selected for an irrigation system and the conditions in the general technological environment will entail significant consequences for the management sector. The greater the discrepancy, the more severe and lasting will be the dependence of the water users on the know-how of the irrigation organization. A trend towards integrated forms of organization is implicit in the situation, as is a tendency for ultimate responsibility to be displaced away from the water users.[1]

3.2.5.2.2.5 The Socio-Cultural Environment

Management tries to affect **human** behaviour in such a way as to achieve prescribed objectives through their cooperation. One might therefore expect management studies of irrigation in **developing countries** to concern themselves with culturally-determined differences in behaviour patterns.

In fact, however, scarcely any studies of the effects of cultural influencing factors on irrigation management are to be found.[2] This is hardly surprising, for three reasons:

Firstly, the trend towards more intensive participation of the social sciences in the international irrigation discussion has so far found only gradual acceptance.[3] Secondly, the available irrigation literature is largely shaped by experience in Asia on the one hand and West Africa on the other. And thirdly, intercultural comparative studies have only recently become an important object of management-related research.[4] The latter phenomenon results largely from the assumption in the 1970's that not only management principles but also contingency variables influencing management practices are to a great extent "culture-invariant". The underlying assumption is that the principles of good management remain valid regardless of cultural differences ("convergence theory").[5]

3.2.5.2.3 The Specific Environment

As already indicated, definition of a "specific environment" ("task environment") eases the task of determining environmental factors. The intention is to address only those sectors of the system environment which directly affect the irrigation system and its achievement of objectives and results, or which are directly affected by the consequences of system outputs. While the "general environment" is the same for all organizations in a particular region, the specific environment will be different for each of them.[6]

The following sub-divisions may be made:[7]

A - Input system,

B - Demand and reception system,

C - Administrative/political and legal system,

1 Cf. Section 3.2.4.2 on "integrated" and "segregated" forms of organization in irrigation.
2 BOTTRALL comes to the same conclusion for tropical agriculture in general. Cf. BOTTRALL (1981), p. 32.
3 In Germany, for example, there is not a single university institute expressly specializing in such problems.
4 Cf. for example KELLER (1982).
5 HOFSTEDE (1983), p. 41.
6 ROBBINS (1984), p. 51.
7 Cf. WALKER (1981), p. 51.

D - Specific ecological environment,

E - Specific socio-cultural and socio-economic environment.

A. The Input System

On the input side, the specific environment may be characterized by the "input system".

It makes "*a certain input potential available to the organization, so acting as a supplier in relation to the requesting organization. The type of inputs offered and their availability in terms of times and amounts influence the irrigation organization, as do the dependent relationships associated with acquiring the inputs.*"[1]

The input system may be further simplified by sub-dividing it as follows:[2]

- the labour input system;
- the capital input system;
- the system for material inputs;
- the system for natural resources.

From this input system, management must select and recruit those inputs needed to produce its outputs or attain its objectives (cf. Section 4.3).

B. The System of Demand and Reception

On the output side it likewise appears useful to collate the factors in the specific environment in a "system of demand and reception". This will first of all include all those persons and groups directly or indirectly demanding a service from the irrigation organization.[3]

In this context, (internal and external) "claimant groups" or "constituencies" are frequently referred to.[4] It is in the nature of many irrigation organizations, as non-profit bodies, that they generally possess more numerous and more heterogeneous claimant groups than do commercial companies.[5]

In addition to the demands system, it is necessary to take into account groups of persons who have no claim on the irrigation organization but are nevertheless influenced positively or negatively by the system's services (e.g. the landless or downstream users of drainage water).

C. The Administrative/Political Environment

This sector of the specific environment comprises those administrative and political forces directly concerned with the irrigation project under whose direct influence the project management is required to act.

1 WALKER (1981), p. 55.
2 Ibid., p. 56.
3 Ibid., pp. 65 ff.
4 Cf. for example DYLLIK (1984), p. 75.
5 SCHWARZ (1985), p. 102.

A characteristic of non-profit irrigation organizations is a very substantial degree of overlap between the demand system in the environment and the political/administrative environment.

D. The Specific Ecological Environment

A distinction must be drawn between the area-wide ecological environment and the extremely specific conditions of the specific ecological environment relevant only to a particular irrigation system.

In view of the potentially damaging effects of irrigation on resources, these must include those environmental sectors which do not influence the irrigation system, but may themselves be influenced by it (e.g. water flows downstream from an irrigation system).

E. The Specific Socio-Cultural and Socio-Economic Environment

Of interest here are the conditions of the general socio-cultural and economic or socio-economic environment specific to the region of the irrigation system.

3.2.5.3 Uncertainty of Environmental Influences

As already noted, not only the type of environmental influeuce but also the uncertainty associated with such influences is of significance for management.

The uncertainty of the environment is determined by its complexity and variability.[1]

The more complex the environment, the more difficult it will be for management to estimate environmental influences and to counteract differing environmental effects adequately. The more variable the influences of the environment, the less opportunity will management have to take preventive measures against them.[2]

The **complexity** of the system environment is dependent on the number and diversity of environmental influences of the kind outlined above which need to be taken into account in decision-making. It is also determined by the distribution of these influences in different environmental sectors.[3]

The **variability** or dynamics of the system environment are a function of the frequency and intensity of environmental changes and the irregularity with which they occur.[4] Such factors as legal security, frequency of personnel changes in important management positions, the stability of important input and output markets, etc. play an important rôle in this respect.

ROBBINS uses a matrix to represent the complexity and variability of the environment (see Fig. 3.2-1).[5]

The effects of environmental uncertainty on organizational structure have been the subject of numerous empirical studies.[6] The English authors BURNS and STALKER,

1 Cf. for example ROBBINS (1984), p. 51 and HILL (1981), p. 337.
2 ROBBINS (1984), p. 52.
3 KIESER and KUBICEK (1983), p. 318.
4 Ibid. p. 319.
5 ROBBINS (1984), p. 54.
6 Cf. Overview in STAEHLE (1985), pp. 475 ff.

Degree of Complexity	Degree of Change: Stable	Degree of Change: Dynamic
Simple	CELL 1 Stable and predictable environment Few components in environment Components are somewhat similar and remain basically the same Minimal need for sophisticated knowledge of components	CELL 2 Dynamic and unpredictable environment Few components in environment Components are somewhat similar but are in continual process of change Minimal need for sophisticated knowledge of components
Complex	CELL 3 Stable and predictable environment Many components in environment Components are not similar to one another and remain basically the same High need for sophisticated knowledge of components	CELL 4 Dynamic and unpredictable environment Many components in environment Components are not similar to one another and are in continual process of change High need for sophisticated knowledge of components

Fig. 3.2-1: Environmental Uncertainty Matrix According to ROBBINS (1984)

for example, saw their many years of research in industrial organizations as confirming their hypothesis that "mechanistic" structures and management systems are suited to low environmental variability and "organic" ones to high environmental variability (cf. Section 3.2.4.1).[1]

Of fundamental importance in this context is the work of LAWRENCE and LORSCH.[2] On the basis of their empirical studies, these authors also regard the differences between organizations as stemming primarily from differing environmental constraints.[3] The work of LAWRENCE and LORSCH also showed that differing sub-environments influence differing subsystems of complex socio-technical systems, and that structural differences between departments can be explained in this way. Subsystems confronted with an uncertain sub-environment exhibited *"an extremely low degree of structuring and formalization, with strong participatory elements"*.[4] The opposite was true of subsystems in a certain sub-environment.

Evaluation of LAWRENCE and LORSCH's data likewise confirms the hypothesis that the importance of lower management levels increases with growing uncertainty of the environment.[5]

The results of LAWRENCE and LORSCH's work today tend to be relativized in the light of multicausal approaches. The cause-effect relationships which they observed are no longer ascribed solely to the factor "environment", but to the interaction of a series of contingency factors whose mix shows a close fit with the specific degree of environmental uncertainty.[6]

Within the framework of such studies of situational "fits", the relationships noted here are of importance for the observations below.

3.2.5.4 Environmental Dependence

Environmental dependence indicates the extent to which the irrigation organization is dependent on particular environmental factors or on claimant groups which provide resources needed by the organization.

In this context, DYLLICK refers to the "threat potential", since the factors in question (e.g. availability of water) or the groups of persons involved may deprive the organization of vital services (e.g. inputs but also non-material support).[7]

The dependence of a system on a particular part of its system environment varies:[8]

- *"directly with the extent to which the system needs the input provided by this part of its environment,*
- *and inversely with the extent to which the same input could be provided by other parts of the environment."*

1 STAEHLE (1985), p. 475.
2 Ibid., pp. 478 ff.
3 Ibid., p. 479.
4 Ibid., p. 480.
5 Ibid.
6 Cf. Section 3.1.
7 DYLLICK (1985), p. 76.
8 Baseded on THOMPSON (1967), quoted in HILL et al. (1981), p. 339. In the text quoted by HILL, the expression *"Umwelt"* (natural environment) is used in place of the term *"Umfeld"* (system environment) employed here.

With increasing autonomy from the environment, the system can act as a closed system and no longer needs to respond to the demands of the environment.[1]

Environmental dependence decreases with the degree to which the environment can be influenced or controlled by management. Here it will be helpful to distinguish between three sectors of the environment:[2]

- the **controllable environment**, comprising the sector of the specific environment which can be influenced and controlled by the system itself, i.e. by irrigation management;
- the **influenceable environment**, covering elements of the specific environment whose activities influence the activities of the organization and the management of the system, and which can themselves be influenced but not controlled by the system;
- the **non-controllable environment**, consisting of those elements of the specific environment which influence the system and its performance without themselves being susceptible to control or influence by it.

A high degree of dependence and external controllability must generally be assumed in the case of non-profit irrigation organizations.

MINTZBERG quotes a series of studies in which an interrelationship between increasing external control and increasing centralization of decision-making and formalization of organizational structure have been observed.[3]

MINTZBERG explains this trend by stating that effective external control is exercised primarily in one of the following two ways:[4]

1) by making the relevant manager of the controlled organization accountable for his decisions;
2) by prescribing externally what objectives are to be achieved and what procedures are to be used.

The first variant encourages centralization of the decision-making process, the second the formalization of the organization.

3.2.5.5 System Environment and Service Provision

The detailed observations above concerning the system environment and its interactions with the system are of particular importance for irrigation because water users may need to be regarded as a component of the system environment, depending on the locus of ultimate responsibility.[5]

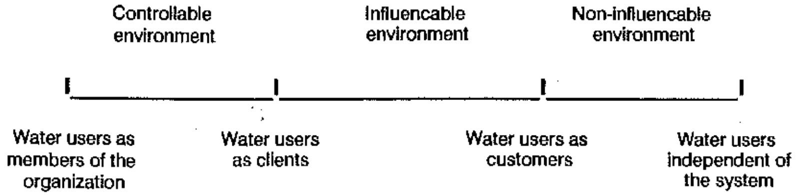
The water users as customers or clients represent the most important part of the system environment from the point of view of the irrigation organization. The more heterogeneous the composition of the water users/water user groups, the more complex this component of the system environment. Moreover, the more intensive the interaction between irrigation organizations and water users, the greater will be

1 HILL et al. (1981), p. 339.
2 SMITH et al. (1980), p. 9.
3 MINTZBERG (1983), p. 146.
4 Ibid.
5 Cf. Section 3.2.4.2.

the environmental uncertainty due to the individual and spontaneously variable desires and claims introduced into the interaction by the water users.

The status of the water users as members of the organization, customers, clients or independent users thus also determines the degree to which this component of the environment can be influenced, an important factor for management.

The following continuum may be used to describe the situation:[1]



3.2.6 Tasks and Technology

3.2.6.1 Introduction

The dimeusions "task" and "technology" are contingency factors very variously defined and differentiated iu the literature.

There is often a considerable degree of overlap between the connotations of the terms "task" and "technology".[2]

Since extension of these terms to the provision of services still further emphasizes overlaps of this nature, the contingency factors "task" and "technology" are here presented uuder a single headiug.

3.2.6.2 The Task as a Contingency Factor

3.2.6.2.1 General

The task is understood as the nominal outcome as deduced from the objectives of the organization.[3]

1 Cf. observations in Section 3.2.8 on this topic and on the term "customer/client".
2 STAEHLE, for example, points out that it is particularly difficult to differentiate between task and technology in the frequently-quoted definition of technology proposed by PERROW. What PERROW refers to as "knowledge technology" differentiates technologies according to the number of exceptions and to problem analyzability. On this basis, it distinguishes between routine and non-routine technologies, craft and engineering technologies, using a differentiation method similar to that employed for the description of tasks. Cf. STAEHLE (1985), p. 507 and ROBBINS (1984), p. 178.
3 In this static view, the task is thus identical with the "outcome" or "output" of the conversion process.

"In the dynamic perspective, a task represents various activities undertaken to achieve the nominal outcome."[1]

In the literature, tasks in the context of manufacturing production are generally differentiated according to their **routinizability.**[2] This characterization is especially important in regard to the organizational structure:

The extent to which tasks can be resolved into monotonous, repetitive sub-tasks - HILL et al. call this the *"routinization potential of the task"* - determines the degree to which performance of the task can be standardized and specialized.[3] This has a considerable effect on organizational structure.

Section 3.2.4 emphasizes the fact that organizational structure, as a mediating variable, also influences the management functions "planning", "leading" and "controlling". It may therefore be assumed that routinizability as a task characteristic is also of significance for these management functions. This does not exclude the need to consider other task characteristics in this coutext (e.g. "task importance", "time pressure", etc.; cf. remarks in Chapter 5).

In the following observations, however, we begin by emphasizing the task characteristics relevant to organization.

The nature of tasks imposes certain task requirements on the human system.[4] The lower the routinizability of a task, the higher the demand imposedon the problem-solving potential of the people (groups) carrying it out. This will be referred to below as a growth in the **"problem-solving requirements"** of the tasks.

According to HILL et al., the routinizability of the task performance depends on the following dimensions:[5]

- task complexity,
- task variability,
- task specificity.

Task **complexity** is determined by the number and diversity of the elements or factors influencing the performance of a task, and by the interdependences between these elements.[6]

Task **variability** or dynamics are a function of the frequency with which iudividual elements or factors influencing the performance of the task vary, and of the degree to which such variatious occur abruptly or are gradual and therefore predictable.[7]

Task **specificity**, i.e. the clarity of requirements imposed on members of the system, is dependent *"on the unambiguity of the outcomes to be achieved and the unambiguity of the paths leading to these outcomes"*.[8] HILL et al. emphasize that routinizability

1 ULRICH and FLURI (1975), p. 147, author's translation; cf. also HILL et al. (1981), p. 123.
2 Cf. HILL et al. (1981), p. 325, ULRICH and FLURI (1984), p. 165 and STAEHLE (1985), p. 486. On the topic of routinizability, it may be stated that: *"An activity can be routinized if it can occur spontaneously in response to certain stimuli on the basis of a previously learned reaction, with no attempt to identify alternative behavioural options."* ULRICH and FLURI (1984), p. 26, author's translation.
3 HILL et al. (1981), p. 325.
4 Cf. Section 3.2.8.
5 HILL et al. (1981), p. 325.
6 Ibid.
7 Ibid., p. 326.
8 HILL et al. (1981), p. 326, author's translation.

decreases if the objectives of task fulfilment cannot be defined clearly and if there are limits on the extent to which objective statements can be made on ways of achieving the objectives (i.e.the extent to which objectives can be made susceptible to interpersonal testing).[1]

In manufacturing production, the following continuum of task requirements is discernible:

Continuum of task requirements in manufacturing production

3.2.6.2.2 Task Requirements in the Provision of Services

Where services are concerned, the above concept of task requirements needs to be supplemented by other aspects. Firstly, a distinction must be drawn between tasks performed exclusively by the provider of the service, i.e. by members of the service organization, and those performed through contacts between the provider of the service and the customers/clients.[2] In addition, it may sometimes be necessary to distinguish tasks performed antonomously by the customer/client himself within the service framework bnt without contact with members of the organization (e.g. "self-service").

An important task dimension, on which the potential participation of the customer/client in the transformation process may also largely depend,[3] is the **performance ambiguity of the task.**

The performance ambiguity of the task expresses the degree of difficnlty experienced by the external customer/client in perceiving and/or measuring and testing a problem solution or the fulfilment of a task.[4] From the viewpoint of the cnstomer/client, low performance ambiguity is especially important where he does not participate or participates only marginally in the fulfilment of particular tasks.[5]

For tasks carried out through intensive contact between service providers and customers/clients, the importance of low performance ambiguity is secondary to that of the specificity dimension referred to above.

It may be assumed that the performance ambiguity of the task varies directly with its routinizability. With increasing task complexity and variability, performance ambiguity will increase.[6]

1 Ibid.
2 The English and American literature distinguishes expressively between "backroom" and "front-office operations". Cf. for example VOSS et al. (1985), p. 8 and MILLS (1986), p. 46.
3 Cf. Section on "Participation of the Water Users" in the Chapter on the management function "leading".
4 Cf. OUCHI (1981), quoted in BOWEN and JONES (1986), p. 431; cf. also RÖPKE (1977), quoted in KUNZE (1983), p. 92.
5 Cf. Section 3.3.2.3.3.4.
6 KUNZE (1983), p. 100.

A further important aspect must be considered in relation to the task requirements imposed on memhers of the organization dnring the provision of services. Customer/client contacts entail task requirements which cannot be fully satisfied by providing a higher problem-solving potential on the part of the members of the organization.[1]

KLAUS differentiates between the following types of activity during customer-contact task fulfilment:[2]

- "instrumental" activities serving pure problem-solving in the sense of performing technical tasks;
- "consummatory" activities directed at the satisfaction of direct social and psychological needs of the customers/clients (e.g. status, well-being, commnnity spirit, etc.).

This means that two task requirement categories must be used to define contact tasks in the services sector: the **problem-solving requirements** for carrying ont "instrumental activities" and what will henceforward be referred to as **contact requirements** for fulfilling consummatory elements of the task.

KLAUS points ont the considerable importance of contact requirement fulfilment in terms of the outcome achieved - in this instance the quality of the service performed - even when problem-solving requirements are low.[3] One cannot therefore assume a close correlation between problem-solving requirements and contact reqnirements.[4]

We may now construct the following two-dimensional continuum of task requirements for the provision of services:

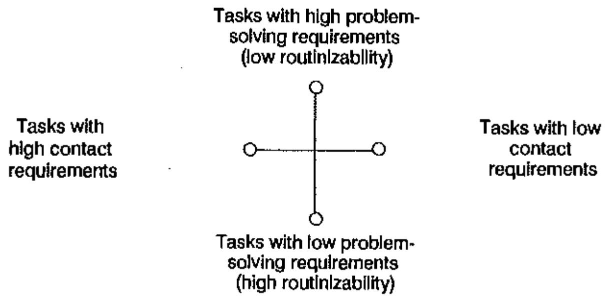


Fig. 3.2-2: Two-Dimensional Continuum of Task Requirements in Service Provision

The contact requirement level of a task can be measured by determining the length of time taken to perform the customer-contact element of the task in relation to the total time taken to perform the task.[5] Tasks with high contact requirements may

1 Cf. remarks on "personnel-specific contingency factors" in Section 3.2.8.3.
2 KLAUS (1984b), p. 59.
3 Cf. KLAUS (1984b).
4 Further support is lent to this conclusion by the fact that the personnel constraints imposed by these two types of task requirement, namely "problem-solving potential" and "service orientation", are also not necessarily correlated with one another. Cf. Section 3.2.8.3.2.
5 This represents an extension of the approach described by CHASE (1978) and discussed below.

include either a large number of short customer contacts or a small number of longer customer contacts.

In terms of contact requirements, services may therefore be differentiated into those with a high **interaction requirement** ("high encounter services") and those with a low interaction requirement ("low encounter services").[1] The interaction requirement depends firstly on the ratio between the **period of time** which a particular customer spends "in the system" and the relative period of time needed to deal with that customer.[2]

Secondly, the interaction requirement is dependent on the **intensity of the relationship** between the customer/client and the service-provider as a result of the service's being performed.[3]

The intensity of the relationship is determined by the degree of individualization of the task, i.e. by the extent to which the outcome eventually achieved must be individually adapted to the preconceptions of the customer/client and the capacities of the service-provider in a process of interactive coordination.[4]

MILLS points out that in tasks with a high interaction requirement ("high encounter services"), interaction is purposeful[5] and includes the exchange of scarce and valuable (information) resources.[6] This means that substantial effort on the part of the service-provider is required in order to develop the service potential needed for this exchange relationship (in the form of training, experience, information gathering and evaluation, etc.). The customer's dependence on the service-provider likewise increases.[7]

3.2.6.3 Technology

3.2.6.3.1 Introduction

In the management literature, the term technology is essentially used in two senses:

a) Technology is understood as the totality of processes used to produce goods and provide services, i.e. the processes for converting inputs into outputs.[8]

   In this context, STAEHLE speaks expressly of "transformation technology".[9]

b) Technology is understood as the material technical resources employed, i.e. the physical equipment used ("hardware").[10]

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1 This distinction is found in the German-speaking literature in, for example, SCHEUCH (1982), p. 109 and in the English-speaking literature in, for example, COWELL (1984), p. 205; MILLS (1986), pp. 43 ff. and TANSIK (1985) in CZEPIEL (1985), p. 150.
2 CHASE (1978), quoted in COWELL (1984), p. 205. A high interaction requirement in a task is expressed (following SCHEUCH), in a higher-intensity and more long-lasting relationship between the persons providing the service and the customer/clients. Cf SCHEUCH (1982), p. 109.
3 SCHEUCH (1982), p. 109.
4 Ibid.
5 The term "purposeful interaction" is employed by CZEPIEL et al. (1985), p. 5.
6 MILLS (1986), p. 25.
7 Ibid., p. 27.
8 Cf. ULRICH and FLURI (1984), p. 26 and HILL et al. (1981), p. 342.
9 STAEHLE (1985), p. 502.
10 Cf. WALKER (1981), p. 252 and ULRICH and FLURI (1984), p. 26.

Although broader definitions of technology are used by various authors,[1] it is in most cases the processes employed in performing tasks in the organization which are meant.[2]

Technology in the sense of the material resources employed also plays a part in determining the character of technological processes, however.

It therefore appears useful to consider both connotations of the term technology and the interaction between them in the remarks which follow.

3.2.6.3.2 Technology as a Contingency Factor in the Industrial Production of Goods

JOAN WOODWARD has carried out fundamental empirical studies of the ways in which different technological processes affect organizational design in industrial production.[3]

WOODWARD assumed that different technologies impose differing requirements on individuals and organizations, and that these must be responded to by a suitable organizational structure.[4] WOODWARD examined a series of 100 industrial companies, categorizing their production processes as follows:[5]

- unit and small-batch production;
- mass production;
- process production.

The investigations showed that successful operations in each of these categories *"employed group-specific organization and management processes which resembled others in the same category, but exhibited considerable differences where different production processes were used."*[6]

Thus, for example, *ad hoc* determined or individually varying outputs in unit and small batch production hardly permitted a sub-division into routine tasks. Spans of control were correspondingly low.[7]

Conversely, in mass production there was a larger proportion of routine tasks and spans of control were appropriately broader.

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1 KAST and ROSENZWEIG, for example, define the term as follows: "Technology is the organization and application of knowledge for the achievement of practical purposes. It includes physical manifestations such as tools and machines, but also intellectual techniques and processes used in solving problems and obtaining desired outcomes." KAST and ROSENZWEIG (1982), p. 176.
2 KIESER and KUBICEK (1983), p. 214.
3 WOODWARD's classic research is discussed in detail in most standard works on management. Cf. for example STAEHLE (1985), pp. 503 ff., KIESER and KUBICEK (1983), pp. 284 ff. and ROBBINS (1984), pp. 176 ff.
4 WOODWARD, quoted in STAEHLE (1984), p. 503.
5 STAEHLE (1984), p. 503.
6 Ibid.
7 MINTZBERG (1983), p. 130. The span of control denotes the number of members of an organization directly accountable to a manager. Cf. STAEHLE (1985), p. 418.

Of interest was the observation that, as mechanization in mass production increased to the point of almost complete automation[1], instead of a further increase in routine tasks, there was a sndden decrease in such tasks, accompanied by a corresponding reduction in the span of control. The reason is presumed to be that routine tasks have here been taken over almost completely by automated technical systems. Instead of a large number of unskilled workers, as in mass production, only a few highly-skilled employees are required to maintain and operate the plant.[2] This "U-hypothesis" has also been confirmed by the studies of BLAU et al.,[3] who likewise note an increased degree of routinization associated with decreased task reqnirements at the point of transition from nnit to mass production, and a reversed trend after the transition from mass to process prodnction.[4]

WOODWARD's studies are regarded as the classic research work on the influence of the contingency factor technology on organizational structure. Numerous subseqnent studies have substantiated their results.[5] It therefore appears fruitful to orient a classification of technological processes on WOODWARD's work, a choice also favonred by the fact that this classification re-appears in analogons form in the categorization of service technology.

3.2.6.3.3 Technology as a Contingency Factor in the Provision of Services

A classification of service-providing processes, based on SASSER et al., distinguishes between:[6]

- object-related services ("job shop"), and
- process-related services ("line/flow operations").[7]

The **object-related service** corresponds to unit and small-batch production as defined by WOODWARD. There is considerable flexibility as to the way in which the service is performed, and the potential for sub-division into routinizable sub-tasks is restricted. At the same time, intensive interaction with the customers/clients is essential. The ability to substitute tecbnology for qualified employees is correspondingly low. Examples are the services provided by consnltancy firms, medical and psychiatric care, educational services, etc. In the irrigation field, agricultural advisory services are an example.

Process-related services, by contrast, correspond to mass production in the production engineering field.

Here, the service is performed by carrying out a sequence of repetitive interlinked tasks.[8] Interaction with customers is confined to repeated short contacts. The se-

1 According to MINTZBERG, extensive automation must be assumed in the process technology studied by WOODWARD. Cf. MINTZBERG (1983), p. 132.
2 Ibid.
3 Cf. STAEHLE (1985), pp. 505-506.
4 Ibid.
5 Only studies of large production companies, where the influence of the transformation process of production personnel was slight by comparison with that of other activities (e.g. administration), failed to confirm WOODWARD's results. Here, too, however, WOODWARD's conclusions remain applicable to those sectors directly related to the technological transformation process. Cf. STAEHLE (1985), p. 504.
6 SASSER et al. add a further category of "intermittent operations" used to implement one-off "projects". Cf. SASSER et al. (1978), p. 85.
7 The terms "object-related" and "process-related" service are employed by SCHEUCH (1982), p. 55.
8 SASSER et al. (1978), p. 82.

quence of consecutive steps can be more successfully snb-divided into routinizable sub-tasks than in the case of object-related services.

Where process-related services are concerned, considerable attention will generally need to be paid to designing the process seqnence, in order to avoid disturbances (confusion, log-jams, etc.) Unlike the object-related service, the process-related service possesses little flexibility in terms of changes in the type or amount of the service to be provided.[1] Examples are services in public transportation and fast-food chains, postal and wholesaling services and the normal daily routines in banking. Examples in the irrigation field are routine water distribution, supplying agricultural inputs, etc.

It is important to note that increasing standardization of sub-tasks in process-related services initially leads to an increase in routine tasks, just as in indnstrial mass production. Conversely, **extensive automation,** like WOODWARD's process production iu mannfacturing indnstry, leads to a decrease in routine tasks, which are now performed by automated processes, and an increase in non-routinizable tasks.

Before attempting to transpose WOODWARD's and SASSER's concepts to irrigation, the overlap between the terms "task" and "technology" already noted above should again be pointed out.

As noted, technology may be understood to mean the processes used to convert inputs into outpnts and thus to fulfil tasks.

In the case of services centering on the interaction with the customer/client, however, the act of performance, i.e. the transformation, may itself be seen as the output.[2] As the distinction between ontput and conversion becomes fluid, the boundary between task and technology also becomes less clear-cut.

3.2.6.3.4 Technological Processes in Irrigation

3.3.6.3.4.1 General

In the various fields of activity of an irrigation organization, differing technologies in the sense of "input-output transformation processes" are used.

Generally, however, it may be assumed that the transformation process of obtaining, distributing and delivering water predomiuates in many irrigation organizations, especially those which are segregated.[3] It therefore appears useful to pay particular attention to technological processes used for the supply and distribution of water.

The question of which technological processes in water distribution and delivery can be defined in terms of WOODWARD's and SASSER's classification entails consideration of "irrigation scheduling" ("water scheduling").

An irrigation schedule is a sequeuce of regulations specifying the time at which irrigation occurs and the amonnt of irrigation water at each point in time during au irrigation period for all recipients or groups of recipients in a distribution system.[4]

1 Ibid., p. 83
2 Cf. Section 4.3.2.2.
3 Cf. Section 3.2.4.2 on the term "segregated" irrigation organization.
4 Following AL-AZAWI and MAROTZ (1982), p. 350.

"The chief task of an irrigation schedule is to distribute water in such a way that it is available in the quantities and at the times when it is needed."[1]

Consequently, the irrigation schedule characterizes the technological process of water supply.

The implementation of the irrigation schedule is carried out by corresponding regulation of water distribution ("water control"). This is achieved by interaction between the hydraulic infrastructure and the fulfilment of operational tasks resulting from the regulations specified in the irrigation programme.

The type of irrigation schedule and the water control based upon it therefore act in conjunction with a correspondingly designed hydraulic infrastructure to exert a highly decisive influence on organizational design and management behaviour in those operational sectors of the irrigation organization associated with the water transformation process referred to above (in a segregated irrigation organization, these include virtually every part of the organization, in an integrated organization only certain parts).

3.2.6.3.4.2 Classification of Irrigation Schedules

Of crucial importance for the establishment of an irrigation schedule is the specification of three components of water delivery at the farm outlet:[2]

a) the rate of water flow ("discharge");

b) the duration of water delivery;

c) the frequency of water delivery.

Assuming that each of these components can either be constant or variable, a number of different types of irrigation schedule may be differentiated.

"Classic" classifications often distinguish only the following types:[3]

i) **Continuous irrigation:**

a constant or variable flow rate is maintained without interruption;

ii) **Rotational irrigation:**

a constant or variable flow rate is supplied intermittently with a fixed or variable duration and frequency in rotation with other recipients/groups of recipients;

iii) **"On Demand" Irrigation:**

water is supplied according to the consumer's demands; flow rate, duration and frequency of supply are all variable.

REPLOGLE presents a more systematic classification of irrigation schedules, which is also more useful in assessing management implications.[4]

1 Ibid., author's translation.
2 Cf. for example the observations of RAO and SUNDAR (1985), p. 11 and REPLOGLE (1986), pp. 120 ff.
3 Cf. for example POIRéE and OLLIER (1971), p. 283.
4 REPLOGLE (1986), in NOBE and SAMPATH (1986), pp. 120 ff.

REPLOGLE sub-divides the multiplicity of irrigation schedules obtainable by permutating the three above components in constant or variable form into **flexible** and **rigid** schedules:

Firstly, REPLOGLE defines two extreme cases:[1]

- the extreme case of a **rigid schedule** is represented by a fixed rotation: all three components of water delivery are fixed and constant;
- the extreme case of a **flexible schedule** is represented by irrigation on demand, in which all three components of water delivery are variable and can be determined by the recipient.

Between these two extremes, REPLOGLE distinguishes a number of transitional types of irrigation schedule[2] (cf. Table 3.2-2).

3.2.6.3.4.3 Management-Related Classification of Irrigation Schedules (Based on WOODWARD and SASSER)

In considering REPLOGLE's irrigation schedule continuum, it is important to note that the schedules at the flexible end of the continuum may be realized by means of two fundamentally disparate technical and organizational processes; i.e., they can be operated either on the basis of intensive coordination between the operators and the water users, or on the basis of a largely automated distribution system.[3]

This means that three basic types of technology (i.e. three basic types of irrigation schedule), analogous to those described by WOODWARD and SASSER et al., may also be defined for irrigation:

A) Restricted/Arranged Demand Schedule (REPLOGLE's terminology)

The extreme case of irrigation on demand, based on intensive coordination between operators as representatives of the irrigation organization and water users as customers/clients corresponds to the above-mentioned type of object-related service according to SASSER et al. It may therefore be regarded as analogous to unit or small-batch production in manufacturing industry as described by WOODWARD.

All three components of water delivery referred to above must be fixed by mutual agreement of the operators and the water users. This results in the customers/clients being integrated to a greater degree in the realization of the transformation process, necessitating great flexibility of schedule design. The potential for sub-division into routine sub-tasks is correspondingly limited. The task requirements imposed on the members of the organization and the water users are associated with considerable problem-solving requirements. Water users, for example, are expected to be able to

1 Ibid., p. 121.
2 Ibid., pp. 124 ff. REPLOGLE achieves his classification by starting out from the extreme case of a rigid schedule and successively varying first one or other of the three components and then different pairs of components. In the same way, starting from the extreme case of the flexible schedule, he moves into the transitional range of the continuum by successively fixing one or other of the components (which in this instance commence by being variable). REPLOGLE, who endeavours to remain consistent in his terminology for the identified schedule types, generally employs the term "rotation" for rigid schedules. Continuous irrigation is included as a special case of "varied-rate rotation". He consistently uses the term "demand" for flexible schedules (cf. Table 3.2-2).
3 The latter based, for example, on downstream control.

No	type of irrigation schedule	technical characteristics	organizational characteristics
	RIGID SCHEDULES		
1	Fixed rotation	Flow rate, frequency and duration are fixed throughout seeson. Seme flow rate delivered at regular intervals	Involves least water-agency management and operational input. Encourages farmers to operate at low efficiency
2	varied-frequency rotation	Flow rate + duration remain constant, only frequency modified	Restricted adjustment possibilities by water-agency mainly according to crop cycle, climatic conditions or immediate local weather. Adjustment easy: fixed opening gates/valves
3	varied-rate-rotation	Frequency + duration fixed. Flow rate varied to approximate seasonal crop demend	Like (2) but adjustment operation more complicated: adjustable gates needed
4	variad-duration rotation	Flow rate + frequency fixed, duration varied, e.g. seasonally	Simple operation for systems with fixed orifice openings at various elevations which operate at intented rate only at certain canal elevation. However, schedules of ditch attendants and of farmers change with duration
5	varied-frequency-and-rate-rotation	Duretion fixed, flow-rate + frequency are varied	Farm outlet gates/valves need to be adjusted in varying intervals
6	varied-duration-and-rate-rotation	Frequency fixed, duretion and rate are varied. This schedule is not common	Similar to (5)
7	varied-duration-and-frequency-rotation	Flow rate fixed, duration and frequency are varied	Allows fixed delivery orifices and low seasonal labor costs to water authority due to fewer delivery cycles than varied-rotation
	FLEXIBLE SCHEDULES		
8	fixed-frequency/restricted/arranged demand	Frequency fixed, rate and duration arranged with water authority	Water euthority operates canal gates to farm unit. One of least desirable demand schedules. Fixed frequency limits types of crops that can be grown
9	fixed-frequency demand	Frequency fixed, rate and duration et will of users	Common in areas with many small ranchettes or lawn waterings
10	fixed-duration/restricted/arranged demand	Duration fixed (usually 24 hours), flow rate and date of delivery are arranged. Flow rate not changeeble during delivery	24-hour duration almost always causes difficulty in use of farm labour. Not conductive to efficient on-farm use of water and labor
11	fixed-rate/restricted/arranged demand	Rate is fixed, duration and frequency are negotiated between water-authority and farm operators. No changes made during delivery	High interaction needed between agency personel and farm operators. However, if fixed rate is maintained accurately, flow duration provides easy volume accounting
12	restricted/arranged demand	Flow rate, frequency and duration are negotiated between water-authority and farmers but restricted, since not further adjustable during delivery by farmers	Very high interaction needed between agency and farmers. If rate remains constant, meter can be flow meter only with time duration serving for totalizing
13	arranged frequency demand	Rate and duration can be adjusted by farmers, but rate has upper limit. Dete of delivery needs to be negotiated with agency	Implies that water authority automates system or closely estimates total volume needed + demand rate, to avoid canal overtopping, requiring high skills of operator
14	limited-rate demand	Valve used or system capacity restrict flow rate but not to a level that seriously limits irrigation choices or efficient labor use	No communication needed between water authority and farm operators. Totalizing flow meters necessary
15	demand	No limits exist on rate, frequency of duration. May be possible when direct eccess of small farm units to lake, river or main canal	No externel control by water authority. Totalizing flow meters needed for billing purposes

Table 3.2-2: Technical and Organizational Characteristics of Various Irrigation Schedules
Source: Modelled on REPLOGLE (1986) in NOBE and SAMPATH (1986), pp. 123 ff.

estimate their current water needs on the basis of specific local conditions and climatic/seasonal conditions of plants, water and soil.

The members of the organization responsible for operation have to coordinate the various individual demands for water and transform them into a practicable water distribution schedule.

Moreover, as with every object-related service, the operator's tasks are associated with a high interaction requirement. Fulfilment of the task can take place only in close contact with the water users as customers/clients ("high encounter service").

B) Fixed Rotation

In the extreme cases of fixed rotation, the components of water delivery referred to above are largely fixed. This corresponds to the type of relatively non-automated, process-like service as described by SASSER et al. and may be regarded as analogous to mass production in the manufacture of goods as described by WOODWARD.

The irrigation programme is rigid, can largely be broken down into routinizable tasks and therefore imposes only low problem-solving requirements on members of the organization. The water users as customers/clients remain largely exclnded from the process of water distribution upstream from the farm outlet, and the operation can be run in accordance with closed systems approaches. Hence, the interaction requirement imposed by the tasks on the members of the organization is correspondingly low ("low encounter service").

C) Irrigation on Demand (Automation-Based)

In the extreme case of automation-based irrigation on demand, no direct influence of the irrigation organization on the three above-mentioned components of water delivery is possible. Most routinizable tasks are automated, i.e. they are performed by the technical equipment.

For maintenance and servicing, and especially for repairs, non-routine or semi-routine tasks are performed by a relatively small number of members of the organization.

This extreme type of irrigation schedule is equivalent to process-like services in their automated form, and can be seen as analogous to WOODWARD's process production.

It is important to note that the types described here are extreme cases and that a great variety of transitional types exists, as in REPLOGLE's classification. The transition from rigid to flexible schedules can occur either via increasing interaction and operational effort or via increasing automation.

3.2.7 The Size of the Irrigation System

A factor especially often mentioned in the general discussion of contingency-dependent differences in the management and organization of irrigation systems is the size of the system. Discussion of the pros and cons of large-scale or small-scale irrigation has taken up much of the irrigation debate in the last decade.[1]

The size of the organization is also much-cited as a contingency factor in general management literature.[2] In the early days of contingency approaches it was seen as so important that various anthors considered size to be the only decisive factor affecting organizational structure.[3]

Unlike other contingency variahles, size is usually extremely easy to quantify, namely in terms of the number of members of the organization.[4]

In irrigation, size is less easy to determine. In practical terms, the size of an irrigation system is geuerally given in terms of the area it covers; systems of up to a few hundred hectares are frequently categorized as "small-scale", those with more than a few thonsand hectares as "large-scale".[5] It is difficult to draw an exact dividing line, however; in India, for example, systems with less than two thousand hectares of irrigated area are regarded as "minor irrigation" systems, and thus as "small-scale".[6]

A second problem arises in relation to the contingency factor "size"; despite the intensive discussion of the influence of size on organizational design referred to above, empirically-deduced propositions on the type of inflnence of size on organizations remain a matter of dispnte.[7]

There is, however, widespread agreement that:

> *"the effects of size on the nature of an organization...[arise] in the framework of a complex interaction between size and other components of the situation".*[8]

Althongh key authors emphasize the special importance of irrigation system size for the organization and management of irrigation,[9] it is scarcely possible, in irrigation as in other fields, to establish unambiguous cause-effect relationships between size and particular design parameters of management activity.

Frequently, indeed, it may be assumed that in small-scale systems relatively "organic" organizational structures, informal coordination mechanisms and a low level of formalization will be enconntered,[10] but exceptions are also docnmented, e.g. the "*Zanjeras*", traditional village rice irrigation systems in the Northern Philippines, where inflexible technology in the form of rigid water distribution modes compels adoption of relatively mechanistic structnres with a high level of formalization, despite small areas.[11]

1 Cf. WALKER (1984), MANIG (1984) and CARRUTHERS (1983) in OECD (1983), pp. 70 ff. for the debate on the respective advantages of large-scale or small-scale systems.
2 Cf. for example ROBBINS (1984), p. 174; HILL et al. (1981), p. 349; ULRICH und FLURI (1984), inter alia p. 31.
3 For example CAPLOW (1956) and RUSHING (1966), quoted in KIESER and KUBICEK (1983), p. 51.
4 HILL et al. (1981), p. 349.
5 Cf. WALKER (1981), p. 267.
6 COWARD (1984), p. 1.
7 Cf. HILL et al. (1981), p. 349.
8 HILL et al. (1981), p. 352, author's translation.
9 e.g. BOTTRALL (1981), p. 70.
10 Cf. for example the remarks in UPHOFF et al. (1985), pp. 11 ff.
11 Cf. UPHOFF et al. (1985), p. 11 and LEWIS (1980) in COWARD (1980), pp. 153 ff.

Another frequently encountered interrelationship is that between size in terms of area and the locus of ultimate responsibility in the irrigation organization. In many cases, it may be assumed that small-area irrigation systems are operated autonomously by the water users, whereas large-area systems tend to be associated with an organizational form in which the system is operated by a governmental or quasi-governmental agency ("publicly operated system").[1]

In this respect, too, however, there is no lack of exceptions; on the Kailali river in Nepal, for example, an irrigation system some 15 000 hectares in extent is run quite autonomonsly by the water users.[2]

The difficulty already referred to, of empirically establishing consistent interrelationships between system size and organizational structure, leads to the following conclusion:

> *"The effects of system size on the organization depend on the nature of the remaining organizational components".*[3]

It therefore appears advisable to regard size as a contingency factor and to consider its influence on organization and management further in relation to other factors, i.e. within the framework of "situational configurations" of the kind described in Section 3.3.

3.2.8 The Human Resource System

3.2.8.1 Introduction

Consideration of irrigation organizations as open systems entails certain difficulties in defining nnambiguonsly which persons are to be considered members of the organization and which are outside the system and must be assigned to its environment. Since organizations are generally characterized in terms of a definable gronp of members, this qnestion is closely associated with the problem of defining an organization *per se*.[4] Correspondingly widespread attention has been paid to this qnestion in the literature.[5]

Delimitation nonetheless remains extremely difficult:

> *"It becomes apparent that defining the boundaries of an organization is roughly as difficult as defining those of a cloud. One can state quite definitely 'I am now in the cloud' and equally definitely 'I am now outside the cloud', but a statement 'I am now exactly at the edge of the cloud' might cause some difficulty."*[6]

An important reason for these problems of delimitation is that it is not persons or objects which are being circumscribed, but forms of human behaviour.[7]

1 WALKER (1981), p. 268.
2 IIMI (1987, p. 13); large-scale traditional systems are also described by PRADHAN (1982) and TAN-KIM-YONG (1983), quoted in COWARD (1984), p. 13.
3 HILL et al. (1981), p. 352, author's translation.
4 Cf. STAEHLE (1985), p. 114.
5 Cf. for example the survey of relevant literature in STAEHLE (1985), pp. 115 ff.
6 KIESER and KUBICEK (1983), p. 8, drawing on STARBUCK (1976) and KUBICEK and THOM (1976).
7 WEICK (1969) quoted in STAEHLE (1985), p. 114.

One consequence of such difficulties is that different approaches to organization theory employ differing criteria for external delimitation of the organization.[1]

In service management, the question of delimitation assumes a particular importance, for in this case it is necessary to distinguish between customers/clients and members of the organization. In view of the difficulties already noted, it need come as no surprise that various authors regard customers/clients as members of the system,[2] while others consider them to be "partial" employees[3] and still others assign them to the system environment.[4]

CYERT and MARCH stress that the dividing line between the system and its environment may be subject to change over time, and that its course may differ according to the situation.[5] The boundary separating members of the organization from customers/clients may therefore be regarded as situation-dependent.

This view, which fits in well with the contingency approach followed in this book, is adopted in the following sections. Detailed discussion of the dividing line between members of the organization and customers/clients will therefore be postponed until ideal types of situational configuration have been described (cf. Section 4.4.3.2). For the moment, it will be assumed for the sake of simplicity that the members of the organization are a component of the system while customers/clients are located outside the system boundaries.

3.2.8.2 Water Users in Irrigation

In irrigation, the above-described problems of distinguishing between members and non-members of the organization are reflected in the qnestion of the status of farmers or water users. Traditional concepts see the water users as members of the organization and regard only the purchasers of products from irrigated agriculture, e.g. local dealers, private households and the processing industry, as customers of the irrigation organization.[6]

In the context of irrigation in developing countries, however, there has recently been an increasing demand for farmers and water users themselves to he regarded as customers/clients.

SALDANHA, for example, expressly uses the terms *"beneficiaries"* and *"beneficiary organizations"* to refer to water nsers and water users' organizations.[7] RÖLING, referring very generally to the *"interface problem"* of distinguishing between the personnel of an agricultural advisory service and its target group, writes that:

1 Cf. remarks in KIESER and KUBICEK (1983), pp. 8 ff.
2 For example CYERT and MARCH (1963), quoted in KIESER and KUBICEK (1983), p. 8.
3 For example MILLS (1986) or MILLS and MORRIS (1986).
4 KIESER and KUBICEK emphasize that most organization theorists place the customers/clients outside the system. KIESER and KUBICEK (1983), p. 8.
5 CYERT and MARCH (1983), quoted in STAEHLE (1985), p. 114.
6 For example WALKER (1981), p. 73.
7 SALDANHA (1985) in ODI (1985), p. 7.

"Progress out of this no-win situation becomes possible only if extension workers realize that ***farmers are like customers*** *who do not necessarily have to buy what extension offers them".*[1]

The most emphatic support for a customer/client orientation in irrigation has so far come from the interdisciplinary research team at the American universities Cornell, Colorado State and Utah State, on whose work the conceptual principles of the "Water Management Synthesis Project" are based.[2] This research team expressly refers to the irrigation farmer as the *"farmer-client"* and makes *"client-involvement"*, the inclusion of customers/clients in the efforts of the irrigation organization, one of its primary recommendations.[3]

So far as the author is aware, there have been no studies of the situational differentiation of water user status in irrigation. Again, detailed consideration of this topic will be reserved for Section 4.4.3.2, and preceded by development of a contingency framework of reference.

For the present, we shall take the simplified view that all water users in irrigation are customers/clients of the irrigation organization.

3.2.8.3 Personnel-Specific Contingency Factors

3.2.8.3.1 Problem-Solving Potential

A significant contingency influence affecting management behaviour is the performance capability of members of the organization, i.e. their "problem-solving potential" in relation to the fulfilment of certain tasks.[4] This performance capability determines the way in which the organization can define its expectations in terms of the task-related behaviour of its memhers.

HILL et al. associate a high problem-solving potential on the part of the organization members with extensive knowledge and skills, with openness to new experience and with a tendency to systematic thought. Starting from these assumptions, they see the professional hackground and socio-cultural environment of members of the organization as the prime determinants of their prohlem-solving potential.[5]

The task of management is to ensnre, especially through organizational measures and by performing its leadership functions, that the performance capability provided by training and experience is matched by a corresponding performance motivation.

In particular, this implies a contribution by the organization to ensnring that personnel pursuing its objectives will simnltaneonsly be able to fulfil their own "real" goals.[6]

The performance motivation of the personnel cannot entirely be regarded as a contingency variahle in the sense defined in Section 3.2.1, inasmnch as it is partly susceptible to short-term manipulation hy management.

1 RÖLING (1986) in JONES (1986), p. 107. Author's underlining.
2 This USAID-sponsored research project, whose results have been applied in irrigation practice, has developed an interdisciplinary approach to improving *"on-farm water management"* with the co-operation of the farmers. Cf. SKOGERBROE et al. (1980) and LOWDERMILK et al. (1983).
3 SKOGEBROE (1980), p. 8.
4 Cf. HILL et al. (1981), p. 328.
5 HILL et al. (1981), p. 329 and pp. 354 ff.
6 Cf. Section 4.4.2.3.

In irrigation, personnel motivation presents a special problem, particularly in the operation and maintenance phase. BISWAS notes that:[1]

> *"Another problem pertains to the attitude of the technical staff. Design and construction phases of water systems are considered to be glamorous, and thus not only do the best staff prefer to work in such areas, but also their superiors prefer to assign them to those tasks. Operation and maintenance assignments are seldom considered to be desirable ... and thus are often staffed by inexperienced and/or below average calibre staff.*
>
> *Primarily as a result of the above ... factors efficiency of irrigation systems a decade after construction is mostly very low."*

3.2.8.3.2 Service Orientation

If aspects of service management are to be included in the discussion, the view of personnel-specific constraints taken by HILL et al. needs to be widened to allow for service management criteria.

Differentiation of personnel constraints solely according to problem-solving potential[2] - which should be matched to the degree of routinizability of the task - is no longer sufficient.

Required in addition to problem-solving potential are the ability and readiness to exercise social and inter-personal skills[3], whose importance to the provision of services, for example in health care, is increasingly being stressed.[4]

Henceforward, we shall therefore follow HOGAN et al. in supplementing problem-solving potential by **service orientation** as a staff qualification.[5] HOGAN et al. define service orientation as *"the disposition to be helpful, thoughtful, considerate and cooperative"*.[6]

CZEPIEL et al., following SCHNEIDER, also associate such features as helpfulness, openness, friendliness, warmth and personal concern for the customer with a service orientation, speaking of the *"provider attitude"*.[7]

CZEPIEL et al. ascribe this form of service orientation chiefly to personal characteristics of the memher of the organization, though also to the way in which the cnstomer/client perceives the interaction (*"client perception"*) and to the situational constraints under which the interaction takes place.[8]

The same anthors consider social and socio-cnltnral aspects to be relevant where personnel are selected according to whether they match certain customer characteristics. Ethnic, religious or class allegiances may play a rôle, as may membership of certain claimant groups.[9]

1 BISWAS (1985), p. 17, referring to HOTES (1983).
2 Cf. HILL et al., p. 328.
3 MILLS (1986), p. 133.
4 Cf. for example MILLS (1986), p. 133 and HOGAN et al. (1984).
5 Cf. HOGAN et al. (1984), pp. 167 ff.
6 Op. cit, p. 167.
7 CZEPIEL et al. (1985), p. 9.
8 SCHNEIDER (1973), quoted in CZEPIEL ct al. (1985), p. 9.
9 CZEPIEL et al. (1985), p. 9.

A high level of **service orientation** will be expressed by an ability of the member of the organization to cater for the customer/client's psychological needs in terms of what SCHUTZ describes as *"control, inclusion, affection"*.[1] In advising a farmer/water user, this will firstly mean allowing him to feel that he himself can control the interview to an adequate extent ("control"). Secondly, it will mean allowing him to feel that he is respected and taken notice of as an individual ("inclnsion"). Finally, it will mean treating him with friendliness and personal warmth dnring the interaction ("affection").[2]

Two aspects are of primary importance for further consideration of the service orientation in the present context:

1) The service orientation of members of the organization exerts a considerable inflnence on the achievements of results in service transactions.[3]
2) Service orientation does not correlate with personal characteristics snch as cognitive skills and intelligence which determine problem-solving potential.[4]

In the following sections, service orientation will therefore be regarded as au independent dimension of customer-related personnel constraints.

Of importance in this context is, finally, that applied psychology has recently devised personality tests capable of estimating the service orientation of personnel ("service orientation index").[5]

3.2.8.4 Customer/Client-Specific Contingency Factors

3.2.8.4.1 Introduction

Section 3.2.8.1 points out that the precise dividing line between members of the organization and customers/clients should be drawn according to the specific situation. This will therefore not be considered in detail nntil Section 4.3.3.

For the present, it will be assumed for the sake of simplicity that the customers/clients - in irrigation terms principally the farmers and water users - are located outside the system boundaries and form part of the system environment.

The terms "customer" and "client" can also be defined more closely only in terms of specified situation constraints. To simplify the discussion, customers and clients will for the moment be regarded as those gronps of persons whose goal-orientation in the exchange-relationsbip with the organization is directed primarily towards consumption rather than prodnction of the organization's services.[6] A more precise definition of these terms appears in Section 4.3.3.

1 SCHUTZ (1966), quoted by KLAUS (1985) in CZEPIEL et al. (1985), p. 31
2 KLAUS (1985), in CZEPIEL et al. (1985), p. 31.
3 HOGAN et al. (1984), p. 167.
4 HOGAN et al. (1984), pp. 172-173.
5 HOGAN et al. (1984)
6 MILLS and MORRIS (1986), p. 429.

3.2.8.4.2 Goals of the Water Users as Customers/Clients in Irrigation

Among the most important customer-specific contingency factors influencing management behavionr in partially or wholly service-oriented organizations are the needs and goals[1] of the customers and the resulting demand for the services offered.

In developmeut cooperation in the irrigation sector, a substantial demand for irrigation is assumed in locations where an irrigation poteutial can be identified on the basis of climatic, soil and water-availability conditions.

The existence of such a demand is frequently taken to have been confirmed if an analysis of the competitiveness of production methods (gross margin calculations), of operational profitability and of liquidity yields positive results. This assumes that the goals and associated decisions of irrigated farming operations are generally oriented towards net profits.

For family smallholdings, which form the majority of customers/clients of irrigation organizations in developing countries, doubt mnst be cast on this assnmption. In particular, it appears to neglect the determining effect of environmental uncertainty (cf. Section 3.2.5.3) and the dependence on environmental factors (e.g. rural elites) of smallholders' decision-making behaviour.[2]

The special nature of the ratioual decisiou-making processes of smallholders in an uncertain environment may, for example, be illustrated using so-called "safety-first" models. Here, the pursuit of profit maximization goals is dependent on previous fulfilment of subsistence and safety goals. Models of this kind have recently also been nsed to represent the decision-making behaviour of smallholders as water users.[3]

BROMLEY, for example, bases his consideration of the decision-making behaviour of smallholders as water users on the following hierarchy of goals:[4]

a) assure survival - the **subsistence** goal;

b) cautious optimizing - the **safety** goal;

c) acquire cash for consumption and savings - the **surplus** goal;

d) profit maximizatiou - the **speculative** goal.

It is assnmed that Goal b) will be pursned only once Goal a) is assured, Goal c) aimed at only if Goal b) is attained, and Goal d) attempted only if attainment of Goal c) is certain ("lexicographic ordering").

A safety-first model of this type does not regard the attempt to maximize profits as a goal pursned by smallholders in an irrigation system irrespective of or parallel to risk minimization goals; rather, an interdependeuce is created between these two high-priority goals. Risk minimization is aimed not only at uncertainties in the physical environment, but also at those in the institutional environment.[5]

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1 In the following sections, the terms "objective" and "goal" are regarded as interchangeahle.
2 Cf. for example HUPPERT (1987).
3 Cf. for example BROMLEY (1982).
4 Ibid., p. 37.
5 No express distinction is drawn here between the respective connotations of the terms "risk" and "uncertainty". Precisely-speaking, decisions are subject to **risk** "*if a number of outcomes predicted as probable but not certain can be allocated to them. If neither statistical nor empirical data on the probability of an outcome are available, the decision is subject to* **uncertainty**." STAEHLE (1985), p. 334.

Microeconomic consideratious in smallholder irrigation thus acquire an added dimension. It is frequently assumed that rainfed cultivation is associated with high risk and low productivity, while irrigated agriculture implies low risk and high productivity.[1] The implications in practice are that a presumption of profitability goals without accompanying consideration of risk criteria inevitably leads to incorrect assessment of the smallbolder's decision situation and thus to a false estimate of demands made on the irrigation organization by the smallholder customers/clients.

On the other hand, inadeqnate or non-existent demand for irrigation due to a "safety-first" approach may be contrasted with excessive or even damaging demand for irrigation. This will, for example, occur if water is by far the scarcest production factor and there is no alternative to irrigation. Safety-first considerations then mean that there must be a keen demand for irrigation to secure subsistence despite possible institutional uncertainties, even at the expense of other water users.

It will be plain that the differently-structured demand situations in these two cases imply different tasks for customer-related irrigation management.[2]

3.2.8.4.3 Customer/Client Performance Potential

3.2.8.4.3.1 Introduction

If water users as customers/clients are to utilize the service offered by the irrigation organization, they in turn must possess adeqnate performance capability and motivation.

There has, however, been scarcely any investigation of the factors influencing the performance potential of irrigation farmers.[3]

Among others, the following determinants may be regarded as significant:[4]

a) Problem-solving potential

b) Availability of irrigation-relevant group structures;

c) Willingness to participate;

d) The socio-cultnral environment.

3.2.8.4.3.2 The Problem-Solving Potential of Water Users

An obvious course is to link the problem-solving potential of water users with their knowledge of agriculture or irrigated agriculture.

UPHOFF et al. further differentiate between irrigatiou-specific knowledge aud knowledge of the local environment,[5] deducing differeut configurations of problem-solving potential for irrigation farmers:[6]

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1 CARRUTHERS (1982), p. 6.
2 Cf. remarks in Section 5.5.3.3.2.2.
3 Cf. WALKER (1981), p. 227.
4 Cf. PAYR and SULZER (1981), pp. 211-212.
5 UPHOFF et al. (1985), p. 17.
6 Ibid.

Table 3.2-3: Configurations of the Problem-Solving Potential of Irrigation Farmers According to UPHOFF et al. (1985), p. 17

		Irrigation-Specific Knowledge: high	Irrigation-Specific Knowledge: low
Knowledge of local conditions	high	I	II
	low	III	IV

I: In this case, there is a **high problem-solving potential**, of the kind which may be assumed for farmers in traditional irrigation systems (e.g. Chattis Manja, Nepal).

II: This configuration of problem-solving potential exists where irrigatiou is introduced into an area traditionally devoted to rainfed agriculture (e.g. Matam, Senegal).

III: This configuration may be assumed where irrigation farmers are re-settled in a new irrigation system (e.g. Muda, Malaysia).

IV: In these cases problem-solving potential is particularly low, as in the first stages of settlement projects (e.g. Mwea, Keuya).

Such a simplified analysis can, of course, serve only as a comparative orieutation and not to "determine" the potential performance capability of water nsers. Studies of tenant-farmers on the Mwea settlement project showed, for example, that settlers who had already been farmers before joining the project had no significant advantages from results achieved in irrigated agriculture. GOLKOWSKY suspects that there was a crucial relationship between the "commercial-mindedness" of settler groups and their performance capability.[1]

3.2.8.4.3.3 Group Structures Relevant to Irrigation

The ability of water users to cooperate in providing services as customers/clients or participants in an irrigation organization will not only depend on their problem-solving potential, but will also be linked with a series of characteristics manifesting themselves in the existence of specific group structures.[2]

The topic of group organization among water users has been dealt with in numerous case studies of specific countries or regions.[3] COWARD, however, expressly criticizes

1 GOLKOWSKY (1973), quoted in WALKER (1981), p. 228.
2 Cf. PAYR and SULZER (1981), p. 212.
3 COWARD (1980) provides detailed references from bibliographies and studies on this topic. COWARD (1980), p. 204.

the generally inadequate attention to special features of the situation in these studies, casting doubt on the transferability of individual results.[1]

COWARD nonetheless detects a series of repeatedly-mentioned features which may tentatively be regarded as pre-conditions for a high performance potential in water user groups:[2]

i) The formation of "mini-groups" small enough for coordination and control to be based on self-coordination and reciprocity.

ii) The identification and appointment of adequate group leaders. COWARD considers the effectiveness and acceptance of such leaders to be coupled with three conditions:
   - The leaders should be in charge of small groups only.
   - The leaders should be elected in some way by the users. It is important that there should be some provision for periodic re-election, even if no use is made of it.
   - The leaders should receive some form of compeusation for their additional duties from the members of the group.

Another factor frequently coupled with the performance potentials of water users is the homogeneity of the groups.[3]

For example, a high proportion of short-lease tenant-farmers, of part-time irrigation farmers or of farmers with off-farm employment will detract considerably from the cooperation and participation potential of the group.[4]

3.2.8.4.3.4 Willingness to Participate

The readiness of customers/clients to participate forms an important influeucing factor of the situation for management action.

"Willingness to participate" is here generally used to mean readiness to cooperate in an interactive relationship with the organization, even if this is interaction without any anthentic participation in the sense defined in Section 2.3.5.

Among the numerous possible determinants of willing participation by water users in irrigation, the following may be emphasized:[5]

a) The dependence of water users on irrigation;
b) The conflict situation between the irrigation organization and the water users;
c) The conflict situation between the water users;
d) The nature of the tasks performed.

The nature of the tasks performed and their effect on the willingness to participate are discussed in more detail in Section 5.5.3.3.2.2.

1 COWARD (1980), p. 205.
2 Ibid., pp. 205-206.
3 According to FISCHER et al. (1978), the homogeneity of groups should be judged by the extent to which group members
- are in the same or a similar position with regard to the resources they possess and the obstacles to resource use which they encounter ("statistical homogeneity");
- represent social units characterized by internal interaction, behaviour controls, leadership, etc.
FISCHER et al. (1978), p. 179.
4 Cf. FAO (1984), p. 21.
5 Cf. UPHOFF et al. (1985), pp. 17-18 and p. 24.

The other determinants referred to are considered briefly below.

A. The Dependence of Water Users on Irrigation

The question of whether and to what extent the water users are dependent on irrigation is a substantial determinant of the willingness to participate.[1] Section 3.2.5.2.2.1 indicates the fundamental differences in the importance of irrigation which may exist.

B. The Conflict Situation between the Irrigation Administration and the Water Users

Conflict situations form an important factor influencing the willingness of water users to participate.[2] Conflict situations may be classified as means conflicts, ends conflicts or emotional conflicts.[3]

Means conflicts, i.e. differences of opinion as to the means by which a goal recognized by all parties should be achieved, can be solved in a relatively easy and objective way, since there is agreement as to the objective.[4]

Important in this context, due to the difficulties of finding a solution, are ends conflicts and emotional conflicts.[5]

Ends conflicts aud their importance for participation are discussed further in Section 5.5.3.3.2.2.

Emotional conflicts arise if a decision which has to be made threatens important personal objectives and interests of one or more of the parties to the conflict.[6]

A fundamental emotional conflict, which may manifest itself as an ends conflict, and which frequently occurs between the water users and the irrigation administration, is a discrepancy between management responsibility and management authority stemming from the rights of ownership and use in land and water.

The necessity of regulating water distribution between numerous users requires not only that someone should assume responsibility for carrying out this task but also that he should possess the authority to impose the necessary decisious.

In cases in which land and water ownership and the locus of ultimate responsibility do not lie at the same level - either with the water users or with the irrigation administration - an emotional conflict situation with negative effects on motivation may potentially arise.

One possible situation is that the management assumes responsibility for water distribution, without possessing the necessary authority to impose certain regulations on autonomous irrigation farmers. The owners may then perceive a threat to their autonomy from the organization through its attempts to exercise authority.

The result may be that, lacking the appropriate authority, management does not succeed in performing its water distribution tasks in the envisaged way. Threats to the

1 UPHOFF et al. (1985), p. 13.
2 MÜLLER and HILL (1977), p. 373
3 Ibid., p. 373. Cf. also Section 5.5.3.1
4 Ibid.
5 MÜLLER and HILL (1977), p. 374.
6 Ibid.

interests of each of the parties are then implicit in the situation. Under these circumstances, management often tends to resort to the mechanism of sanctions supported by state authority.

C. Conflict Situations at the Water User Level

A significant characteristic of irrigation is that it ties water users to one another through the water distribution network. Water users who may have acted relatively independently in their previous status as farmers in rainfed cultivation now find their decisions influenced by the behaviour of others. The degree of dependence may vary according to the type of irrigation process employed, but it is scarcely possible to eliminate it completely; even wbere ground water is tapped individually, the limits of independence are reached when falling water tables influence neighbouring wells and higher pumping costs for neighbouring operations are incurred.

In a canal system, the extent to which a water user can influence water distribution decreases in direct proportion to the number of delivery points upstream from his own on the distributary caual.[1] Both his economic situation and his political power in local institutious will, however, be important in this respect. The coucept of a user's "real location" as opposed to his "nominal location" in an irrigation system has been used as an indicator of relative influence on water distribution matters.[2]

Grave conflict situations arise between water users with differing "real locations" where inadequate or unreliable water supply introduces a complicating factor.[3] Under sucb conditions, a water user with a more favourable real location will be particularly inclined to extract more water than is due to him.

As a result, the willingness of the disadvantaged water user to participate may be substantially or wholly called into question.[4]

Conflict situations of a different kind, with noticeable effects on the williuguess of water users to participate, relate to questions of ownership and rent. An extreme case exists for the water user as tenant if the introduction of irrigation means that the owner may terminate his tenancy and himself take over the cultivation of the land, due to the anticipated higher profitability of the operation.

Even where such an extreme conflict situation does not arise, a latent conflict is generally present in irrigation under tenancy conditious, because of the need to clarify who is to bear the risk of an unreliable water supply given the increased demand for inputs associated with irrigation.[5]

3.2.8.4.3.5 The Socio-Cultural Environment

The socio-cultural environment, referred to in Section 3.2.5.2.2.5, must be regarded as a further significant factor influencing the performance capability and motivation of the customers/clients and thus of water users in irrigation.[6]

1 BROMLEY et al. (1980), p. 376.
2 Ibid.
3 Cf. HUPPERT (1984a), p. 10.
4 Ibid.
5 Cf. HUPPERT (1984a), p. 11 and HUPPERT (1987).
6 Cf. KLAUS (1985), p. 27.

3.3 Ideal Types of Situational Configuration

3.3.1 Introduction

As already noted in Section 2.2.4.2, the main concern of contingency approaches to management science is to *"abandon the unsatisfactory postulate of general validity for management propositions in favour of adequacy to the specific situation."*[1]

Originally, contingency approaches attempted to establish the influence of individual contingency factors on organizational structure and management action. Today, however, there is widespread agreement that monocausal approaches which attempt to define the situation in terms of a single factor must be regarded as unrealistic.[2] Rather, it is assumed that management is **simultaneously** confronted by a series of contingent influences.[3] This implies that management action matched to the situation must adapt itself to **situational configurations** characterized by a number of contingency factors rather than to individual factors.[4]

The notion of the situation as an "open concept" (cf. Section 3.2.2) assumes, however, an infinite number of potential influencing factors. This makes it difficult to describe particular situational configurations and to ensure their comparability with other coufigurations.

As already mentioned, it is therefore of great importance for application-oriented approaches that the multiplicity of factors should be reduced to a practicable level.[5] For this reason, STAEHLE sees the development of situational typologies as one of the most important tasks of contingency research.[6]

In line with these considerations, ideal types of situational configuration for manufacturing production and for services are presented below. These ideal configurations can then be helpful in assessing the management implications of real situations in irrigation.

3.3.2 Ideal Types of Situational Configuration in Manufacturing Production

3.3.2.1 Introduction

An approach to the development of ideal types of situational configuration mnch discussed in German-speaking management literature has been presented by HILL, FEHLBAUM and ULRICH.[7]

1 STAEHLE (1985), p. 82, author's translation.
2 KIESER and KUBICEK (1983), p. 212.
3 Ibid.
4 The implication for empirical research is that multivariate procedures such as correlation and regression analysis must be resorted to in analyzing multicausal relationships of this nature. Cf. KIESER and KUBICEK (1983), p. 212 and STAEHLE (1985), p. 82.
5 STAEHLE (1985), p. 97.
6 Ibid.
7 This approach was presented in HILL et al. (1981) and discussed, among others, by ULRICH and FLURI (1984), whose "contingency concept of the enterprise" is based on it, by STAEHLE (1985), pp. 93 ff. and by KIESER and KUBICEK (1983), pp. 47 and 54 ff.
In the present study, reference is made only to the development of ideal types of situational configuration by HILL et al. The approach based on this, involving the deduction of contingent organizational models by formulating axiomatic "IF-THEN" propositions, is not pursued further in this context.

On the basis of the fundamental situational configurations which they formulated, HILL et al. consider the influence of these situational constraints on organizational structure and design (i.e. on the performance of the management function "organizing"). ULRICH and FLURI go one step further, and extend analysis to the whole of management, i.e. to the functions of planning, organizing, leading and controlling.[1] KAST and ROSENZWEIG, orienting their study on identical basic situational configurations, also derive from them various concepts covering management action as a whole.[2]

The following observations follow the approach of HILL et al. in identifying ideal types of situational configuration, on which further consideration of the situational differentiation of management action in the areas of planning, organizing, leading and controlling is based (cf. Chapter 5).

3.3.2.2 The Approach of HILL, FEHLBAUM and ULRICH

The first problem which arises in describing specific situational configurations is that of systematizing the numerous contingency factors and their interactions, i.e. of bringing them into a logical and ordered relationship with one another.

HILL et al. begin with the proposition that, in socio-technical systems, certain **tasks** are performed by certain **members of the system**, using certain technical resources, in order to attain the system objectives.[3] On this basis, the influencing factors in the situation can then be categorized in two groups:

a) **Task-related influences,**[4] i.e. those influences affecting the character of the tasks to be performed by system members ("task-related constraints");

b) **People-related influences**, i.e. factors influencing the *"characteristics of the representatives of the system which determine their behaviour during performance of their tasks in the social system"*[5] ("people-related constraints").

Task-related inflnences inclnde the contingency factors "environment", "size" and "technology"[6], while the people-related constraints discussed in Section 3.2.8.3, so far as they affect the problem-solving potential of the staff, are primarily determined by vocational characteristics and the socio-cultural environment.[7]

The above classification assumes that the type of task-specific inflnence determines the natnre of the task constraints and that the type of personnel-specific influence determines the character of the personnel constraints.

Fig. 3.3-1 shows the way in which the contingency factors influenced by the choice of objectives and strategies determine the task- and people-related constraints.

So long as consideration is confined to tasks requiring no customer/client contacts, tasks alone can be characterized by a continunm ranging from high to low routiniza-

1 Cf. ULRICH and FLURI (1984).
2 KAST and ROSENZWEIG (1982), pp. 488-489.
3 HILL et al. (1981), p. 322. Cf. also ULRICH and FLURI (1984), p. 19.
4 In this context, HILL et al. make use of the term "task constraints". Cf. HILL et al. (1981), p. 328.
5 HILL et al. (1981), p. 322
6 Cf. ibid., p. 336 ff.
7 Ibid., p. 335.

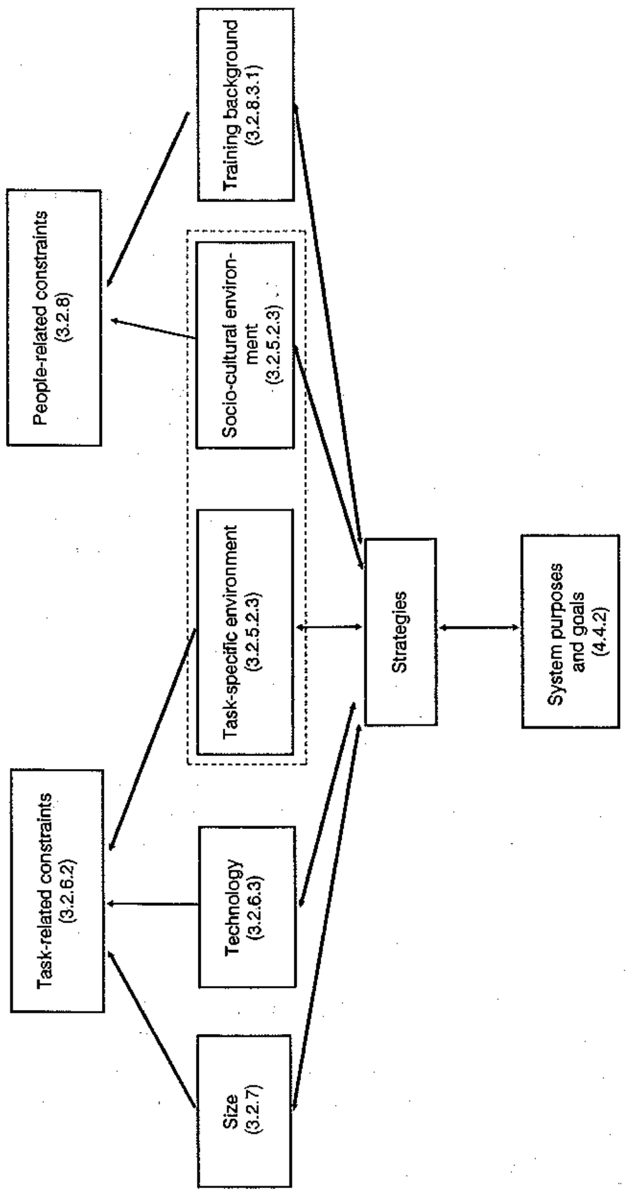


Fig. 3.3-1: Influencing Variables of the Situation (with reference to relevant sections of the text)
Source: adapted from HILL et al. (1981), p. 335

bility, as noted in Section 3.2.6.2. For people-related constraints, a corresponding continuum from high to low problem-solving potential of staff members can be defined (cf. Section 3.2.8.3.1).

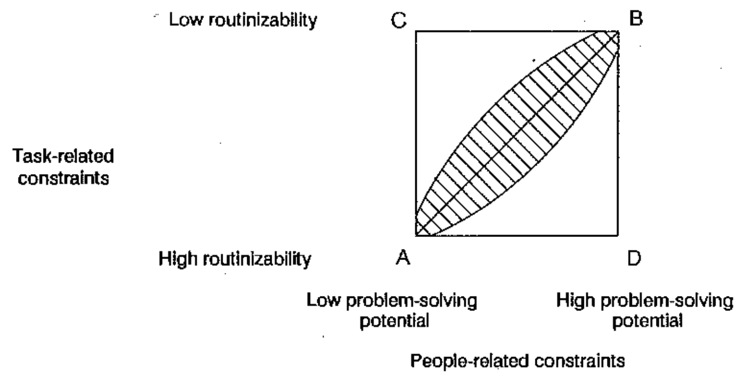
A central consideration in HILL et al. is that successful organizing is possible only if there is a tendency for task-related and people-related constraints to match, i.e. if there is a "situational fit" between these groups of variables:[1]

> "*... there must be a certain fit between task-related and people-related constraints: if the requirements imposed by the task (routine or problem-solving character) are incompatible with the qualifications, needs and expectations of the personnel, no rational form of organization can be found to satisfy both components of the situation*".[2]

If there is no fit between the groups of variables, one must first be created through additional, non-organizational measures - e.g. through technological modifications or training measures.[3]

If the extremes of both task-related and people-related constraints are opposed, as in Fig. 3.3-2, four fundamental configurations result:

Fig. 3.3-2: Configurations of Task- and People-Related Constraints in Manufacturing Production
Source: HILL et al. (1981), p. 331



Only in the shaded area along the A-B diagonal is there an approximate fit between task and personnel constraints.

1 HILL et al. (1981), p. 332. "*'Fit' or 'misfit' are central concepts in the contingency approach. They indicate whether two groups of variables ... display matching features, whether they correlate or not.*" (STAEHLE, 1985, p. 91), author's translation.
2 ULRICH and FLURI (1984), pp. 170-171, following HILL, FEHLBAUM and ULRICH (1981).
3 Ibid., p. 171.

Low routinizability and thus high problem-solving requirements of the tasks (Point C) are incompatible with low problem-solving potential on the part of the staff. Similarly, highly routine tasks are incompatible with the high problem-solving potential of highly-qualified personnel, if it is assumed that such staff require greater freedom to take decisions on their own initiative when carrying out their tasks.[1]

Points A and B at the ends of the diagonal in Fig. 3.3-2 therefore represent the two extreme fit situations and thus the two opposed ideal situation types described in detail below.

3.3.2.3 Type A and Type B Situational Configurations

Drawing on the characteristics of the most important contingency factors presented in Section 3.2, the two extreme types of situation may be described as follows:[2]

Type A Configurations

As outliued above, **tasks** In Type A configurations have a high degree of routinizability, i.e. they are well-structured and can be sub-divided into simple, unvarying sub-tasks with low problem-solving requirements.

The **system environment** of Type A configurations is therefore correspondingly simple and unvarying, or any variability of the environment can be compensated for by a high degree of independence of the system from its environment (high autonomy).[3] The above-mentioned environmental constraints allow a clear dividing line between system and environment.

Unvarying tasks correspond to a **rigid technology** (provided there is not a high degree of automation),[4] precisely defining transformation from inputs to outputs. This allows task implementation to be coordinated by means of fixed rules aud programmes.[5] Organizational structures of high complexity and formalization therefore tend to predominate in Type A configurations.

Rigid, programmable technology reduces the need for coordination by means of personal instructions and enables larger organizational units to be formed. Similarly, as the **size** of the organization or organizational unit increases, there is a tendency towards increased use of formal rules.[6] Type A conditions are therefore also characterized by the large size of the (sub)system.

1 HILL et al.regard "*the willingness and ability to take decisions on one's own initiative ... as a prerequisite of problem-solving potential*" (p. 330). They therefore see the expectations of personnel with a high problem-solving potential as directed primarily towards "self-reliance", i.e. towards considerable personal initiative. Conversely, the expectations of personnel with low problem-solving potential are concentrated chiefly on "security", i.e. on a working situation structured in such a way as to "*shield them from the uncertainty of unexpected reactions from their environment*" (p. 167). They therefore look for only limited personal initiative in their work in the system (p. 331). Cf. observations in Section 4.4.2.3.2 - "Real Objectives of Members of the Organization".
2 Cf. HILL et al. (1981), pp. 387-388 and pp. 392-393.
3 HILL et al. (1981), p. 388.
4 The effects of automation on technological flexibility and personnel constraints are noted in Section 3.2.6.3.2.
5 Cf. Section 5.4.5.
6 MINTZBERG (1983), p. 66.

The **people-related constraints** in Type A configurations are characterized by low problem-solving potential of the members of the system.

The combinations of the various contingency factors in Type A configurations are summarized in Table 3.3-1.[1]

This situational configuration describes constraints which in terms of manufacturing industry are approximately applicable to mass production (e.g. textiles, sections of the metalworking industry, etc.).[2]

Type B Configuration

The ideal Type B configuration is characterized by complex, frequently-changing **tasks**, virtually insusceptible to routinization.[3]

This situation corresponds to a complex, variable environment, with a low degree of independence from environmental alterations.[4]

Little is known of cause-effect relationships in input-output transformation, so that flexible **technology** capable of being adapted to the task in hand is required.

The unpredictability of environmental influences and task developments makes it virtually impossible to fall back on formal coordination mechanisms in a situation of this type.[5] The emphasis is therefore on organic organizatioual structures, restricting organizational units to a limited **size.**

The preponderance of tasks with high problem-solving requirements demands correspondingly high problem-solving potential from the **members of the system.**[6]

Situations corresponding to Type B situational configurations (cf. Table 3.3-1) will be of roughly the kind encountered in unit or small-batch production, with frequently-changing complex tasks (e.g. certain forms of handicraft or small-workshop production, but also organizational units in the aerospace industry, chemical industry, etc.).[7]

3.3.3 Ideal Types of Situational Configuration in the Service Sector

3.3.3.1 Introduction

In general, the approach used by HILL et al. to deduce ideal situational configurations can also be applied to the service sector. It must, however, be noted that, with respect to service provision, two different dimensions have been introduced to describe both task-related and people-related constraints (cf. Sections 3.2.6.2.3 aud 3.2.8.3).

With respect to **task-related constraints,** it has been explained that tasks in the service sector not only require "instrumental" actions, i.e. actions demanding a certain problem-solving potential on the part of members of the organization, but also include

1 These essentially correspond to the constraints on which BURNS and STALKER's "mechanistic" system is based, and which are described by the closed system model referred to in Section 2.3.2.2. Cf. KAST and ROSENZWEIG (1982), p. 486.
2 ULRICH and FLURI (1984), p. 173.
3 Ibid.
4 HILL et al. (1981), p. 392.
5 Cf. Section 5.4.5.
6 Type B situational configurations match the constraints in the "organic" system described by BURNS and STALKER and may be defined in terms of the "open" system model referred to in Section 2.3.2.2. Cf. KAST and ROSENZWEIG (1982), p. 486.
7 ULRICH and FLURI (1984), p. 173.

"consummatory" elements. These are referred to as "contact requirements" of the task. As indicated above, contact requirements represent an extra task dimension needing to be taken into account in addition to problem-solving requirements.[1]

The task-related constraints for members of the organization may thus be differentiated as follows:

Fig. 3.3-3: Personnel-Specific Task-Related Constraints in Service Provision

		Contact requirements: high	Contact requirements: low
Problem-solving requirements	high	B_1'	B_1
	low	A_1'	A_1

In terms of personnel-specific **people-related constraints**, these task dimensions match a performance potential for which, as indicated in Section 3.2.8.3, a distinction must be drawn between the dimensions of problem-solving potential and service orientation.

The personnel-specific people-related constraints can therefore be represented as follows:

Fig. 3.3-4: Personnel-Specific People-Related Constraints in Service Provision

		Service orientation: high	Service orientation: low
Problem-solving potential	high	B_2'	B_2
	low	A_2'	A_2

1 Cf. Section 3.2.6.2.3.

The description of the dimensions of task-related and people-related constraints in the service sector shows that it is more difficult to identify situational configurations which achieve a fit in the above sense in service provision than in manufacturing production.

There is an additional problem in relation to services: the participation of the **customers/clients** in the transformation process also has to be taken into account when considering task-related and people-related constraints.

For **short-duration low-intensity customer contacts**, i.e. tasks with a low interaction requirement, influences of the customers on the system can essentially be assigned to the category of environmental influences. Heterogeneous and variable customer needs are consequently reflected in complex, dynamic environmental influences.[1]

For **long-duration high-intensity customer contacts**, on the other hand, it appears helpful to follow MILLS' concept, referred to several times above, of regarding the customer as a partial employee of the system.[2]

Implicit in this approach is a consideration of the client-specific task-related and people-related constraints on the tasks to be performed by the clients.

In this case, the client-specific task-related constraints are characterized by high participation requirements, with a tendency towards high problem-solving requirements because the customer/client is called on to participate intensively in finding solutions.

Comparison of the task-related and people-related constraints presented in Figures 3.3-3 and 3.3-4 reveals that inclusion of service provision entails not two but four ideal types of situational configuration with a fit between task- and people-related constraints.

A fit between constraints A_1 and A_2 corresponds to the Type A situational configuration above and a fit between constraints B_1 and B_2 is identical with Type B. The remaining ideal situation types A' and B' are explained in more detail below.

3.3.3.2 Type A' and Type B' Situational Configurations

On the basis of the service-related aspects of task- and people-related contingency factors illustrated in Section 3.2, it is possible to describe the following extreme situational configurations in which customer/client-contacts form an element in task performance.

The discussion below will examine first Type B' and then Type A' configurations.

Type B' Configurations

Like Type B configurations, these represent situations characterized by relatively non-routinizable **tasks**, and are therefore referred to as Type B'. In this case, however, tasks are additionally characterized by high contact requirements, demanding lengthy interactions of high relational intensity.

1 Cf. Sections 3.2.8.1 and 4.4.3.
2 Cf. MILLS (1986), pp. 142 ff. and remarks in Section 4.4.3.

The participation of customers/clients in the transformation process represents a high **environmental uncertainty**, since the continually changing and individually differing needs and claims of the clients are difficult for the system to predict. High **technological** flexibility is necessary in order to perform these variable and virtually unstandardizable tasks.

In this case, too, organic organizational structures, i.e. structures with low complexity and low formalization, are likely to prevail.

In addition to a high **problem-solving potential**, personnel require a high level of **service orientation.**

There is an ideal fit in this situation if the staff-specific performance potential referred to above is matched by a corresponding client-specific performance potential; the latter must above all be characterized by a high participation potential and if necessary by a sufficiently high problem-solving potential to meet high problem-solving requirements implicit in client-specific task components.

Situations approximating to the ideal situational configuration described above will be found in service organizations in which the provision of services affects clients at the intellectual or emotional level or which incorporates individual clients' wishes and opinions in its service-providing activities.[1] In this context, KLAUS follows MILLS and MARGULIES in referring to *"personal-interactive services"*.[2] SASSER et al. characterize organizations approximating to this situational configuration as "professional service organizations".[3]

Examples of snch personal-interactive services are training, psychotherapy and tax and legal advice.

Type A' Configurations

As in Type A configurations, tasks with low problem-solving requirements are carried out, and the configuration is therefore referred to as A'. Unlike Type A, however, Type A' involves tasks associated with high contact reqnirements. The customer contacts associated with these **tasks** are, however, of short duration and low relational intensity, so that high task routinizability as compared to Type B' may be assumed. This corresponds to a relatively static **environment** and largely programmable **technology.**

The ideal personnel-specific **people-related constraints** are characterized here by low problem-solving potential and high service orientation.

The fact that adequate fulfilment of customer-contact reqnirements is necessary despite high task rontinizability, in order to achieve greater service quality, imposes special demands on management action (cf. Chapter 5).

An additional factor is that the main emphasis dnring provision of a service in such situation configurations is not placed on customer interaction. The short interactive relationship with the customers mnst be preceded by preparation of the service to be performed. The Type A' situation may therefore be described in terms of two

1 KLAUS (1984), p. 471
2 Ibid.
3 SASSER et al. (1970), pp. 400 ff.

Variable	Ideal Types of Situational Configuration			
	A	B	A'	B'
Type of task	high routinizability, i.e. simple, monotonous, repetitive tasks with low problem-solving requirements. Contact requirements low or non-existent.	low routinizability, i.e. complex, variable tasks. Contact requirements low or non-existent.	CO: medium/high routinizability and high contact requirements with low interaction requirement. BO: high routinizability with low contact requirements.	tasks with low routinizability. high contact requirements with high interaction requirement.
System environment				
• **Type of environment**	static, simple	complex, dynamic	relatively static, simple	complex, dynamic
• **Predictability of environmental influences**	high	low	CO: medium; BO: high	low
• **System boundaries**	closed, system boundary closely defined	relatively open, system boundary relatively indistinct and variable	CO: open to customer subsystem; BO: closed	open, system boundary indistinct
Size of organization or organizational unit	large	small	CO: small/medium; BO: large	small
Technology	low flexibility, analogous to industrial mass production	high flexibility, analogous to unit production	CO: low/medium flexibility BO: low flexibility, analogous to process-related services	flexible analogous to object-related services
Personnel-specific people-related constraints	low problem-solving potential	high problem-solving potential	low problem-solving potential, high service orientation	high problem-solving potential, high service orientation
Customer-specific people-related constraints	-	-	(customer forms part of environment)	medium/high problem-solving potential, high willingness to participate

Table 3.3-1: Ideal Types of Situational Configuration

CO = contact operation
BO = backroom operation

sub-situations: the actnal area of Type A' constraints, in which customer-contacts take place, i.e. the "front-office operation", and the preparation of the service, the "back-room operation".[1]

Service organizations approximating to this ideal configuration are those which KLAUS, following MILLS and MARGULIES, terms "maintenance interactive services", e.g. banks, insurance companies, registration offices, post offices, etc.[2]

3.3.4 Ideal Types of Situational Configuration in Irrigation

3.3.4.1 Introduction

The situational configurations described in the preceding sections may also be used to characterize ideal types of situation relevant to irrigation management. As noted, these are formed by extreme states of a series of contingency factors. Moreover, these configurations are characterized in each case by an ideal fit between task and people-related constraints.

The significance of describing such ideal sitnational configurations lies in the fact that idealized patterns of management action ("management models") can be assigned to them. Such management models and the situational contexts they refer to can then serve as guidelines for situation-adapted management behaviour in real situations.

It is important that such guidelines should be relevant to the management of complete organizations as well as organizational sub-units.

The following sections will therefore first discuss ideal situations in irrigation organizations and then consider those in important organizational sub-units.

3.3.4.2 Ideal Types of Situational Configuration in Irrigation Organizations

Type A Configurations

A Type A configuration for irrigation can be described by reference to the Type A constraints in manufacturing production mentioned above (cf. Table 3.3-2).

Large-scale integrated irrigation organizations often operate in this type of situational context. The farmers/water users have the statns of members of the organization and are subject to direction by the irrigation organization, which retains ultimate responsibility for the management of the system.

All important operational decisions are made by the irrigation organization ("top down"). This applies both to the planning of water distribntion and to other important technical production matters, e.g. planning of cropping calendars, including determining dats for soil preparation, planting and harvesting ("closely-supervised production"). The **structure** of the organization is complex and largely formalized.

1 The terms "backroom" and "front-office operations" stem from the Anglo-American literature. Cf. MILLS (1986), p. 46. SCHEUCH uses the expressions "*Kontaktorganisation*" and "*Angebotsorganisation*". Cf. SCHEUCH (1982), pp. 130 ff.
2 Cf. KLAUS (1984), p. 471. Cf. also MILLS (1986), pp. 26 ff.

The environment of snch an idealized irrigation organization is simple and stable. This may partly be due to high financial and administrative antonomy of the system.[1]

Irrigation technology in the relevant sectors of the system permits widespread routinization of tasks. The degree of antomation is low.

In general, task reqnirements imposed on members of the organization are characterized by a low problem-solving reqnirement and reqnire no substantial service orientation.

Real irrigation systems resembling this ideal type include state farms or a number of export-oriented large-scale irrigation projects created in the colonial period and/or operated in a similar way (e.g. Mwea, Kenya; Gezira, Sudan; Semry, Cameroon).[2]

Type B Configurations

This ideal type describes sitnational configurations in which small-scale systems are operated under complex and variable environmental constraints, with a large degree of autonomy and by a relatively small number of water nsers.

The **task** constraints, which vary dne to **environmental** conditions, demand correspondingly flexible **technology** and a **human sub-system** (the water nsers) characterized by high problem-solving potential. This generally means that the water users must possess snbstantial irrigation experience or traditions.

In systems matching this configuration, organic organizational structures with largely informal coordination mechanisms predominate.[3]

Irrigation systems whose situational constraints resemble those in this ideal type include small pumped irrigation systems, like the "périmètres irrigués villageois" (PIV) in Senégal,[4] small mountain irrigation systems in Nepal or other small-scale irrigation systems confronted with high environmental nncertainties (e.g. nncertainties in the **ecological** environment; cf. Table 3.3-2).

Type A' Configurations

This ideal situational configuration roughly corresponds to irrigation organizations which offer largely autonomous water users certain clearly-defined services. In particular, these include segregated irrigation organizations[5] or multi-purpose organizations cooperating with highly competent water users.[6]

In the ideal case, the **environmental** constraints for these irrigation organizations are of low complexity and relatively high stability. This involves a clear division of responsibilities between the irrigation organization and the water users, with little variation in the demands of the water nsers as customers.

As in Type A configurations, irrigation **technology** in relevant sectors requires essentially routine tasks with a low level of automation.

1 Cf. Section 3.2.5.4.
2 On Mwea cf. CHAMBERS and MORRIS (1973).
3 Cf. Section 5.4.5.
4 Cf. in particular BELLONCLE (1985), pp. 59 ff.
5 Cf. Section 3.2.4.2
6 "Multi-purpose" irrigation organizations of the kind described by SAGARDOY are segregated irrigation organizations offering other services apart from supplying water, e.g. advisory services, marketing, etc. Cf. SAGARDOY et al. (1982), pp. 42 ff.

The **task** requirements imposed on members of the organization are therefore essentially determined by low problem-solving requirements. The contact requirements are high, but interaction requirements are restricted to short contacts with water users to note down orders, deliver products (water and other productive resources), levy charges, etc.

The **structure** of the organization is relatively complex and largely formalized.

Irrigation organizations approximating to this ideal type include in particular the public irrigation schemes operated in numerous countries (e.g. Spain, Turkey, Bolivia, Ecuador, etc.)[1] (cf. Table 3.3-2).

Type B' Configurations

This ideal type describes situational configurations in which irrigation organizations perform primarily or exclusively consultation-intensive tasks for the water users (cf. Table 3.3-2).

The intensive interaction with the water users and the need to allow for varying customer requirements in task fulfilment imply conditions of high **environmental** uncertainty.

The variable and complex **tasks** demand a high problem-solving potential from the members of the organization, who employ correspondingly flexible processes or **technologies** to solve problems.

Of particular importance is a high service orientation of the members of the organization, since provision of services centres on intensive interactions with the water users as clients. The water users possess a problem-solving potential matching the tasks they are presented with, and are willing and able to enter into intensive interactions with advisers from the irrigation organization.

An irrigation organization much described in the literature which approximates to this ideal type is the "communal irrigation programme" of the "National Irrigation Administration" (NIA) in the Phillipines.[2] Under this programme, NIA posts so-called "community organizers" (CO's) to village communities.

These CO's live for a time with the water users, developing or improving their interaction potential or service orientation.

They advise farmers whose problem-solving potential and cooperativeness is relatively high, as a result of a long rice-growing tradition and mature and homogeneous village structures.[3]

In this case, the water users are regarded as clients for whom the NIA performs mainly advisory and support services, with a high interaction requirement.

These services are related to the realization of programmes in which objectives and results and the measures to be realized are concretized in a relationally intensive individualization process between NIA organization members and the farmers.[4]

1 Cf. Sagardoy et al. (1982), p. 33.
2 Cf. for example KORTEN (1982) and NOBE and SAMPATH (1986), p. 59.
3 Cf. KORTEN (1982), pp. 13 ff.
4 Cf. Section 4.4.2.4 on the individualization process and associated concretization of objectives.

Ideal Types of Situational Configuration

	A	B	A'	B'
• Type of Task • System environment • Size • Personnel constraints	——————as in Table 3.3-1——————			
Process-related technology	low flexibility	high flexibility	CO: low/medium flexibility BO: low flexibility	high flexibility
Locus of ultimate responsibility	ultimate responsibility at agency level	ultimate responsibility at water user level	split responsibility	ultimate responsibility primarily at water user level
Status of water users	organization personnel, subordinate status ("paid agricultural labour")	participants in independent user organization	customers	clients
Situation approximating to the ideal type	large-scale integrated irrigation organization in stable environment or with high autonomy, multiple cropping mechanized rice cultivation (e.g. Mwea, Kenya)	small village community system with homogeneous water user group under highly variable environmental constraints and with diversified cropping (e.g. various traditional irrigation systems)	large/medium segregated irrigation organization in stable environment or with high autonomy, cooperating with competent water users (e.g. public irrigation schemes in Spain, Turkey)	small/medium irrigation organization with chiefly advice-intensive, variable tasks in smallholder village systems (e.g. regional units of NIA, Phillipines)

BO = backroom operation
CO = contact operation

Table 3.3-2: Ideal Types of Situational Configuration in Irrigation

Of importance in this example is the initial necessity for a complete restructuring of the NIA irrigation organization, i.e. an adaptation to constraints resembling those in the Type B' configuration, in order to carry out this service.[1]

3.3.4.3 Ideal Types of Situational Configuration for Organizational Subsystems in Irrigation

A significant proportion of management problems in irrigation may stem from the fact that irrigation organizations - especially integrated or multi-purpose organizations - inclnde areas of activity which can be assigned to widely differing situational configurations. Different situation-adapted management concepts are therefore also required for these snbsystems.

Situations approximately equivalent to the configurations referred to above may be illustrated by the following imaginary organizational subsystems in irrigation.

Type A Configurations

Construction nnits of large-scale irrigation organizations often prefabricate components or small constructional elements (gauging weirs, distribution boxes, etc.). If the organizational unit in question is on a **large scale**, if no significant supply or delivery problems exist and if the desired objectives and output standards show little variation, so that **environmental** constraints remain stable, the unit closely resembles a Type A situational configuration, provided that fabrication of components is not highly automated.

Under these conditions, **tasks** can be largely routinized. The **technologies**, i.e. the production processes, can be geared rigidly to these tasks.

The personnel in a unit of this kind will not require a high problem-solving potential or marked interaction skills. Any water users involved in the work have the status of members of the organization.

Type A' Configurations

Situational confignrations largely corresponding to Type A' may for instance occur if a larger multi-pnrpose irrigation organization provides the water users not only with water bnt with inputs of other kinds, i.e. fertilizers or seed.

The unit charged with providing these inputs may resemble a Type A' situation if procednres for providing this service are already well-established. The farmers then have customer status and only short, routine contacts between farmers and responsible members of the organization are required. The participation requirement for the farmer-customers is high, but short, repeated contacts with the organization will not generally impose enhanced problem-solving reqnirements.

Task fnlfilment by the members of the organization can be largely routinized, although the high contact requirements of the tasks must be satisfied.

1 The restructuring process is documented in detail in KORTEN (1982).

Type B Configurations

The unit in an irrigation organization responsible for operating a small experimental station for irrigateda griculture generally works under situational constraints similar to those in a Type B configuration.

The **tasks** are complex and variable, since they are conditioned by the changing problems within the irrigation system during the construction or operation phases.

Task routinizability is therefore low. The **technologies**, i.e. the experimental procedures, must be adapted flexibly to the various problems concerned.

A relatively high problem-solving potential is demanded of members of the organization in such units. Interactions with water users in connection with task fulfilment are rare, and contact requirements are correspondingly low.

Type B' Configurations

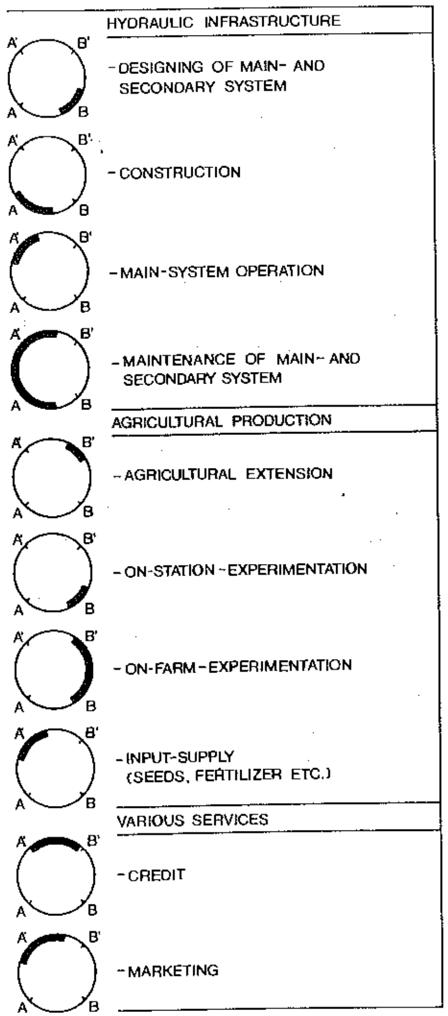
The unit in a multi-purpose irrigation organization most closely resembling a Type B' configuration is the agricultural extension service.

Here, the tasks to be performed are complex and may be highly variable, since they depend to a large extent on climatic and production constraints, on input supplies and the market sitnation, and last bnt not least on the differing desires and expectations of the individual water nsers.

The interactions between members of the organization and farmers/water users are frequently individual and intensive. Correspondingly high reqnirements are imposed on the problem-solving potential and service orientation of members of the organization active in this field. The participation requirements imposed on the farmers/water users are similarly high.

Fig. 3.3-5 shows various organizational subsystems of the kind frequently encountered in larger multi-purpose irrigation organizations. An attempt to localize the situational configurations in these snbsystems in relation to the ideal types defined above produces roughly the situational constraints depicted in Fig. 3.3-5, assuming that not only configurations A and B and A' and B' bnt also configurations A and A' and B and B' mark the ends of continua.

Fig. 3.3-5: Selected Areas of Management in a Large-Scale Multi-Purpose Irrigation Organization and Relevant Situational Constraints for Ideal Types A, A', B' and B



4. SITUATION CONFORMITY OF SYSTEM MODELS IN IRRIGATION

4.1 Introduction

The perception of irrigation systems as socio-technical systems presumes that output-oriented transformation processes take place in them.[1] In the course of such conversion processes, inputs are imported from the system environment, transformed, and exported to the system environment as outputs.[2] The implication for management is that the management functions of planning, organizing, leading and controlling need to be exercised in various transformation processes and at various stages of these transformation processes (input-supply, conversion or ontput-delivery).

The following sections examine the question of how this systems perception of irrigation schemes needs to be modified with reference to the various situational configurations developed iu previous chapters.

Discussion first centres on the exteut to which the above transformation model must be adapted to varyiug contingency criteria. Brief consideration is then given to the inpnt, transformation and output subsystems.

4.2 System Models and the Situation

4.2.1 The System Model in Type A Configurations

Systems perceptions in irrigatiou have so far been oriented on a model coucept describing the use of production factors ("inputs") in a technologically-dominated production and combinatiou process ("conversiou") to yield products or fulfil tasks ("outputs").[3]

This model is oriented on the traditional preseutation of the production process iu mauufactnring industry ("industrial model"; cf. Fig. 4.2-1).[4] This model assumes high environmental stability, so that the system may be presumed to be closed in the sense defiued in Sectiou 2.3.2.2.

The objectives are clearly defined and operationalizable, and tasks are associated with low problem-solving requirements and can be largely routinized. This makes it possible to define the transformation process precisely, to distinguish various transformation processes clearly aud to draw a relatively clear dividing line between the input, couversion and output fields.

Uuder snch conditious, which closely resemble the Type A configuration described above, the customers/clients as environmental factors have no direct influence on the transformation process. The iuput and output functions form a buffer between the

1 Cf. Section 2.3.2.2.
2 For non-profit irrigation systems, this concept must be modified insofar as outputs are not exported exclusively to the external environment, i.e. to "third parties", but may also be destined for the members of the system themselves ("internal environment"). Cf. SCHWARZ (1985).
3 Cf. KLAUS (1984), p. 468. A topical example, in which this model concept is expressly used as the basis for irrigation management, is the "Command Water Management Project" implemented with the support of the World Bank and USAID in Pakistan. Cf. FAIRCHILD and NOBE (1986) in NOBE and SAMPATH (1986), pp. 387 ff.
4 Cf. KLAUS (1984), p. 468.

transformation process ("technical core") and the system environment.[1] This sealing off of the conversion process[2] from the environment may be supported by a variety of management strategies:[3]

On the input and supply side, it can be achieved by maintaining stocks of inputs (e.g. water storage, material stockpiles, etc.), by preventive maintenance of infrastructure and equipment and by personnel training and recruitment measures, etc.

On the output and demand/delivery side, it is important to maintain a stock of outpnts in order to even out price or demand fluctuations. If demand exceeds snpply, rationalization on the output side (e.g. water distribution according to a fixed plan) or smoothing (e.g. introduction of night-time irrigation at reduced charges to smooth out daytime peaks) may help to shield against environmental uncertainties.

Under the conditions described above, the interdependences between various subsystems within the conversion system are chiefly of a sequential nature.[4] In consequence, the outputs from the first subsystem are needed as inputs for the second system, the ontpnts of the second as inputs for the third, and so on.[5] The process sequence is coordinated principally by means of formal rules and programmes.[6]

The transformation model for Type A constraints can be represented graphically in the form shown in Fig. 4.2-1.

4.2.2 The System Model in Type B Configurations

Under situational constraints approximating to those in a Type B configuration, the basic conditions are entirely different; the system under review in this case is small, confronted with high uncertainty with respect to environmental iufluences and therefore engaged in highly complex and variable tasks. This results in constant change on the input and output sides and in the conversion process, necessitating a process of ongoing adaptation and coordination and thus an open, "adaptive", "organic" system.[7]

Under such conditions, the above "industrial" transformation model is no longer appropriate as a basis for management concepts. FACHEUX and MAKRIDAKIS emphasize in respect of this industrial model that:[8]

> *"it is believed that it is not appropriate for anything more complex than mechanistic, engineering type of operations , with a few variables and constant or predictable inputs".*

Under Type B constraints there is considerable variability of inputs and outputs, demanding a highly flexible conversion sequence. Input-supply, conversion process and output-delivery are areas of activity which it is difficult for management to separate precisely. Of significance under these conditions are the learning capacity of the system and its capacity for self-regulation and adaptation to the system environ-

1 Cf. TANSIK (1985) in CZEPIEL et al. (1985), p. 150.
2 Cf. for example MILLS (1986), p. 44.
3 Cf. ROBBINS (1984), pp. 61 ff.
4 Cf. the discussion of various types of subsystem interdependence in STAEHLE (1985), p. 434.
5 Ibid.
6 Cf. Section 5.4.5 on different types of coordination mechanism.
7 The terms "adaptive" and "organic" are employed by KAST and ROSENZWEIG (1982), p. 488.
8 FACHEUX and MAKRIDAKIS (1979), p. 214.

ment. Interdependences between subsystems are of a mainly reciprocal nature, i.e. the output of one subsystem becomes the input of another, and vice versa (e.g. in teamwork).[1] Coordination of the process is chiefly by means of mutual adjustment between the subsystems[2].

Significant in this respect are the synergic effects of group dynamics and the creation of an "internal milieu" in the system, i.e. common values and standards of the participants.[3] This enables each individual member of the system to react to environmental influences in the interests of the group, arming the system with the ability to survive even under turbulent environmental constraints.[4]

4.2.3 The System Model in Type B' Configurations

The input-transformation-output model is further modified by the introduction of a service component.

Interaction with the customers/clients means that these are now partly involved in the transformation process, i.e. that the customers may become part of the input, conversion or output system.[5] In B'-type configurations, i.e. where there is inteusive interaction with customers/clients, environmental uncertainty is particularly high; the desires aud claims of the customers/clients and their behaviour when participating iu the transformation process are subject to change from case to case, and difficult to predict.

In this instance, the transformation process takes the form of a learning process between the system aud its customers/clients. This is necessary, because at first only vague notions of the output to be achieved exist.[6]. These notions must be concretized in a reciprocal, multi-phase process of mutual adjustment between the customer/client and the service-provider, working on an individual basis ("individualization process").[7]

The system is therefore an open and adaptive one, which, despite its learning capacity, must in each new case succeed afresh in creating an internal milieu between the customers/clients and the organization through reciprocal individual coordination and personal relationships.[8] Fig. 4.2-1 indicates the transformation process under these conditions.

4.2.4 The System Model in Type A' Configurations

A clear perception of the system is particularly difficult to conceptualize under conditions approximating to the A' configuration.

Here, too, the customers/clients participate in the transformation process. In this case, however, interaction is restricted to brief, low-inteusity contacts, and a significant

1 Cf. STAEHLE (1985), p. 435.
2 Cf. Section 5.4.5.
3 Cf. FACHEUX and MAKRIDAKIS (1979), p. 215.
4 Op. cit., pp. 217-218.
5 Cf. Section 2.2.5.2.
6 SCHEUCH (1982), p. 113
7 Op. cit., p. 114.
8 Cf. SCHEUCH (1982), pp. 113 ff.

proportion of service-providing activities can take place remote from customer contact.

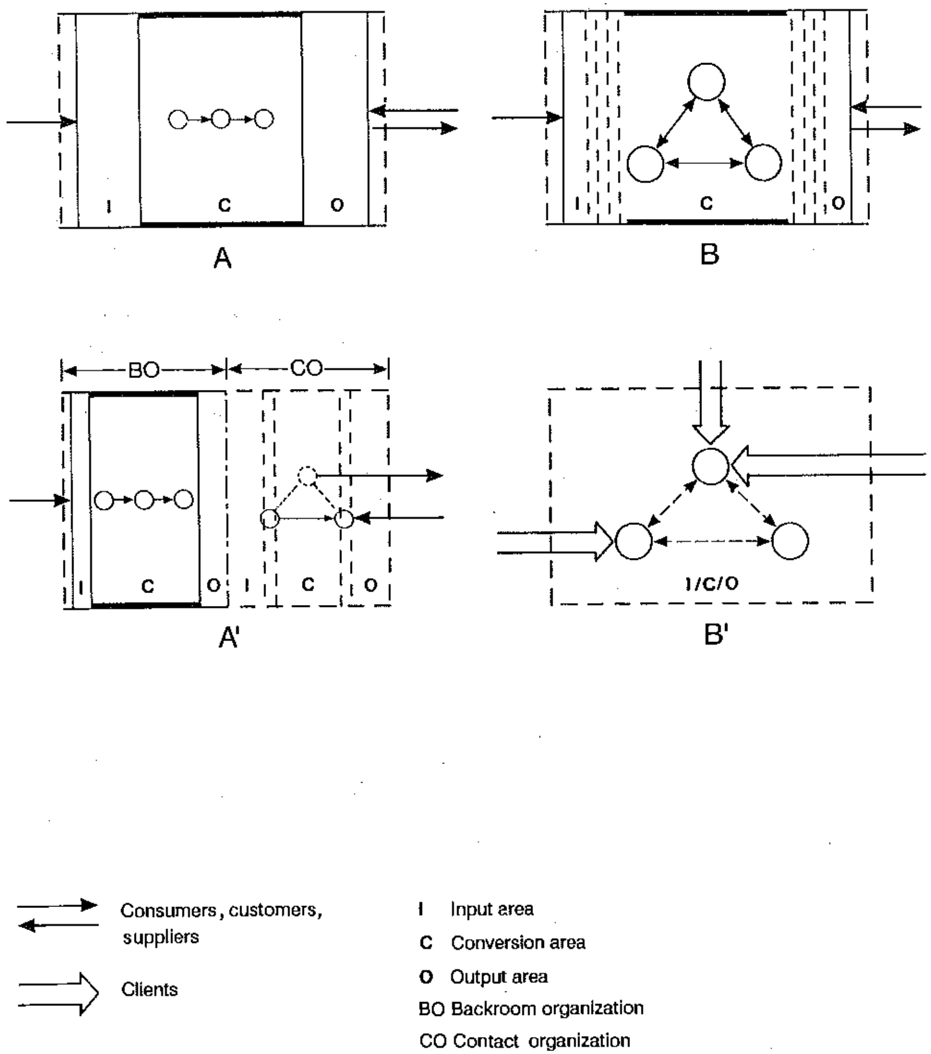
It is therefore helpful to study two separate system areas. On the one hand, there is the process of service preparation, which can take place without customer contact and whose process sequence therefore tends to be oriented towards Type A or B configurations. In the management literature this is referred to as the "backroom" operation.[1]

The area containing the organizational unit responsible for customer-contacts, by contrast, is referred to as the "front office"[2] operation. The process here is one in which management may indeed be oriented towards Type A constraints, but in which the interaction requirement of the tasks must also be adequately fulfilled.

The fact that transformation processes take place quite differently in the backroom and front-office sectors, demanding quite different management concepts, has even led to an express recommendation by some authors that it should be reflected through physical separation.[3] Fig. 4.2-1 shows the transformation process under Type A'constraints.

1 Cf. SCHEUCH (1982), p. 130 and MILLS (1986), p. 46.
2 Ibid.
3 Cf. for example MILLS (1986), p. 44 or VOSS (1985), p. 9.

Fig. 4.2-1: Situation-Adapted System Models, following suggestions by TANSIK (1985) in CZEPIEL et al. (1985)



4.3 The Input and Output Systems

4.3.1 Input and Output Systems in Type A and B Configurations

In large organizations and sitnational configurations resembling Type A, input and output areas can be differentiated clearly.[1] The outputs, i.e. the **outcomes** of the transformation process, are primarily products, in the case of irrigation agricultural produce.

Two different categories of input must be distinguished: human resources and material resources.[2]

The **material resource system** may be sub-divided into financial inputs - i.e. "*all productive resources, in the widest sense, which are needed and used for the construction and operation of the hydraulic infrastructure, for agricultural production and in administration*" - and natural resources (especially water and land).[3]

Fig. 4.3-1 indicates important elements and attributes of the material resource system.

The **human resource system** in this case comprises the members of the organization, whose working capacity is available to the organization in the form of "employee inputs".[4]

One special characteristic of A-type conditions in irrigation is that the farmers/water users are regarded as members of the organization ("paid agricultural labourers"), subordinate to management.[5]

In B-type configurations, separate analysis of the input and output systems is much more difficult. Close, continuous coordination between the input and outpnt systems is required in response to the variable environmental conditions referred to iu Section 4.2.2, restricting opportunities for separate consideratiou of clearly-defined input and output sectors.

4.3.2 Input and Output Systems in Type A' and Type B' Configurations

4.3.2.1 General

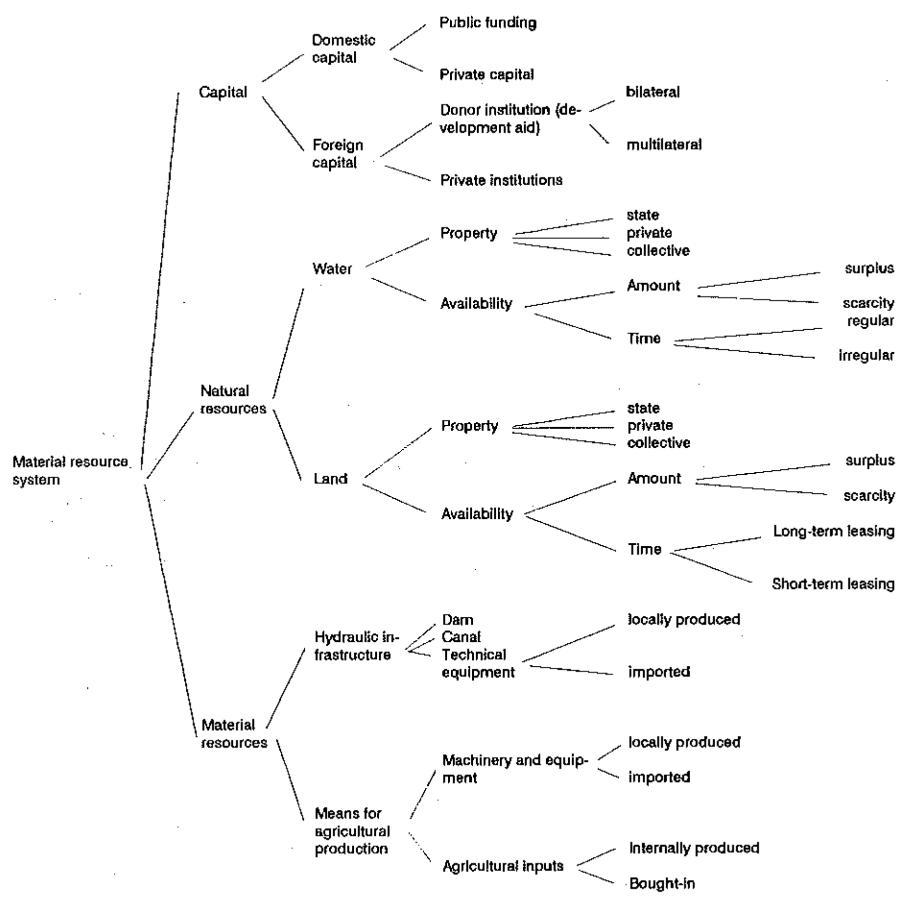
The iuclnsion of service aspects in consideration of the inpnt and output sectors complicates analysis in several respects:

As already noted, nnder B'-type constraints, in which intensive interaction with the cnstomers/clients represents the actual service, input and ontput areas can no longer be clearly separated from one another.

The participants may be both subjects and objects of the service process.[6] It is of prime importance that the customer/client may be a component of both the input and ontput systems, and may himself participate in the conversion process. When a group of water nsers is being advised by the agricultural extension service of an irrigation organization, the "uninformed water users" (adopting the transformation model) are being

1 In such situations, these areas are also frequently distinguished from one another by functional subdivisions in the organizational structure. Cf. Section 5.4.3.
2 Cf. Walker (1981), pp. 50 ff., for a discussion of the input system in irrigation.
3 WALKER (1981), p. 60, author's translation
4 Ibid., p. 59. Cf. Sections 3.2.8 and 4.4.3.
5 Cf. Section 4.4.3.
6 KLAUS (1984), p. 470.

Fig. 4.3-1: Important Elements and Attributes of the Material Resource System in Irrigation
Source: Walker (1981), p 60



"converted" into "informed water users" by an intensive "transformation process" in which they themselves are participating. Consideration of the input and output sectors without including the water users as customers/clients is therefore no longer possible.

In Type B' configurations, in which intensive interactions with the customers/clients predominate, this inclusion effect is particularly great. In Type A' configurations, where contacts with the customers/clients are shorter and less intensive, separation is easier (cf. the division into "backroom" and "front-office" operations referred to above).

It is also important in considering Type A' and B' configurations to note that the "employee input" of members of the organization (service providers) does not consist solely of the **work** they perform, but includes such elements as the employee's **personal attitude** when providing the service, together with his **personal appearance and effort to help** the customer, which are also to be regarded as important employee inputs.[1]

The difficulty which the customer/client experiences in judging the quality of the service he receives in interaction-intensive transactions causes him to look for surrogate indicators of quality. These include the attributes of the service-provider adumbrated above.[2]

4.3.2.2 The "Service Package"

In Type A ideal configurations, which frequently reflect conditions in manufacturing production, outpnts can be unambiguously defined in the form of tangible products.[3]

Under Type B' conditions, on the other hand, there are no tangible service "products" to fall back on. The outputs (and iuputs) in this case are non-material, intangible benefits, i.e. service performances (e.g. the advisory service of an agricultural extension officer).

SHOSTACK has, however, pointed out that in reality both cases - the "pure" product and the "pure" service - are rarely encountered.[4] SHOSTACK assumes that both products and services are in fact generally combinations of tangible products and intangible services, and that in practice they can be positioned along a continuum between the two extremes.[5]

The supplying of water to water users by an irrigation organization comprises more than the mere "delivery" of the tangible product water. It simultaneonsly iucludes intangible service elements, for example when the organization adapts the water supply to plant water requirements, when it ensures adequate distribution between the users, wheu it advises water users on water distribution matters, etc.

The composition of the "service package" is further complicated by the fact that it contains not only "explicit" products or services, but also "implicit" elements repre-

1 Cf. CZEPIEL et al. (1985), p. 9.
2 Cf. the discussion on "customer control" in the chapter on the controlling management function.
3 Cf. SASSER et al. (1978), p. 15.
4 Cf. SHOSTACK (1977), quoted in COWELL (1984), pp. 32-33.
5 Ibid., p. 33.

senting psychological benefits for the recipients which are not expressly offered but nonetheless conferred (status, comfort, a sense of community, etc.).[1]

4.4 The Conversion System: the Irrigation Organization

4.4.1 Introduction

The framework within which management activities take place is provided by the organization(s) responsible for irrigation. It is important to distinguish here between organization as a function, i.e. the activity of organizing, and the organization as an institution, i.e. the outcome of organizing. The management function "organizing" is discussed in depth in Section 5.4. Here, a number of observations must be made on the organization as the institutional framework for mauagement activities.

> *"Organizations are goal-oriented social constructs with a definable group of members. The demand of the participating members of the organization to achieve the prescribed objectives rationally, and thus to cooperate effectively, leads to the goal-oriented institutionalization of a series of rules (formal organization: formalized general behavioural expectations, system structures, organized division of labour and functions). Action in organizations is consciously planned, ordered and directed towards the realization of specific objectives, supported by a rationally designed, functioning structure."*[2]

A definitiou of this kind focuses attention particularly on

- the goals of the organization,
- the members of the organization,
- the structure of the organization.

The structure of the organization will be examined more closely in connection with discussion of organizing as a management functiou iu Section 5.4.

The following sub-sections cousider the objectives aud the members of the organization from the viewpoint of contingeucy criteria.

4.4.2 Goals in Irrigation

4.4.2.1 Introduction

A distinction is frequently drawn in management literature between the terms "mission" and "goal".[3] The **mission** is understood as the function fulfilled by the organization for society or for its system environment.[4] The output which represents

1 Cf. SASSER et al. (1978), p. 10.
2 STAEHLE (1985), p. 109, author's translation.
3 Cf. for example STAEHLE (1985), p. 123, HILL et al. (1981), p. 24, and STAEHLE (1983), pp. 50-51, where a distinction is drawn between "*Zweck*" (mission) and "*Ziel*" (goal).
4 HILL et al. (1981), p. 24.

the chief justification for the existence of a system is defined as its "primary mission", although a system may have a number of primary missions.[1] One primary mission of irrigation systems is, for example, the supplying of water for plant cultivation.[2]

Goals, by contrast, are normative statements describing a desired future state of reality.[3]

If goals are to serve as criteria for evaluating management success, they must be formulated **operationally** aud **consistently**, i.e. they must be stated as **objectives.**[4]

Goals are formulated operationally if[5]

- the objective is described clearly and unambiguously, i.e. if the objectives are precisely defined in regard to conteut, level and regional and temporal delimitatiou;
- the measurability or observability of the level of objective-attainment is ensured, i.e. if the objectives are described in quantifiable categories or if indicators of attainment can be given;
- desired values for the envisaged level of objective-attainment are established.

Goals are formulated consistently if

- they form an ends-means system consistent in itself, defining what resources and activities (inputs) are to be used to achieve what outcomes (outputs), what objectives these outcomes are intended to achieve and on what assumptions these cause-effect relationships are based.[6]
- "*complementarity or indifference relationships exist between horizontally ordered objectives, or if an additional order of preference (weighting) is given for competing relationships*".[7]

In discussing the goals of irrigation organizations, it may be useful to begin with a separate consideration of[8]

- **formal goals**, i.e. the goals of the organization intended to act as a guideline determining the behaviour of members of the system;
- **real goals**, i.e. iudividual goals or motives of the members of the organization.

4.4.2.2 Formal Goals in Irrigation

Irrigation organizations, insofar as they belong to the category of non-profit organizations are not primarily oriented towards the goal of "making profits", but towards need-satisfaction or benefit-creation goals.[9]

1 Ibid.
2 Cf. Section 1.2.2. Strictly-speaking, this mission applies only to segregated irrigation organizations. In integrated irrigation organizations, a primary mission is the creation of agricultural produce through irrigation.
3 HAUSCHILD (1977), quoted in STAEHLE (1985), p. 124.
4 Cf. SCHUBERT et al. (1984), p. 94.
5 Ibid.
6 SCHUBERT et al. (1984), p. 94.
7 HILL et al. (1981), p. 142, author's translation.
8 The distinction chosen here between "missions", "formal goals" and "real goals" corresponds to that between "social goals", "system goals" and "individual participant goals" in KAST and ROSENZWEIG (1982), pp. 155 ff. Cf. STAEHLE (1985), p. 128.
9 Cf. HASITSCHKA and HRUSCHKA (1982), pp. 16-17.

For this reason, great difficulties are encountered in operationalizing the goalsof non-profit irrigation.[1]

The priucipal difficulties stem from the following circumstances:[2]

a) The goals of ueed-satisfaction and benefit-creation are generally heterogeneous. Irrigation systems are therefore directed towards the attainment of multiple goals which are difficult to define aud hard to arrange in any order of priority.

   There have been uumerous attempts to find a generally valid formulation for the heterogeneous goals of irrigation organizations, resulting in some widely differing lists.[3] Table 4.4-1 shows an example.

b) The goals of non-profit orgauizations are often not objectives at all in the sense defined above, but missions, i.e. outputs for or effects on the system environment. Missions cannot, however, be operationalized in the way described above. Since they relate to effects outside the system, they are also not always suitable as guideliues for the behaviour of system members.[4]

c) "*The more complex and innovative the problem to be solved, the less familiar ... are the relationships between objectives and measures and the more difficult of solution is the problem of allocation (effective contribution of an implemented measure).*"[5] This applies particularly to interaction-orieuted services of importance for non-profit irrigation organizatious.

1 Cf. HASITSCHKA and HRUSCHKA (1982), p. 16.
2 Cf. SCHWARZ (1985), p. 101/102.
3 Cf. WALKER (1981), pp. 86 ff.
4 SCHWARZ (1985), p. 101.
5 Ibid., p. 102, author's translation.

Table 4.4-1: Example of a List of Formal Goals in Irrigation
Source: MANN, G. (1982), p. 52, author's translation

National Goals:

- producing crops for export (hard currency income),
- reducing dependence on imports (import substitution),
- increasing the contribution of agriculture to the gross national product,
- creating jobs,
- securing food supplies,
- re-settling displaced persons and refugees,
- settling sparsely populated border regions,
- introducing new forms of settlement,
- utilizing water resources.

Regional Goals:

- developing regions with a view to integrating the national economy,
- reducing immigration to urban centres,
- settling backward areas,
- introducing ecologically favourable forms of cultivation.

Economic Goals:

- improving farmer incomes,
- increasing production of traditional crops,
- introducing new crops,
- introducing new production methods,
- setting up model production systems.

Much space has been devoted in the literatnre to attempting at least partly to overcome these difficulties and develop systems of goals for irrigation which are operationalizable and snitable as guidelines for action in real situations.[1]

CHAMBERS expressly attempts

> *"to identify objectives and criteria for use in evaluating and improving the operation and management of surface gravity irrigation systems, particularly those with a water control bureaucracy".*[2]

Some of the most important results of these efforts are collated in Table 4.4-2.

1 WALKER (1981) provides a comprehensive survey of such endeavours. Cf. WALKER (1981), pp. 88 ff.
2 CHAMBERS (1976), quoted in WALKER (1981), p. 88.

CHAMBERS (1976)	THORNTON (1975)	BOTTRALL (1979)
1. 'Productivity: e.g. productivity of water'	1. 'Economic criteria: e.g. social/private cost-benefit terms.'	1. 'Productivity (especially of water) - This is a function not only of the quantity of water delivered but also of the timeliness and reliability of deliveries.'
2. 'Equity: e.g. equitable distribution of water to cultivators'	2. 'Productivity criteria: especially productivity of water'	2. 'Equity (especially of water distribution)'
3. 'Convenience: e.g. convenience of cultivators with respect to "predictability of water-delivery" (including reliability and certainty) and "appropriateness of water delivery" (including quantity delivered, place of delivery, timeliness and controllabity)'	3. 'Water utilization efficiency e.g. in terms of the water finally absorbed by plants as a percentage of water diverted from the original source.'	3. 'Environmental stability'
4. 'Stability: capacity of longterm sustained operation without environmental depletion'	4. 'Efficiency of water administration: e.g. efficiency of the personnel involved, effectiveness of two-way communication within the organisation and across the gap between the public body and the farmers, adequacy of technical knowledge at relevant levels, strength of morale and attitudes.'	4. 'Cost'
5. 'Cost-effectiveness: concerns the relationship between benefits in the form of objectives achieved, and costs in terms of finance and other scarce organisational resources used.'		5. 'Cost-recovery'

Table 4.4-2: Examples of Goal Systems in Irrigation
Source: Walker (1981), pp. 88 ff.

Of note is the fact that almost all this work is directed at the formulation of generally valid goals and goal-criteria for irrigation. There has been been scarcely any attempt at situational differentiation of the analysis of goals in irrigation.[1]

In view of the non-profit nature of many systems, it appears relevant to expand **goal-orientation** for irrigation to include system sustainability ("sustainability goals") in addition to the production of goods and services ("performance goals"). If, in addition, irrigation organizations are regarded not as static social constructs but as transformable structures, it may also be useful to stress the goal-orientation of planned transformation ("development goals").[2] Development as used here means attaining continuous progress in the satisfaction of the needs and interests of those affected by the organization and its actions.[3] In irrigation in developing countries, this will in particular require the creation of performance potentials in organizations and water users.

Where this is achieved through external consultancy, the term "interventionist goals" ("*Einwirkungsziele*") as defined by MAYNTZ may be applied.[4]

The goal-criteria indicated in Table 4.4-2 can be roughly assigned to these goal orientations, producing the configuration shown in Table 4.4-3.

4.4.2.3 Real Goals in Irrigation

4.4.2.3.1 General

Current management literature is focused less on precise definition of the form and content of goals than on the way in which goals are formed in organizations.[5] It is now widely accepted that goals are crystallized in a bargaining process between various claimant groups.[6] Various internal and external groups perform services for the organization and therefore make claims upon it intended to contribute to the satisfaction of their real goals (individual goals).[7] An important feature of the result of the bargaining process between claimant groups is the fact that it is not always feasible to fulfil the claims of all gronps symmetrically.[8]

The following sections consider in more detail the real goals of two particularly important groups: the real goals of memhers of the organization and the real goals of the water users as customers/clients.

4.4.2.3.2 Real Goals of Members of the Organization

HILL et al. subsume the numerous conceivable real goals of members of the organization under the two heads "security" and "independence".[9]

1 An exception must be made in the case of THORNTON's classification of irrigation systems, which assumes varying goal-orientations for differing types of irrigation organization. Cf. WALKER (1981), pp. 90-91.
2 Cf. particularly KIRSCH (1979) on the management of planned change in organizations.
3 KIRSCH et al. (1979), p. 345.
4 MAYNTZ (1963), quoted in STAEHLE (1985), p. 123.
5 STAEHLE (1985), p. 127.
6 Cf. DYLLICK (1984).
7 Cf. HILL et al. (1981), pp. 149 ff.
8 Cf. STAEHLE (1985), p. 130.
9 HILL et al. (1981), p. 166.

Members of the organization strive for security in order to protect themselves against the uncertainty implicit in unexpected responses of the system environment.[1]

The organization can attempt to satisfy these security goals by using its organizational resources to ensure that tasks are clearly specified, a clear, fair system of incentives and disciplinary measures is established and relationships with other members of the organization are promoted.[2]

The need of members of an organization for security is paralleled by a need for **independence** and individual discretion in carrying out their tasks. Following MASLOW's theory of stages in motivation[3], it may be assumed that independence will be desired as a real goal only if security goals have already been fulfilled.[4]

Organizational resources can be used to meet the independence goal by allowing members of the organization "*to decide their work behaviour and system according to their own judgement, without being exposed to excessive demands which engender uncertainty or fear*".[5]

From a management viewpoint, it is significant to note that, organizationally, efforts to attain security goals teud to compete with efforts to achieve independence goals:

> "*...a high degree of individual protection against uncertainty tends to reduce individual freedom of decision, and vice versa. The greater the extent to which the work situation is organizationally structured, therefore, the less will be the uncertainty with which a member of the system tends to be confronted, but the more restricted will also be his opportunity to develop his own potential.*"[6]

4.4.2.3.3 Real Goals of the Water Users

The real goals of the water users are significant influencing factors in the system environment in cases where water users are regarded as customers/clients external to the system.

The goals of water users as customers/clients have therefore been discussed in Section 3.2.8.4.2, as part of the description of contingency factors.

In situations in which water users may be regarded as members of the organization, the remarks in the preceding section apply accordingly.

4.4.2.4 Goals and the Situation

In regard to the situational conditions examined in Section 3.3, it may be asked what goals, what processes of goal formation and what features of the goal system tend to be compatible with the ideal situational configurations described above.

1 Ibid.
2 Ibid.
3 Cf. STAEHLE (1985), p. 177.
4 HILL et al. (1981), p. 166.
5 Op. cit., p. 168, author's translation.
6 Ibid, author's translation.

It cannot be assumed that the situation determines the content of goals. Rather, the selected goals and strategies determine the contingency factors.[1] Nonetheless, there will often be considerable feedback from situational constraints to the formation of goals.[2] The following observations therefore describe the content of goals in relation to situational constraints not in terms of strict cause-effect relationships, but as trends often subject to a process of adjustment between the objectives and the situation.

Type A Configurations

Where large organizations exist in a context of stable environmental constraints, with high routinizability of tasks at the implementational level, it may be assumed that routinization will imply a clear, operationalizable and consistent system of goals. In the majority of cases, goals will be formulated from the top down, by a small "core group".[3] The stable environmental constraints are conducive to a stable goal system, and favour a closed system approach. Under A-type constraints, production goals will be predominant.

In irrigation as elsewhere, the dominant goal-criteria will be primarily productivity, technical efficiency and profitability.

A fit will exist between formal goals and the real goals of the members of the organization only if the latter are oriented chiefly towards security aspects.

Type B Configurations

Under situational constraints approximating to those in a Type B configuration, a system of objectives of a different character is to be expected. The complex, variable environmental constraints frequently express themselves in multiple goals and may also necessitate a frequent **transformation of goals.**[4]

The high task requirements in this situational configuration demand qualified employees, whose real objectives are directed more strongly towards independence and greater freedom of judgement than is the case in Type A configurations. This is frequently associated with greater participation of system members in the process of goal formulation. Owing to uncertain environmental constraints, consolidation and development goals may take priority.

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1 Cf. Section 3.2.1.

2 This is at least the case with goal formulations oriented on so-called "exploratory goal planning" as defined by KIRSCH et al. (1979), following BAMBERGER (undated). Here, the current conditions of the organization and its system environment are used as a basis for predicting future events and states. In "*autonomous*" planning of goals, conversely, there is no feedback from situational constraints to formulation of goals if "*desired future characteristics of the organization are formulated solely in terms of the desirability of the future state*". Cf. KIRSCH et al. (1979), p. 361.

3 Cf. STAEHLE (1985), p. 130.

4 According to STAEHLE, a transformation of goals occurs "*when the current goals do not require preciser definition, but their overall orientation must be altered.*" Transformation of goals may occur as "***goal multiplication*** *(e.g. diversification)* ***goal shifts*** *(existing resources are used for a new purpose) and* ***goal follow-up*** *(orientation towards completely new goals after existing goals have been attained)*". STAEHLE (1985), p. 127.

In irrigation, the systems corresponding to these constraints will be those autonomously managed by water users under uncertain environmental conditions. Dominant goal criteria will, in particular, be system stability, cost-effectiveness and equity, together with the "convenience" referred to by CHAMBERS.[1]

Type B' Configurations

Special constraints on the system of goals need to be observed in organizations and organizational units in which there is intensive interaction with customers/clients, i.e. those resembling the Type B' configuration. The goal formation process includes the system members responsible for implementation and the customers/clients, and is therefore subject to a process of "**concretization of goals**".[2] In general, goals are initially vague, and are defined more precisely through interaction with the customers.[3] As provision of "pure" services predominates, it is often difficult to quantify goal attainment satisfactorily, and clear indicators for goal attainment ("performance quality of the service") are seldom available.

In irrigation, "interventionist goals" aimed at promoting the performance potential of the water users will take high priority.

The dominant objectives criteria in terms of the above-mentioned table are the stability referred to by CHAMBERS, in the sense of sustained system operation, and THORNTON's "efficiency of water administration", provided this is understood to mean a high quality of interaction with the water users.[4]

Type A' Configurations

Type A' configurations are characterized by a pronounced service orientation, accompanied by short low-intensity customer contacts and tasks requiring only a low problem-solving potential.

The "service package" generally includes tangible products - in irrigation primarily in the form of water - delivered to the customers/clients via repeated short contacts.

Goal formulation usually takes place without direct customer/client involvement, but great attention is paid to their needs. The goal system is easier to operationalize than under Type B' constraints, and is relatively stable, so long as customer/client needs remain unchanged.

In irrigation, "performance goals" are of primary importance, while efficiency of water distribution, equity and cost recovery are the dominant goal criteria in the sense of Table 4.4-2.[5]

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1 Cf. Table 4.4-2.

2 According to STAEHLE, concretization of goals becomes necessary if "*unclear and imprecise goal formulations exist*". Following BLAU/SCOTT (1962), ETZIONI (1964) and ENDRUWEIT (1981), STAEHLE distinguishes between the following forms of concretization:
- differentiation of goals, i.e. derivation of sub-goals in an goals-tree;
- extension of goals, i.e. the adoption of new goals with the aim of clearer definition;
- limitation of goals, i.e. restriction of goals, for example in bottleneck situations.

Cf. STAEHLE (1985), p. 127.

3 Cf. SCHEUCH (1982), p. 114.

4 Cf. Table 4.4-2.

5 Cf. Table 4.4-3.

Ideal Types of Situational Configuration

Attribute of goal system	A	A'	B'	B
Process of goal formation	by small core group (top down)	by core group paying considerable attention to water users' needs	with participation of water users as clients to concretize goals during implementation	with water users as participants
Type of goal system	unambiguous, operationalizable, consistent	relatively unambiguous, operationalizable and consistent	- vague - in most cases not initially operationalizable	- multiple goals - some objectives difficult to operationalize - not always consistent
Goal dynamics	stable goal system	relatively stable with occasional transformation of goals to adapt to customer's needs	concretization of objectives ("individualization")	goal transformation
Dominant goal-orientation	performance goals (production)	performance goals (services)	- intervention goals - development goals	- sustainability goals - development goals
Significant goal criteria (modelled on Table 4.4-2)	- productivity - technical efficiency - economic viability	- water distribution efficiency - equity - cost-recovery	- quality of interaction with water users - sustainability of effects	- system stability - cost-effectiveness - equity - convenience

Table 4.4-3: Approximate Fit between Goal Systems and Situational Configurations in Irrigation

4.4.3 The Members of the Irrigation Organization

4.4.3.1 Introduction

The questions of system membership and contingent changes in water user status have already been discussed in Sections 3.2.5.5 and 3.2.8.

The following observations attempt a closer definition in terms of situational differentiation.

4.4.3.2 The Situational Differentiation of Organization Membership

The conceptual difficulties involved in delimiting the organization from its environment, and thus in defining what is meant by membership of the organization, have been indicated in Section 3.2.8.1. Mention was also made of CYERT and MARCH's view that the exact position of the dividing line between the organization and its environment may be situation-dependent.

Following MILLS and MORRIS,[1] one may use certain criteria to establish the organization membership or customer/client status of a person or group. The result is a list of criteria of the kind shown on the left-hand side of Table 4.4-4.

An attempt to establish organization membership on the basis of this list of criteria and in relation to the familiar ideal types of situational configuration produces an evaluation matrix of the kind shown in Table 4.4-4.

The diagram shows that in differing situational configurations, different criteria or groups of criteria must be used to establish the dividing line between members and non-members. It also shows clearly that this line is extremely difficult or even impossible to draw in Type B' configurations. It therefore appears useful to apply MILLS' concept of the "partial employee" to clients in this particular configuration.[2]

4.4.3.3 Situational Differentiation of Water User Status in Irrigation

Using the contingency matrix in Table 4.4-4, the status of water users in irrigation may be differentiated roughly as follows:

Type A Configurations

In configurations resembling Type A, of the kind prevailing in irrigation under conditions of "closely-supervised production", the water users generally have the status of subordinate members of the organization. The organization can use formal rules and personal instructions to influence the behaviour of the water users as "employed agricultural labourers" in the desired direction. The water users are closely integrated in the transformation process controlled by the organization.

1 MILLS and MORRIS (1986), p. 728.
2 MILLS (1986), pp. 142 ff.

Ideal Types of Situational Configuration

Defining criteria	A		A'		B'		B	
	Organization member (water user)	Consumer	Organization member	Customer (water user)	Organization member	Client (water user)	Organization member (water user)	Consumer/ customer placing order
Specificity of contract with organization	high	high	high	high	medium	low	medium	medium
Involvement in transformation process	high	non-existent	high	low	high	medium/high	high	low
Duration of personal contact with organization	-	low	-	low/medium	-	high	-	low/medium
Proportion of working time spent in personal contact with organization members	-	low	-	low	-	high	-	low
Intensity of contact with organization members	-	non-existent	-	low	-	high	-	low/medium
Influencability by formal organizational rules	high	non-existent	high	low/medium	medium	low	medium	low
Influencability by leadership measures	high	non-existent	high	low	high	medium/high	high	low
Time span of subsequent behavioural control	high	non-existent	high	low	high	medium	high	low
Objectives-orientation in relation to organization's performance	production	consumption	production	consumption	production (consumption)	consumption/production	production	consumption

Table 4.4-4: Situational Differentiation of the Definition of Organization Membership, adapted from MILLS and MORRIS (1986)

Type A' Configurations

In situations resembling Type A', found in specialized water-management organizations,[1] the organization provides certain services to the water users.

In extreme cases, therefore, the status of the water users may be that of **recipients or consumers** who develop no personal relationships with the organization as the "supplier". This presumes that the organization has a monopoly position, with no risk of consumers turning elsewhere for their supplies. Where this is not the case, the organization will need to enter into a relations-oriented interaction with the water users as **customers** to prevent them from turning to other suppliers and to secure their customer loyalty.[2]

As customers, the water users are relatively little involved in providing services, i.e. in water supply, distribution and delivery.

The irrigation organization has only limited scope for imposing its rules of behaviour on the water users through formal organizational rules, for example by means of rigid irrigation schedules. Influencing water user/customers through personal leadership is virtually impossible in this configuration.

The water users - as opposed to the members of the irrigation organization - see the goal of the interaction not primarily in "production", i.e. in water supply, but in "consumption", i.e. in consuming water supplied by the organization to cover their plant water needs.

Type B' Configurations

In configurations approximating to Type B', tasks require intensive interaction between the representatives of the irrigation organization as service-providers and the water users as **clients.** Client status implies a greater intensity of interaction, i.e. a high level of task individualization. The water users play a substantial rôle in shaping the transformation process - e.g. the way in which irrigation extension services are carried out - and can make individual contributions to its design. Nonetheless, they perceive the goal of interaction primarily in terms of "consumption", for example in utilizing the advice given to them, and less in the advisory interaction itself.

Type B Configurations

In Type B configurations of the kind described for irrigation organizations in Section 3.3.4.2, the water users have the status of active participants, sharing responsibility for influencing system design.

Involvement in the transformation process is high and behaviour within the water users' organization is influenced chiefly by means of participatory leadership[3] and through mutual adjustment with other members of the water users' organization.[4]

Adopting situational criteria, water nser status in irrigation may thus be represented as follows:

1 Cf. Section 3.2.4.2 and Table 5.4-1
2 Cf. Section 5.5.3.3 on customer loyalty.
3 Cf. observations in Section 5.5.
4 Cf. Section 5.4.5 on the topic of "mutual adjustment".

Water User Status in Irrigation

	I	I	I	I
Ideal types of situational configuration	A	A'	B'	B
Water user status	Organization member ("paid agricultural labourer")	Consumer/ customer	Client	Independent user/participant
Example of an irrigation organization	State farm	Specialized water-management organization	Advisory organization	Village community system

PART D: APPLICATIONS

5. MANAGEMENT FUNCTIONS

5.1 Introduction

The following chapter discusses the management functions of planning, organizing, leading and controlling, with reference to the explanatory remarks in Section 2.3.3.

This part of the study aims not at a comprehensive presentation of the ways of applying these functions in irrigation, but rather at indicating the potential usefulness and practical relevance of the conceptual framework developed in this book.

As mentioned in Section 3.1, contingency management demands coordination between goals, contingency factors and the chosen means, i.e. the relevant parameters of the management functions. The following sections describe the most important of these parameters. They are presented both as independent variables of the situation and as instruments of management action. The intention is to show that reference to the situational and goal configurations described above leads to a clear situational differentiation of management action orientation.

It must be assumed that in current irrigation management practice there is neither a conscious, conceptually-based situational differentiation of management approaches nor explicit reference to the requirements of service management.[1]

The aim of the following presentation is therefore to indicate that a contingency and service-oriented framework of reference of the kind developed here can provide concrete indications of how to improve situation conformity in irrigation management.

It is hoped that this will stimulate further attempts to attain improved situational compatibility in the management of irrigation systems.

The presentation of the management functions in the following sections emphasizes the close interrelationship between the planning and controlling functions on the one hand and the organizing and leading functions on the other. In order to underline this interrelationship clearly, Sections 5.2 and 5.3 first discuss planning and controlling, while organizing and leading are grouped together in Sections 5.4 and 5.5.

In the context of the following observations, it must again be pointed out that situation-oriented management action of the kind supported here cannot mean that action is **determined** by the situation. Situational influences represent constraints on management. These constraints may have a predominant effect on management action, but that action is finally determined by the responsible decision-makers themselves.

1 This is the conclusion to be drawn from the literature consulted in the course of preparing this study and from the author's personal experience in the irrigation sector of German technical co-operation.

5.2 Planning

5.2.1 Introduction

"*Planning is the systematic intellectual pre-enactment of future action*".[1] It assumes concrete form in the creation of "plans", which define this future action.[2]

In accordance with the conceptual framework presented here, "planning" is understood as one of the management functions in the cycle of several successive functions of this kind. This should not disguise the fact that the functions of planning and controlling are closely allied:

> "*For planning alone cannot ensure that objectives are attained. Timely detection of deviations with respect to the basic conditions (constraints, assumptions) and to the intended effects of measures on objective attainment may be used to initiate corrections or to provide important data for controlling, forming part of the database for future planning periods.*"[3]

In the **closed** system model (cf. Section 2.3.2.2), planning is "inward-directed", i.e. it is orieuted towards the coucerns of the system and its transformatiou processes. Conversely, an **open** system model requires the above-uoted "*intellectual pre-enactment of future action*" to be directed both outwards (i.e. towards environment-system interactions) and inwards (i.e. towards the design of sub-systems and their interactions).

From this systems viewpoint, "planning" as a management function may be defined as follows:[4]

> *The task of planning is to concretize the general objectives of the organization, taking internal and external situational constraints and trends into account, to establish sub-objectives for sub-systems and to determine necessary and appropriate measures for attaining objectives, while simultaneously ensuring system sustainability.*

The open character of the system, and thus the interactions between the system and its environment, are taken into account by **strategic planning**. It is in the natnre of strategic planning to be "more environment-related and politically-oriented, whereas planning in the narrower sense is more organization-related and technologically-oriented."[5]

Strategic planning in this sense is long-linked, and assumes the character of directional overall planning.[6]

1 SCHWANINGER (1985), p. 54, author's translation.
2 The term "planning", here connoting the management function of that name, is also frequently used in an institutional sense. In the following passages, this second sense will be denoted throughout by the term "planning system". Cf. KIRSCH et al. (1979), p. 95, for preciser definition of the terms "planning", "plan", etc.
3 ULRICH and FLURI (1984), p. 91, author's translation.
4 Based on ULRICH and FLURI (1984), p. 92
5 STAEHLE (1985), p. 340. Various authors employ the term "strategy" rather than "strategic planning"; they differentiate between "strategy" and "planning", which is more organization-related and inward-directed. Cf. for example STAEHLE (1985), p. 340 and UNDERMAN and DAVIES (1984), p. 19.
6 Strategic planning is virtually non-existent in irrigation in developing countries. This agrees with UNDERMAN and DAVIES' findings that, in non-profit organizations, strategic perspectives are generally neglected in favour of budgetary considerations. Strategic planning is, however, also necessary for non-profit organizations. Cf. UNDERMAN and DAVIES (1984), p. 20.

Implicit in this view of the system and in the existence of mutually interactive subsystems is a need for management to undertake further operationalization of this framework, i.e. to transform it into **operative planning**. The task of operative planning is to convert strategic goals into operational objectives for subsystems and establish concrete measures for attaining objectives over fixed planning periods.[1]

Short-term implementation planning then serves to:[2]

- direct recurrent processes (disposition planning, especially in procurement, stock-keeping and production).
- plau nnique measures and actions (planning one-off measures, project planning in the narrow sense).

In sum, this systems-oriented view of planning results in the following hierarchy of planning:

i) Strategic planning

ii) Operative planning and the creation of operational sub-plans.

iii) Implemeutation planning in the form of

- disposition planning,
- planning for one-off measures.

The particular difficnlty involved in practical execution of this type of hierarchical planning system is to maintain consistency of sub-objectives and sub-plans so that implementation of the sub-plans makes an efficient contribution to attainment of overall objectives and goals.

Contingent or situation-adapted planning provides a means for management to exercise the planning function in a way which ensnres that the parameters of planning action are closely matched to the prevailing situational constraints and the desired objectives. It is importaut to note that while strategic planning may perfectly well be situation-adapted, it is in no sense identical with contingency planning.[3]

Strategic planning relates to the content of planning and to its forecasting of opportnnities and risks in the environment, as well as to the strengths and weaknesses of the organization. Contingency planning as understood in this context attempts, by contrast, to shape the variables of planning action in accordance with the situational constraints. A more detailed discussion follows.

5.2.2 Situation-Dependent Features of Planning

5.2.2.1 Introduction

Contingency approaches were latecomers to the field of planning and controlling in management.[4] This explains the considerable divergence of view as to the significant planning variables which may be subject to contingent change. The following contingent planning variables are singled ont for attention:[5]

1 Cf. ULRICH and FLURI (1984), p. 94 and pp. 95-114.
2 Ibid., p. 117.
3 Cf. STAEHLE (1985), p. 386.
4 STAEHLE (1985), p. 384.
5 Cf. ibid., pp. 384 ff.; ROBBINS (1984), pp. 120 ff.; KAST and ROSENZWEIG (1982), pp. 425 ff. and STAEHLE (1983), pp.91-92.

a) The **specificity** of planning, i.e. the clarity, unambiguousness and operationalizability of the objectives on which planning is based and the resulting detailedness of planning;

b) The **organization of planning**, i.e. the structure of the planning system;

c) The **planning procedure;**

d) The **planning horizon**, i.e. the period covered by planning.

In the following sections, these variables are discussed in relation to the ideal types of situational configuration deduced in the previous chapter.

5.2.2.2 The Specificity of Planning

5.2.2.2.1 Introduction

Planning with high specificity is based on the formulation of clear, unambiguous, operationalizable and consistent objectives (cf. Section 4.4.2). Such objectives can be broken down into similarly precise sub-objectives, i.e. into outcomes or tasks which can then become the objects of "specific planning".[1]

Planning specificity describes a planning dimension which can be presented in terms of a continuum ranging from "specific" to "directional" planning.[2]

In reality, however, it is extremely difficult to fulfil the above prerequisites for specific planning:

- Specific planning presumes that only one objective has been defined, or that there are packages of objectives with no conflicts between individnal objectives. This is, however, possible only on the premise that legitimized formulation of goals and objectives is confined to a single person or a small core group, or that there is a close fit between the goals of different claimant groups.[3]. In reality, systems of objectives are frequently characterized by substantial conflicts between individnal objectives.[4]
- Specific planning assumes high predictability of the effects of actions.[5] This in turn implies low environmental uncertainty and high task specificity.[6] Only under these conditions will it be possible to define the attainment level, i.e. the desired level of attainment of results and the planning period, i.e. the period in which this attainment level is to be reached, with sufficient precision.

5.2.2.2.2 Specificity of Planning in Type A and Type B Configurations

It is evident from the above-described constraints that planning with a high level of specificity is justifiable only nnder situational constraints approximating to those in the Type A configuration. Under such conditions, a relatively clear, operationalizable and consistent description of objectives can be assumed, together with task and environmental constraints corresponding to the premise noted above.

1 Cf. ROBBINS (1984), p. 122.
2 Ibid.
3 Cf. Section 4.4.2.
4 Cf. STAEHLE (1985), p. 126.
5 ROBBINS (1984), p. 122.
6 Cf. Section 3.2.6.2.1.

Conversely, under Type B situational constraints it will be virtually impossible to attain high planning specificity. High environmental uncertainty and poorly structured task descriptions will here generally lead to vague formulations of objectives and results and to low predictability of the effects of management actions. "Directional" planning, i.e. planning with a low degree of specificity, will be more suitable in such cases. The advantage of greater planning flexibility is here gained at the expense of planning precision.[1]

5.2.2.2.3 Specificity of Planning in Type A' and Type B' Configurations

Configurations where tasks demand intensive client interaction, as for example under Type B' constraints, confront planning with additional problems. In such cases, the description of desired outcomes is not merely vague and variable, as is typically the case in Type B configurations, but must often be assumed to be completely **non-existent.** Both service-providers and customers/clients often have only vague notions as to the required qnality of service.[2]

This means that sub-objectives or result specifications can be defined only in the course of performing the service, i.e. during implementation. Formulation of objectives and implementation are thus partially concurrent.[3]

Snch situational constraints correspond to the conditions under which McCASKEY considers "planning without objectives", i.e. directional planning, to be appropriate. "*Whereas planning with objectives assumes that objectives can be formulated, operationalized and measured, planning without objectives confines itself ... to indicating a general direction for action.*"[4]

Concretely, this means that a particularly low specificity of planning must be assumed in situational configurations resembling Type B'.

To attempt a high degree of specificity in snch situations would mean evading the bargaining process and neglecting customer objectives. Plans can, however, be relevant to action only if they have been accepted by both the planners **and** those affected by the plans.[5] Considerable acceptance problems for the customers/clients would be likely if such a procedure were adopted.

In essence, this problem of objective formulation is also encountered in Type A' configurations. Due to the knowledge of customers' needs, the short, repeated customer-contacts and the low problem-solving requirements of the service task, however, the output which the cnstomer is thought to require can be concretized much more swiftly. Planning specificity can therefore be higher than under Type B' constraints. In Type A' configurations, moreover, planning specificity will generally differ for the backroom and front-office operations. It is important that planning specificity shonld preserve sufficient flexibility to cope with short-term adaptation to customer/client needs.[6]

1 ROBBINS (1984), p. 123.
2 SCHEUCH (1982), p. 113.
3 SCHEUCH (1982), pp. 113-114.
4 STAEHLE (1985), p. 384, author's translation.
5 STAEHLE (1983), p. 91.
6 Cf. SCHEUCH (1982), p. 110.

5.2.2.3 The Organization of Planning

5.2.2.3.1 Introduction

The organization of planning describes the structure of the planning system, i.e. the differentiation of overall planning iuto sub-sectors and individual plans and the coordination of plans with one another to ensure the consistency of planning as a whole. The extent of differentiation and integration is also referred to as "planning inteusity".[1]

Empirical studies have shown that organizational structnre, as a mediating variable of the situation, has a considerable influence on the nature of planning organization.[2]

In organizations with complex, largely formalized organizational structures and highly-centralized decision-making, there tends to be a preponderance of highly-differentiated, formalized and centralized planning systems. HADSCHIK's studies have shown a particularly clear tendency for planning intensity to increase with the size of the organization.[3]

5.2.2.3.2 Planning Organization in Type A and Type B Configurations

The introductory remarks indicate that in Type A configurations there is a tendency towards greater planning intensity and clearly-defined planning hierarchies. Responsibility for planning will also in general be largely centralized and implementation in the hands of specialized planning staffs.[4]

As noted in Section 4.2.1, under Type A constraints there is a relatively clear sub-division of the transformation process into an input, a conversion and an output sector. The following operative planning areas can be distinguished with equal clarity:

i) Planning of input-related tasks, such as personnel planning, equipment goods/material planning and financial planning;

ii) Planning of conversion-related tasks, e.g. production scheduling, organizational planning;

iii) Planning of output-related tasks, such as sales planning and evaluation planning.

Substantial differentiation of planning necessitates a corresponding effort to coordinate planning and ensure planning consistency.

In configurations similar to Type B, planning differentiation and formalization are considerably less marked. An "organic" planning structure analogous to the "organic" organizational structure will predominate; the planning system will be less differentiated, planning intensity lower and planning responsibility distributed within the organization.[5]

Planning areas are also less readily definable in B-type situations. For example, a small village irrigation system will require personnel, material and financial planning, but

1 STAEHLE (1985), p. 388.
2 This emerges from studies by KÖHLER (1981). Cf. STAEHLE (1985), p. 389. See also Section 3.2.2 for the rôle of organizational structure as a mediating variable of the situation in relation to planning action.
3 Cf. STAEHLE (1985), p. 382.
4 Cf. Section on "Coordination".
5 STAEHLE (1985), p. 476.

the required capability to react flexibly to differing environmental influences, in conjunction with the smallness of the system and its informal organizational and communication structures, will lead to a more holistic, flexible and informal type of planning if there is high environmental uncertainty.

BEARDSLEY et al. for example report on Japanese irrigation cooperatives in Niiike in the west of the main island, Honshu. Highly uncertain environmental constraints due to irregular distribution of precipitation and alternating problems of drought and flooding require a flexible response to water distribution and control problems at the low village level. Tasks of this type are insusceptible to intensive formalized planning from the top down.

In relation to the Niiike sitnation, the authors note that:[1]

> "*... in contrast to many phases of life which the central government absorbs completely, once it touches them, irrigation problems are too complex and variant to permit higher government to take over and mold the situation at will ...*".

5.2.2.3.3 Planning Organization in Type A' and Type B' Configurations

In organizations corresponding to Type B' constraints, opportunities for structuring the course of planning are still more restricted. As noted, tasks entailing intensive client interactions frequently demand procedures in which sub-objectives or desired results are concretized only during implementation.

The planning of the transformation process itself can therefore be of only low intensity, and will occur chiefly at an informal level, between the service-provider and the clients. Planning responsibility must be delegated largely to organization members carrying out the interaction, and will to a considerable extent be shared by the clients.

By comparison with Type A and Type B configurations, provision of services with a high customer/client interaction component involves two new planning areas; here, planning must also allow for the fact that customer/client interaction can be successful only if:

- the customers/clients are ready and willing to participate in the interaction, and
- the service-provider and customer/client are in the same place at the same time ("presence criterion")[2].

This means firstly that attention must be paid to planning which prepares customers/clients for the interaction ("enabling planning for the service object")[3], and secondly that coordinating the supply of the service in terms of time and place is an important planning area.

The following significant planning areas thus apply to the provision of services:[4]

a) planning for preparation of the service potential;

b) enabling planning for the service object (customers/clients);

c) coordinating the time and place for providing the service;

1 BEARDSLEY et al. (1980) in COWARD (1980), p. 142.
2 Cf. SCHEUCH (1982), p. 68 on the presence criterion.
3 SCHEUCH (1982), p. 116.
4 SCHEUCH (1982), p. 116.

d) planning of the service provision.

In situations resembling Type B', in which there is especially intensive client contact, "enabling planning for the service object" is of particular importance. The fact that a service can be provided sncecssfully only if the customers/clients are ready and willing to participate means that planning mnst attach special importance to creating this customer/client performance potential.[1]

For example, in the simple case of an extension service for irrigated agricnltnre which is planning to hold a field day with demonstrations of water distribution practices, enabling planning involves:[2]

- deciding what group will participate (target gronp planning);
- determining entry qualifications (e.g. users who have already adopted certain technologies);
- determining whether materials and equipment have to be provided for the participants, and if so, which;
- allowing lead time for participants to receive information beforehand;
- planning this preliminary information.

In situations resembling Type A', a **planning mix** will often be appropriate for the planning organization. Tasks in connection with the preparation of the service potential will often be of relatively high importance. These backroom tasks can often be prepared without significant customer/client participation and thus with the aid of relatively well-structured input/outpnt planning of the kind noted above for Type A configurations.

Proper coordination of this planning-intensive area with the less-structured area of direct customer interaction is both important and difficult.

5.2.2.4 Planning Procedure and Planning Horizon

5.2.2.4.1 Planning Procedure and Planning Horizon in Type A and Type B Configurations

In configurations where customer interactions do not take pride of place, planning procedures will generally be situated between the two following extremes:

a) A synoptic, holistic procedure comprising the following steps:[3]
   - selection of fundamental goals and values on which the planners base their planning;
   - a search for alternative strategies for attaining the goals;
   - evaluation of these alternative strategies;
   - selection of the optimum strategy, i.e. deduction of objective specifications and measures for the attainment of objectives.

b) An incremental step-by-step procedure:[4]

1 Cf. Section 3.2.8.4.3.
2 Modelled on SCHEUCH (1982), p. 117.
3 STAEHLE (1985), p. 385.
4 STAEHLE (1985), p. 385.

- identification of the present strategy;
- identification of the organization's current strengths and weaknesses;
- identification of opportnnities and risks in the system environment;
- modification of existing strategies to obtain a better fit between strengths and weaknesses and opportunities and risks.

Whereas the synoptic procednre demands a clear determination of overriding goals, there is only a limited need for such goals in the incremental procedure. In its extreme version, the latter represents a pattern of planning and decision-making which comes close to "mnddling through".[1] The synoptic procedure will therefore be particularly appropriate in organizations which permit high planning specificity, of the kind enconntered in A-type confignrations.

As far as the planning horizon is concerned, increasing size of the organization tends to require longer-range planning.[2]

An incremental planning procedure, on the other hand, represents a flexible procedure with a short-range planning horizon. Incremental planning will therefore tend to be more sitnation-adapted in configurations resembling Type B. The smallness of the organization and the environmental uncertainty under such situational constraints both adversely affect long-range planning horizons.[3]

5.2.2.4.2 Planning Procedure and Planning Horizon in Type A' and Type B' Configurations

It has already been noted that tasks in the service sector, with an intensive customer/client interaction requirement, present special difficulties for planning. There will generally be only a vague "notion" of desired outcomes. Precise definition of objectives or outcome specifications usually takes place only during actual implementation of the service.[4] The planning procednre is thus quasi-concurrent with the performance of the service. In this context, SCHEUCH refers to a multi-stage "individualization process", in which gradual adaptation and coordination of mutual expectations as to the outcome ("service quality") takes place between the service-provider and the customer/client.[5] The process is one of mutual learning by experience, equivalent to that of "action research".

The term "action research" originates with the American author Kurt LEWIN.[6] The most important feature of action research is the close cooperation between a planning or research team and the customer, with the process of gradual learning by experience on both sides referred to above.

LEWIN regards the action research process as *"a spiral of steps, each of which is composed of a circle of planning, action and fact-finding about the result of the action"*.

1 LINDBLOM (1959, 1968), quoted in STAEHLE (1985), p. 386.
2 KEPPLER (1975), quoted in STAEHLE (1985), p. 388.
3 KEPPLER (1975), quoted in STAEHLE (1985), p. 388.
4 SCHEUCH (1982), pp. 113-114.
5 Ibid.
6 BOTTRALL (1981b), p. 5.

BOTTRALL emphatically supports more intensive use of action research approaches in irrigation,[1] citing the positive experience with action research in the irrigation sector in the Phillipines, where the technique has been used with considerable success, especially for extension services to small farmer village community systems.[2]

Planning procedures in configurations resembling Type A' will generally take the form of a **planning mix**, i.e. different procedures will be appropriate in different areas.

A more synoptically-oriented procedure will be appropriate to the situation in the backroom organization, and a more incremental, individualization-oriented procedure in the front-office organization.

In irrigation planning, however, there are generally substantial problems in achieving adequate coordination between the two planning procedures. To a not insignificant extent, this may be due to the influence of international financial development cooperation, which primarily supports synoptic planning concepts originating from engineering approaches.

HOTES, for example, presents the World Bank's planning approach in the following terms:[3]

> *"Beginning in 1981, the Bank has had a requirement, for all types of projects, that field investigations, engineering work, and detailed design should be well advanced at the time of loan approval, so that bidding documents could become available and that tendering could begin shortly thereafter. Generally this requires final designs for large monolithic structures such as dams and other major structures and canals, and detailed designs for the first year of work for other facilities. For irrigation projects this means that plans, profiles and cross-sections should have been made for the main system and that detailed designs and estimates should have been made for representative areas of the project. There should be no major surprises in quantities during construction.*
>
> *Similarly, software components - for example training programmes or organization reforms - should be fully designed and if possible underway. The project organization should be formulated and the initial staff scheduled and provided for in the local budget. Housing and equipment requirements should be developed and initial procurement ready to go. Agricultural research should be sufficiently advanced to make results available for dissemination by trained extension agents; and, on the social side, preparation for farmer participation should be on-going."*

It need not be emphasized that such requirements are scarcely conducive to interactive action research with the water users as customers/clients.

1 BOTTRALL (1983).
2 Ibid., pp.4-5.
3 HOTES (1983), in OECD (1983), p. 128.

Planning attributes	Ideal Types of Situational Configuration			
	A	A'	B'	B
Specificity of planning	high ("specific planning") - clear, operational description of objectives and outcomes - high predictability of effects of action - highly planning detail	varying: - in backroom organization tending to be medium or high; -in contact organization medium to low; problems of short-term adaptation to customer needs	extremely low; - lack of described objectives and outcomes through intensive client participation	low ("directional planning"): - vague description of objectives and outcomes - low predictability of effects of action - low planning detail
Organization of planning	mechanistic - high planning intensity (= high planning differentiation and coordination) - pronounced planning hierarchy - strong formalization - strong centralization of planning responsibility - planning sectors: input/conversion/output with clear delimitation of sectors	"planning mix" - in the backroom organization: medium planning intensity, hierarchization and formalization - in the contact organization: largely organic - planning sectors: -- in backroom organization: input/conversion/output -- in contact organization: tending to resemble B' -- additionally: coordination planning between backroom and contact organization	organic: - extremely low planning intensity - extremely low hierarchization - informal - planning responsibility divided between organization and client - planning sectors: -- planning preparation of service potential -- enabling planning for object of service (customers/clients) -- time and place coordination -- planning of service provision	organic: - low planning intensity - low planning hierarchization - mainly informal planning - widely distributed planning responsibility - planning sectors: input/conversion/output with little delimitation of sectors
Planning procedure and planning horizon	- synoptic, rigid, long planning horizon	- "mixed strategy": -- in backroom organization quasi-synoptic medium planning horizon -- in contact organization quasi-incremental short planning horizon	- flexible, incremental concretization of service quality - planning and implementation concurrent - short planning horizon	- incremental, flexible, short planning horizon

Table 5.2-1: Situational Differentiation of Important Planning Attributes

5.3 Controlling

5.3.1 Introduction

The management function "controlling" consists in ongoing monitoring and adaptation of all organizational activities by reference to specified plans and standards.[1]

As already noted, there is a close link between the functions of planning and controlling. For internal purposes of an organization, they are therefore often subsumed under the single head of "controlling", describing the internal planning and control system as a whole.

Implementing the control function involves the following important steps:[2]

a) Formulate measurable implementation standards;

b) Measure actual status;

c) Compare desired with actual status;

d) Analyze deviations;

e) Take corrective measures.

This view of the controlling function illustrates the close relationship between controlling and planning; if analysis of the deviations shows that they originate from an unrealistic specification of objectives or outcomes, the plan will need to be adjusted. Plan adjustment will also be necessary if there is an alteration in extremely important environmental constraints not subject to influence by management.

In this context, it appears important to distinguish between monitoring aud evaluation:[3]

Monitoring assumes that planning is correct, and checks agreement between planning and implementation. Monitoring is therefore the basis for effective control.

Evaluation, by contrast, questions the correctness or appropriateness of planniug and determines the extent to which deviations from the plan are due to planning faults, in order to deduce plan adjusting activities. Evaluation is therefore a part, not of the controlling functiou of management, but of its planning function.

The first two steps in the above list - formulation of measurable implementation standards and measurement of the actual status - are tasks for **monitoring**, while comparison of actual and desired status, analysis and corrective measures are tasks for **correction.**[4]

In hierarchical organizational structures, the top management of an organizational unit receives regular information on the course of actual results and of deviations and projected deviations for that particular unit. As a result, a coutrol hierarchy largely reflecting the hierarchical structure of the organization is set up.[5]

1 STAEHLE (1985), p. 373.
2 Cf. ROBBINS (1984), p. 417 and GTZ (1986), p. 67.
3 GTZ (1986), p. 66.
4 Monitoring tasks also include the design and use of an adequate reporting system. Cf. GTZ (1986), p. 67.
5 ULRICH and FLURI (1984), p. 125.

This reveals the close relationship between management's controlling function and the organizational structure as a mediating variable of the situation (cf. Section 3.2.4) and the importance of contingency approaches for controlling.

> *"From the contingency viewpoint, there is no such thing as* **the** *controlling system; differing organizations will make use of differing controlling systems".*[1]

Despite the highly contingent nature of management's controlling function, it was a long time before contingency approaches were introduced in this area.[2] Few empirical studies on situational controlling are available.[3]

As far as irrigation is concerned, increasing attention has been paid to the areas of controlling and monitoring and evaluation (M+E) in recent years.[4] Contingency aspects receive scant or unsystematic attention, however.[5]

5.3.2 Contingent Attributes of the Controlling Function

5.3.2.1 Introduction

The following parameters may be regarded as important attributes of the coutrolling function, i.e. as variables dependent on the situation:[6]

- the control structure,
- the controlling agent (allocation of responsibility),
- the object of control.

Following AMIGONI, the **control structure** is taken to refer particularly to the following attributes of controlling:[7]

- closeness of control,
- flexibility of control,
- coutrol behaviour,
- formalization of control,
- hierarchization.

The close relationship already noted between organization and controlliug is especially evident from this description of controlling structure.[8]

The **controlling agent** is the position or unit to which powers for carrying out the controlling function are allocated. The **object of control** is that component or area of the transformation process which is subjected to controlling.

The following sections discuss the situational differentiation of these parameters.

1 STAEHLE (1985), p. 390.
2 Op. cit., p. 384.
3 Ibid., p. 389.
4 The World Bank, for example, has set up a "Monitoring and Evaluation Unit", which assists partner countries in developing their own M+E facilities. This also affects irrigation projects (e.g. the UPRIIS project in the Phillipines, cf. NG and LETHEM, 1983). REDDY concludes, however, that monitoring is still little practised in the irrigation field (cf. REDDY in NOBE and SAMPATH, 1986, p. 111).
5 Cf. for example BISWAS (1985).
6 Cf. STAEHLE (1985), p. 390.
7 Cf. AMIGONI (1978), quoted in STAEHLE, p. 390.
8 Cf. Sections 3.2.4 and 5.4 on organizational structnre.

5.3.2.2 Controlling Structure and Controlling Agent

5.3.2.2.1 Type A and B Constraints

In organizational structures resembling Type A and B configurations, i.e. in strongly formalized structures with a high degree of horizontal and vertical differentiation, a tendency towards a "mechanistic" form of controlling may also be assumed.

The routinizability of tasks permits routinization of the process of controlling; precise implementation standards can be established, the scope and frequency of data collection can be fixed with relative exactness and the information and reporting systems can largely be formailzed. The controlling function is exercised by higher management levels and the distributions of controlling and management authority coincide.[1] In the ideal case there will be only **one** agent of control: the responsible leadership or top management.

A different type of controlling is required in configurations tending more towards Type B. The low routinizability of the tasks means that it is much more difficult to describe the coutent and timing of objective attainment. A precise, repetitive and rigid monitoring system is much less useful nnder such conditions.

There is an additional problem in this situational configuration: tasks requiring a high problem-solving potential must be performed by highly-qualified specialized staff. These demand a similarly high freedom of action.[2]

Too precise and too formalized a form of controlling may therefore have dysfunctional effects in this situation. It may demotivate staff aud obstruct spontaneous and creative problem solving.[3]

The appropriate form of controlliug for such situations therefore tends to be of an "organic" type; the controlling process is flexible, controlling can be carried out at different levels aud it iucludes self-regulation by semi-autonomous groups[4] and self-control by individuals.[5] The latter feature means that **two** controlling agents may exist alongside one another: the individual employee (or group of employees) and the responsible leadership or management.

5.3.2.2.2 Type A' and B' Configurations

The service character of the tasks in Type A' and B' configurations adds additioual dimensions to the discussion of the structure and the ageut of control.

Of significance is the fact that iu this case customers/clients, who as such no longer count as members of the organization, participate iu the transformation process. This entails a numher of different consequences for controlliug:

1 Cf. remarks in Section 5.4.
2 Cf. Section 4.4.2.3.2.
3 Cf. MEREDITH and MANTEL (1985), p. 355 and ROBBINS (1984), p. 429.
4 Cf. STAEHLE (1985), p. 471.
5 Cf. MILLS (1986), pp. 117 ff. on self-control by members of the organization. A significant aspect of self-control is the internalization of organizational and/or professional values and standards. (Cf. STAEHLE (1985), p. 291. MINTZBERG (1983) speaks of "standardization of skills" in this context. Cf. MINTZBERG (1983), p. 6. A detailed discussion of "self-control" also appears in MILLS (1985) in CZEPIEL et al. (1985), pp. 163 ff.

1) A distinction must be made between controls on areas in which tasks are performed solely by organization members and those in which they are not. In the latter case, the tasks may be carried out interactively by members of the organization and customers/clients or performed by customers/clients autonomously.

   The control systems for these different areas, with different agents of control, may also be differently structured.

   Interactive task areas are particularly difficult to formalize and standardize. This is especially true of lengthy, intensive client contacts, of the kind which predominate in Type B' configurations. An example is provided by extension services in irrigated agriculture. Control systems in Type B' organizations are therefore particularly organic in structnre and based to a high degree on the principle of self-coutrol by the members of the system.[1]

   The potential variability of control structures in task areas of the above type often lead to their separation in Type A' organizations, even to the extent of their being carried out in separate locations. A more mechanistic control structure can theu be established for non-interactive task areas than for interaction-related functions.[2]

2) In the interactive task area, the customer/client participates in the transformation process. The controlling function is thus divided among still more agents; it is exercised both at an internal level within the organization and at the external level of the customers/clients.[3] Three agents are therefore generally involved in control: managemeut, the member of the orgauization performing the task and the customer/client.[4] Customers/clients also measure the actual status of task-fulfilment, though by their own standards. They too compare the actual with the desired status and try to apply corrective measures in accordance with the intensity of their contact with the organization.

3) The fact that customers/clients participate in the trausformation process without beiug members of the organization, and that - especially in irrigation - there are task areas relevant to success which the farmers/water users implement independently of the orgauization greatly complicates the control process. The consequence is that these task areas lie outside management's direct control. The organizational and leadership instruments used to correct the behaviour of members of the organizatiou cannot be applied to the customers/clients.

   As already noted, both MILLS and MILLS and MORRIS take the view that interaction with the customer/client means that the latter may *de facto* be regarded as a "partial employee".[5] As such, he is in a quasi-subordinate relationship with the employees of the service organization for the duration of the interaction. From these considerations, the authors deduce two options for indirect cus-

1 Consultation with professional colleagues plays an additional rôle ("peer-group consultation"). Cf. MILLS (1986), pp. 33-34.
2 The distinction between "front-office" and "backroom" tasks frequently referred to above is again evident in this instance. Cf. Section 4.2.4.
3 Ideal Types A and B neglect to allow for the fact that organizations in the manufacturing production sphere are in reality also subject to a certaiu degree of indirect control by external consumers and claimant groups.
4 Cf. CZEPIEL et al. (1985), p. 12.
5 Cf. MILLS (1986), p. 120 and MILLS and MORRIS (1986).

tomer/client control, which they term "supervision" and "leadership".[1] These authors thus *de facto* introduce the same control structures and processes for behaviour control in service interactions (Types A' and B') as for manufacturing production (Types A and B).

Unlike MILLS and MILLS and MORRIS, KLAUS supports a concept which does not categorically rely on the partial employee structural model, and thus sidestep the special nature of customer interaction.[2] KLAUS explicitly emphasizes the interdependence of the respective modes of action of the organization member and the customer/client and the importance of customer/clieut satisfaction as a component in an interaction-oriented service.

This view questions the appropriateness of the mechanistic control structures and approaches which might be introduced on the basis of MILLS' and MILLS and MORRIS' customer supervision concept.

5.3.2.2.3 The Influence of the "Relative Water Supply" on the Control Structure in Irrigation

Apart from the considerations presented above, the influence of a further contingency factor with a special effect on the control structure is of importance in irrigation. This factor is termed "relative water supply" (RWS) by KELLER.[3]

KELLER nses the term to denote the ratio of the average amount of water available at a farm outlet in an irrigation system to the average amount of water needed at such an outlet in order to cover the plant water requirement of the crop most preferred by the nsers.[4]

KELLER draws the analogy of a membrane stretched across the entire irrigated area. The tension in this membrane increases as the relative water supply decreases.

Translated into management terms, this means that as the relative water supply diminishes, the **importance** of water distribution and allocation grows. The "importance" of a task increases in proportion to the risk that a failure to perform it properly will lead to negative consequences for the organization.[5]

The importance of a task is an important contingency factor for control; the greater the task's importance, the greater the tendency towards complex, formalized and hierarchic control structnres.[6] Examples of multiple control in critical areas of flight control make this extremely clear.

In terms of irrigation, this means that as the relative water supply decreases, there will be a tendency to adopt mechanistic control structures (cf. Section 5.5.3).

1 Cf. Section 5.5.3.3.
2 Cf. KLAUS in CZEPIEL et al. (1985), pp. 17 ff.
3 Cf. KELLER (1986) in NOBE and SAMPATH (1986), p. 336.
4 KELLER (1986) in NOBE and SAMPATH (1986), p. 336.
5 Cf. MÜLLER and HILL (1977), p. 365 and 368.
6 ROBBINS (1984), p. 433.

5.3.2.3 The Object of Control

5.3.2.3.1 Type A Situational Constraints

In situational configurations corresponding to Type A, a clearly defined input-output-transformation process may be assumed to exist (cf. Chapter 4).

For control, this implies that both inputs, outputs and the course of the conversion process may be the object of control and thus of monitoring activities. Since both inputs and outputs are clearly definable and measurable under these conditions, control will be concentrated on these areas.

Within the general framework of control tasks, input control then performs a kind of early-warning function. Timely information on input bottlenecks allows adaptive measures to be adopted before the conversion process has taken place and thus before the bottlenecks can have any concrete effects ("feedforward control").[1].

In irrigation, input control is particularly important in relation to:[2]

- staffing,
- finances,
- inputs of materials and equipments,
- water,
- information.

Under special circumstances, controls on the factors land (e.g. cultivable area and changes in ownership) and energy (pumped irrigation) may also be necessary. Control of legal regulations may also be required.[3]

Output control, i.e. checks on the results of the various transformation processes, suffers from the disadvantage that negative trends become apparent only after the event ("feedback control") so that corrections affect only future activities.[4]

It is important to differentiate between various levels in output control. These range from checks on the attainment of the objectives of the organization or of certain sub-units to output controls at the operational level.[5]

Management's difficulty is to reconcile balanced monitoring at the various control levels with the principles of cost-effectiveness and appropriateness of the control system. On the UPRIIS irrigation project in the Phillipines, for example, where a comprehensive monitoring system has been pnt in place, no less than 278 different indicators have to be monitored and analyzed.[6] In the majority of cases, such an

1 Cf. ROBBINS (1984), pp. 422-423.
2 Cf. Section 4.3.
3 Information is a frequently neglected area of input control. Control of the information flow is the responsibility of a "Management Information System" (MIS).
A Management Information System (MIS) is a formal, established information system providing project management with information on deviations between project plan and real status and on general project development. Within the project organization, this information gathering is of use for accounting, bookkeeping and reporting, with reporting taking responsibility for information on the physical and financial progress of the project. Cf. DOPPLER (1985), p. 79.
4 Cf. ROBBINS (1984), p. 424.
5 Cf. GTZ (1986), p. 70.
6 NG and LETHEM (1983), p. 35.

expenditure of effort is incompatible with the principles outlined above. For this reason, the principle of "key area control" and "reporting by exception"[1] is recommended. This states that managerial control should be concentrated on strategically important areas where variations have substantial effects on the fulfilment of objectives.[2]

Large publicly administered irrigation organizations in developing countries seldom follow this strategic view of the object of control, however. Controls on input areas usually predominate, without adequate attention to effects on achievement of results. SECKLER concludes that:[3]

> *"In the case of public agencies heavily involved in publicly directed irrigation projects in developing countries, such as irrigation ministries, the usual operational mode is to focus on a delivery of inputs rather than on the impact its delivery program is having on production outputs".*

For this reason, output-oriented management systems have increasingly been recommended for irrigation in recent years.[4]

The problem involved in this choice of control object is, however, that large-scale, publicly administered irrigation systems in developing countries fail to match the Type A configuration in two respects:

1) Formal, mechanized control systems, of the kind feasible in Type A configurations, require[5]

   - virtually complete agreement between legitimated decision-making groups as to objectives,[6] since otherwise outputs and relevant indicators cannot be defined clearly;
   - the ability of these groups to impose the common objective during implementation, since otherwise corrective control measures cannot be realized.

   Within non-profit organizations, however - including public irrigation administrations in developing countries - substantial conflicts betweeu the objectives of the various claimant groups must be assumed to exist.

   Restriction to input supply objectives is a *de facto* recoguition of these conflicts. Before there can be a shift to output control, therefore, solution of these conflicts is frequently required.

2) Publicly administered irrigation organizations in developiug countries are not usually integrated organizations in the same way as, for instance, state farms. There is generally a division of responsibility between irrigatiou organizations and water users, who in this case possess the status of customers/clients. Such organizations therefore correspond not to Type A but to Type A'. Different

1 ROBBINS (1984), p. 428 and STAEHLE (1985), p. 374.
2 STAEHLE (1985), p. 374.
3 SECKLER (1986) in NOBE and SAMPATH (1986), p. 386.
4 A system of this kind very recently propagated for irrigation is the "Management by Results" subscribed to by SECKLER. This approach attempts to introduce the output side as an object of control alongside and in coordination with the input side. The "Command Water Management Project" (CWM) in Pakistan, financed by the World Bank and USAID, is currently being established on these principles. Cf. SECKER in NOBE and SAMPATH (1986), p. 387.
5 Cf. ROBBINS (1984), p. 433.
6 Cf. Sections 4.4.2.2 and 4.4.2.3.

objects of control are consequently relevant in such organizations (cf. Section on Type A' configurations).

5.3.2.3.2 Type B Situational Constraints

A complicating factor for controlling in Type B configurations is the way in which fulfilment of complex, variable and often creative task requirements leads to uneven results. Formalized and mechanistic output control is virtually impossible to realize under these conditions.[1]

For example, control in a small village community irrigation system, confronted by highly variable environmental constraints and pursuing multiple objectives, can scarcely be oriented towards rigid output standards. Preferred objects of control under Type B constraints are therefore the conversion process itself and the input side.[2]

Monitoring of the conversion process focuses on the behaviour of the organization members concerned and on the course and manner of task performance. The aim of control is to determine whether complex tasks are carried out in the agreed way and within the agreed time period, i.e.to measure **process quality.** Process quality is high if the way in which tasks are performed corresponds to certain (e.g. professional) standards.[3]

Inputs are also important objects of control in Type B configurations. Here again, however, mechanistic control is not feasible. Excessive consumption of inputs must be avoided, but the precise level at which inputs become "excessive" is difficult to define in creative task performance.[4]

5.3.2.3.3 Type A' and B' Situational Constraints

5.3.2.3.3.1 General

Extension of controlling to services entails a considerable widening of the discussion of control objects.

The main additional aspects are as follows:

a) As noted in Section 4.3.2.2, the "service package" wholly or partly consists of intangible "products", the **services.** Their intangibility means that the output side is little suited as a control object in the provision of services.

b) Numerous activities iu the service sector, especially in Type B' configurations, require intensive interaction with clients. This means that the client participates in the conversion process, as frequently stressed above. Owing to the difficulties of predicting the client's behaviour and the associated latent problems of responsibility allocation, the course of the conversion process is likewise of limited usefulness as an object of control where there is intensive customer interaction, i.e. in Type B' configurations.

1 Cf. MEREDITH and MANTEL (1985), p. 355.
2 Ibid., pp. 355-356.
3 Cf. MILLS (1986), p. 142.
4 MEREDITH and MANTEL (1985), p. 356.

c) Intensive client interaction also means that the boundaries between the input, conversion aud output areas in Type B' configurations are fluid and difficult to define. In consequence, none of the objects of control discussed above can be applied without reservation in Type B' configurations.

d) The extension of the agent of control in the service sector to include the customers/clients means that objects of control must now also be identified from the customer/client standpoint. It is essential for management to know these **customer-specific objects of control** if it is to influence customer/client behaviour.

e) In the field of cooperation with customers/clients there may be areas in which tasks are antonomously performed by customers/clients, outside the process of interaction. The relevant input, conversion and output areas are ofteu inaccessible to direct managerial control, since they belong uot to the controllable but at best to the influencable system environment.[1]

Management's controlling tasks are therefore supplemented by influencing tasks related to customer behaviour in these areas.

5.3.2.3.3.2 The Control Dilemma in Service Provision

The features detailed in (a) to (c) above result in a **fundamental control problem** for interaction-oriented services. This problem stems from the difficulty of defining an object of control for highly interactive tasks. Iu general, the quality of an interactive service is difficult to appraise, since the service is intangible and hard to measure, and is therefore a matter of subjective judgement.[2]

In practice, one way of confronting this problem has been to identify qnantifiable qnality attributes on which quality control can be based (e.g. speed, punctuality, duration of customer contact, etc.).[3]

Studies have, however, shown that there are no simple, direct cause-effect relationships betweeu quantifiable quality attributes and the customer's snbjective perception of service quality.[4]

A secoud approach to controlling service quality in interactive task areas therefore addresses itself specifically to **customer satisfaction** as an object of control.[5] The attention of the controlling agents is directed away from exclusive consideration of the service-providing process towards the customers/clients and the effects of the service on them. Customer satisfaction becomes an output of the service activity and au object of control.

Such control approaches have also attracted criticism, however, iucluding the following objections:[6]

1 Cf. Section 3.2.5.4.
2 MILLS (1986), p. 128.
3 In the context of this perception of quality, KLAUS refers to the "product attribute" of service quality; interactive services are regarded as "products" and their quality is measured according to their ability to satisfy prescribed, quantifiable standards. Cf. KLAUS (1985) in CZEPIEL et al. (1985), pp. 19 ff.
4 An entire field of "customer-satisfaction" research has developed in this context, investigating such cause-effect relationships. Cf. literature cited in CZEPIEL et al. (1985), p. 21.
5 KLAUS (1985) in CZEPIEL (1985), pp. 22-23.
6 Ibid.

- The concept of customer satisfaction becomes problematical in circumstances where customer satisfaction is easy to attain because the customer has no alternatives with which to compare the service.
- The concept also becomes questionable if customer satisfaction is subject to excessive manipulation through advertisement.
- The concept represents a shift in attention from the previous excessively one-sided concentration on the service process to an equally one-sided concentratiou on the external customers/clients.

Almost no solutions to this control dilemma in relation to interaction-oriented services and thus to Type A' and B' configurations have yet been suggested.[1]

This has led to particular emphasis on the **attitude of the organization member to task fulfilment** in the discussion of suitable objects of control.[2] This is based on a view that only intensive enconragement of quality and customer awareness on the part of the staff, with associated self-control, offers a way out of the control dilemma for interactive tasks described above. Aspects such as recruiting and training, and especially employee motivation, therefore acquire special importance in configurations of these types.[3]

5.3.2.3.3.3 Complexity of Objects of Control in Type A' Configurations

Type A' configurations are partly characterized by the fact that the organization is in this case producing a service package which may contain both goods, i.e. tangible products, and intangihle services. Task areas which include and others which exclude customer contact can also be distinguished. The basis for identifying suitable objects of coutrol is therefore an exceedingly complex one. All the objects of control already noted for various types of configuration may be relevant: control of the input and output sides for the production of material goods in the backroom operation, control of the conversion process for complex tasks not involving customer contact and control of interaction quality for customer-contact tasks.

An additional, frequently-overlooked requirement for controlling systems in Type A' organizations is that coordination between the backroom and front-office organizations must be treated as an object of control.[4]

5.3.2.3.3.4 Customer-Specific Objects of Control

The participation of the customers/clients in the transformatiou process means that the customer/client also attempts to control this process. Iu many interactions, however, especially those associated with a transfer of knowledge - e.g. consultation, training - the customer/client is scarcely in a positiou to evaluate the quality of service performance.

1 KLAUS develops approaches in this direction with an integrated concept based on the interdependence of service-provider and customer behaviour and on a quality pyramid modelled on MASLOW. But he himself sees difficulties in operationalizing such a concept at present. Cf. KLAUS (1985) in CZEPIEL (1985), pp. 25 ff.
2 Cf. SASSER et al. (1978), p. 179 and MILLS (1986), pp. 117 ff.
3 MILLS (1986), p. 117.
4 Cf. remarks in VOSS (1985), p. 9.

As a result, he looks for **surrogate control objects** which he can monitor and from which he can deduce a necessity for corrective measures (including reduced use or non-use of the service).[1]

Important surrogate control objects for customers/clients include:

- the outward appearance of the service facilities (e.g. type and furnishings of office accomodation, type of equipment used, appearance of employees, etc.);
- the image of the organization offering the service;[2]
- the intensity of the organization member's efforts during the interaction ("effort substitution").[3]

A lack of attention to customer-specific control objects by the organization may represent a serious deficiency of controlling and management.

1 Cf. MILLS (1986), pp. 129 ff.
2 MILLS (1986), p. 131.
3 Ibid., p. 130.

Attributes of controlling	**Ideal Types of Situational Configuration**			
	A	A'	B'	B
Controlling structure	"mechanistic"	backroom organization: mechanistic contact organization: quasi-organic	"organic"	"organic"
Controlling agent	higher management level (manager)	backroom organization: higher management level contact organization: -- higher management level -- self-control -- control by customers/clients	- self-control by organization member with peer-group consultation - control by customers/clients	self-control by implementing group
Object of control (from management viewpoint)	key areas in: - inputs - conversion process - outputs	in backroom organization: key areas in inputs/conversion/outputs in contact organization: - process - surrogate objects of control as in B' additionally: coordination between backroom and contact organizations	no direct objects of control surrogate objects of control: - quantifiable quality criteria - customer/client satisfaction - attitude of organization member	particularly - process - inputs
Objects of control (from customer/client viewpoint)	product quality	- performance quality of tangible outputs - supporting facilities - image	no direct objects of control surrogate objects of control: - effort of service provider - image	product quality

Table 5.3-1: Situational Differentiation of Attributes of Controlling

5.4 Organizing

5.4.1 Introduction

In the following discussion of the management function "organization", a distinction must be drawn between the organization as a social entity and the management activity "organizing", which is concerned with the shaping of organizational structures. Very generally, the structure of an organization is to be understood in this context as a system of formal rules.[1]. Organizing as a management function therefore signifies directing the behaviour of members of the organization towards achievement of the organization's goals and objectives, through the medium of formal rules.[2] Direction of this kind constitutes an **impersonal** act influencing behaviour, and is supplemented by the leadership function of management, which represents a **personal** influencing of the members of the organization with a view to achieving the organization's goals.[3]

The function of organizing invariably comprises two aspects[4]:

a) **Differentiation,** i. e. *"the tasks to be performed must be divided into sub-tasks, and responsibility for these sub-tasks allocated to various positions. In this way, sub-systems are formed."*

b) **Coordination,** i. e. *"the sub-tasks, or those responsible for carrying them out, must be coordinated with one another and the results of the work performed by the individual sub-systems must be combined to form an overall result. This means that the sub-systems must be coordinated and their objectives oriented towards the objectives of the system as a whole."*

The basic organizational problem is simultaneously to differentiate and coordinate the system, so far as possible, while ensuring the correct balance between the two aspects.[5]

The structural dimensions determined by differentiation are:[6]

- **specialization,** i.e. sub-division of tasks;
- **configuration,** i.e. sub-division into management levels;
- **delegation,** i.e. the vertical devolution of authority.

The more differentiated each of these dimensions, the more difficult and the more necessary will be the task of **coordination**[7].

The coordination function may be secured by means of various coordination instruments or mechanisms, described in greater detail in Section 5.4.5.

The following sections deal both with the above-mentioned structural dimensions and with coordination and the associated **formalization.**[8] The explanations given should

1 STAEHLE (1985), p. 396
2 Cf. ULRICH and FLURI (1984), p. 139 and p. 245. Such rules are *formal*, if the authorized persons ("core group") have laid them down in a conscious act of organization, if they are declared to be valid irrespective of particular persons (impersonal), and (generally-speaking) if they are also set down in writing. ULRICH and FLURI (1984), p. 139
3 Cf. the chapter on "Leadership".
4 ULRICH and FLURI (1984), p. 145, author's translation.
5 ULRICH and FLURI (1984), p. 145 and STAEHLE (1985), p. 399
6 "Dimensions" in this context denote "empirically observable aspects of reality", HILL et al. (1981), p. 40. Cf. the following sections for a definition of the individual structural dimensions.
7 STAEHLE (1985), p. 432
8 Cf. Section 5.4.6

not, however, mislead the reader into thinking that structural dimensions can be altered independently and sequentially. MINTZBERG emphasizes that they constitute an integral whole, in which every dimension is interrelated with every other dimension: "*...change any one and all the others must be changed as well.*"[1]

Where structural dimensions of organizations are referred to below, idealized homogeneous structures are meant. In reality, however, organizational structures frequently represent a conglomerate of variously-structured sub-units.

In irrigation systems, the exercise of the organizing function is subject to special difficulties:

1) In an irrigation project, several organizational structures frequently co-exist or are linked to one another; in general, these are the irrigation organization(s), the water users' organization and an organization of external consultants, as for example in the case of the Madura Ground Water Irrigation Project in Indonesia (see Fig. 5.4-1).

2) A significant goal of government-initiated irrigation projects is often achievement of the highest possible degree of autonomy by the future water users. Contingent organizational design cannot, therefore be restricted to establishing a contingent organizational structure by securing a situational fit between objectives, contingency factors and design parameters. Rather, organizing must be understood in the sense of a continuous long-term process of **organizational development** and organizational transformation.[2]

The following sections discuss the structural dimensions defined above.

5.4.2 Specialization

5.4.2.1 Introduction

In organizations, the tasks necessary for the achievement of objectives must be sub-divided and distributed between the various members of the organization.[3] This division of labour is in part reflected in specialization, i. e. by the allocation of certain sub-tasks to certain positions specializing in the performance of such tasks. A distinction should be drawn between the **type of specialization,** i. e. the form of sub-division

1 MINTZBERG (1983), p. 95.
2 Cf. KIRSCH et al. (1979) on the "planned organizational transformation".
3 KIESER and KUBICEK (1983), p. 80. Apart from the distribution of tasks, the distribution of information and the distribution of authority must be ensured. Cf. STAEHLE (1985), p. 400.

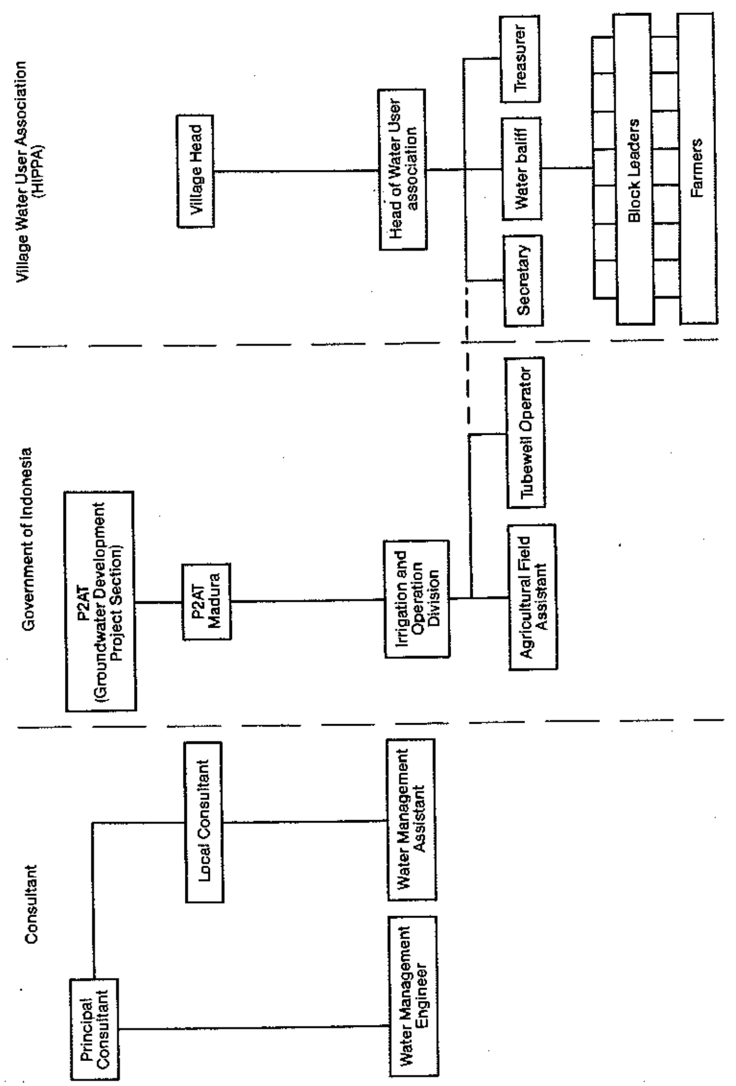

Fig. 5.4-1: Parallel Organizational Structures in Irrigation on the Example of the MADURA Groundwater Irrigation Project in Indonesia
Source: SMOUT (1986), p. 7

into sub-tasks, and the **degree of specialization**, which describes the extent of sub-division into sub-tasks.[1]

> *"Specialization is a characteristic of all organizations, but one which may be more or less pronounced (along a continuum)"*[2].

The various possible forms of specialization lead to differing task requirements for members of the organization.[3] It is of great importance in this respect that specialization should give rise to the creation of "positions" or "posts", which are established independently of the persons filling them.[4]

In larger organizations and organizational units, the creation of positions alone is not enough. Here, specialization relates not only to single positions but to larger organizational units (creation of departments).

The most important forms of sub-division into positions or departments are:[5]

- **functional structure**, grouping particular types of activity according to the functions performed ("functional centralization")[6]
- **divisional structure**, in which different activities related to the same object or product are grouped together ("product centralization", "divisional centralization");
- **regional division**, in which different activities related to various objects are grouped together in a particular location ("regional centralization").

These forms of sub-division characterize ideal organizational structures of a kind which rarely occur in practice. In reality, different principles of differentiation are applied both at differing hierarchical levels and within the same level.[7]

BOTTRALL points out that in large-scale irrigation organizations it is generally possible to distinguish between four broad functional areas, which he describes as follows (the first two areas are of central importance for most irrigation organizations, the last two only for organizations of certain types):[8]

a) Water supply service activities: water distribution, system maintenance, supervision of watercourse development, assessment and collection of water charges.

b) Agricultural production advisory service activities: general agricultural extension and water management extension (backed by agricultural research).

c) Commercial service activities: input supply, credit, marketing.

d) Basic infrastructure and social service activities: housing, roads, schools, health services, etc.

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1 In this context, a distinction is often made between "classification by type" and "classification by degree". Cf. STAEHLE (1985), p. 401 and KIESER and KUBICEK (1983), p. 81.
In the literature, the advantages and disadvantages of specialization are discussed in some detail. The advantages are to be found primarily in short training and learning times, low qualification requirements, high learning effects and simplicity of supervision. The disadvantages, much emphasized in recent decades, lie in the lack of acceptance of too closely-defined responsibilities and too one-sided a work-load for those concerned. Cf. STAEHLE (1985), p.405.
2 STAEHLE (1985), p. 402
3 KIESER and KUBICEK (1983), p. 82.
4 STAEHLE (1985), p. 405. HILL et al. define a "position" as "any abstractly-conceived unit of one or more persons ... which has been charged with performing a particular complex of tasks within an organizational whole, and which is furnished with the necessary authority, the necessary responsibilities and the lines of communication to other positions necessary for coordination." HILL et al. (1981), p. 130/131, author's translation.
5 Cf. STAEHLE (1985), p. 405.
6 KIESER and KUBICEK (1983), p. 86.
7 KIESER and KUBICEK (1983), p. 97.
8 BOTTRALL (1981), pp. 74-75.

It will depend on the objectives of the organization and the division of responsibility between the irrigation organization and the water users, whether the above functional areas are combined to form an "integrated" irrigation organization or whether the tasks performed by the organization comprise only some of these areas ("multi-purpose organization") or a single area only ("specialized water management organization"; cf. Table 5.4-1).

It is important to note that the choice of functional areas for the irrigation organization largely determines the rôle of the water users and the extent to which they are integrated in the organization (cf. Section 4.4.3), and thus the degree of service orientation of the irrigation organization.

5.4.2.2 Specialization in Type A and B Configurations

In irrigation, large-scale systems with responsibility for operations predominantly in the hands of the irrigation organization and featuring "closely-supervised production" approximate to the Type A situation.

It may be assumed that the extent of organizational differentiation will increase with the size of the organization.[1] BOTTRALL also stresses this relationship in irrigation.[2] As far as the system environment is concerned, it is assumed that more "mechanistic" organizational structures with a high level of specialization are more appropriate to low environmeutal uncertainty than "organic" structures with a low level of specialization.[3]

This means that in configurations resembling Type A a high degree of specialization will usually predominate, together with the high routinizability of tasks assumed for such situations. In situations approximating to Type B, by contrast, there will be a low degree of specialization.

As far as the type of specialization, i.e. the type of sub-division into positions or departments is concerned, the high degree of specialization iu Type A organizations makes functional sub-division more likely than in Type B organizations, in which there tends to be a more holistic distribution of tasks. In the latter case, if departmeutalization takes place, there may be a tendency to adopt more flexible divisional structures.[4]

5.4.2.3 Specialization in Type A' and Type B' Configurations

Introductiou of service aspects and a focus on customer contact entail a number of consequences for specializatiou:

1 This is particularly evident from BLAU and SCHÖNHERR's empirical studies. These show that specialization increases not linearly but degressively with size. Cf. KIESER and KUBICEK (1983), p. 267.
2 BOTTRALL (1981), p. 75.
3 As noted in Section 3.2.5.3, this correlation is nowadays considered to be less stringent, in view of the multicausal concept of the situation referred to in Section 3.2.2.
4 The advantages and disadvantages of divisional as opposed to functional structures are compared in KIESER and KUBICEK (1983), p. 99. Empirical studies have, however, shown that a situation-related choice between functional and divisional structures is extremely complex. This fact should be taken into account in appraising the tendencies presented here in simplified form. Cf. KIESER and KUBICEK (1983), pp. 99-100.

INTEGRATED MANAGEMENT ORGANIZATIONS (Maximum integration of all the development activities)	Maximum government intervention (public institutions)	Large production units:	STATE FARMS
		Small production Units:	IRRIGATION SETTLEMENT PROJECTS
	No government intervention (farmers' associations)		IRRIGATION COOPERATIVES
SPECIALIZED WATER MANAGEMENT ORGANIZATIONS (only responsible for activities related to water management)	Maximum government intervention (public institutions)		PUBLIC IRRIGATION SCHEMES
	No government intervention (farmers' associations)		IRRIGATION ASSOCIATIONS
	Mixed government and farmers intervention (public and farmers' associations)		IRRIGATION SCHEMES WITH MIXED CONTROL
MULTIPURPOSE WATER MANAGEMENT ORGANIZATIONS (responsible for water management and other development activities)	Maximum government intervention		MULTIPURPOSE PUBLIC IRRIGATION SCHEMES OR PROJECT DEVELOPMENT AUTHORITIES

Table 5.4-1: Types of Irrigation Organization
Source: SAGARDOY (1982), p. 24

a) Tasks involving intensive customer/client contact are difficult to sub-divide. The degree of specialization will therefore tend to decrease with the scope of the tasks required by such customer contacts. The potential degree of specialization will accordingly increase as the interaction requirement of the contact falls.[1] This means that the level of specialization in configurations resembling Type B' will tend to be lower than under Type A' constraints.

b) In service-oriented organizations or organizational units it will generally be necessary to distinguish between two different types of sub-task: tasks including and tasks excluding customer/client contact.

Particularly in situations approximating to Type A', it will therefore often be advantageous deliberately to group these two types of task in different positions/departments and, where possible, to separate them in terms of their physical location ("backroom organization" and "front-office organization").[2] The level of specialization in the backroom organization can be higher than in the front-office organization, where task complexity and variability are greater due to interaction with the customers.[3]

c) In service-oriented organizations or organizational units, a largely regional sub-division is often necessary in order to satisfy the presence criterion: the need to implemeut the service process interactively with the customers/clients frequeutly means that it must take place in the customer/client's location (e.g. on the water user's farm).[4]

d) For tasks iuvolving iutensive customer coutact, the above-noted distinction in manufacturing production between the post and the person occupying it will no longer apply in all cases. In situatious of the kind which tend to appear particularly frequeutly iu Type B' configurations, a certain person may form an essential component of the service offered (an expert with especially high qualificatious, an advisor who is especially familiar with the customers'/clients' problems, etc.).[5] Under these conditions, the form of specialization may be tailored to suit the persons concerned.

e) The organizing function of management aims to define the behavioural expectations of the orgauization towards its members. It thus attempts to influence the behaviour of its members by meaus of formal rules.

This form of behavioural influence is fully effective in respect to the customer/clieut only if the latter has the status of a member of the organization, as in Type A and Type B coufigurations. In terms of the attainmeut of objectives,

1 The fact that a high level of specialization is also possible in service organizations has been demonstrated in drastic form by the American fast-food chain "McDonald's". Cf. FITZSIMMONS and SULLIVAN (1982), pp. 149-150.
2 Physical separation also appears advantageous because it secludes the work process of the backroom operation from customer observation and evaluation. Cf. MILLS (1986), pp. 44-45.
3 Cf. MILLS (1986), p. 69.
In the context of lower specialization in the front-office organization, SCHEUCH refers to the greater "process centralization" of the task. Cf. SCHEUCH (1982), p. 103.
4 Cf. for example SASSER et al. (1978), p. 400. This "regional centralization of tasks" may conversely also mean that customers/clients make their way to a central location where the service-provider is to be found.
Cf. SCHEUCH (1982), p. 103.
5 In this context, SCHEUCH refers to "people-related adjunctive assets". He uses the term "adjunctive assets" to connote those characteristics of a person or of the method of task performance which are inseparably bound up with the organization and are of decisive importance for customer loyalty. Cf. SCHEUCH (1982), p. 65.

however, customer/client participation in the transformation process means that the organization must also be able to influence the behaviour of customers/clients if these are to be regarded as part of the organizational system environment (cf. Section 3.2.5.5). As far as specialization is concerned, management must therefore decide whether or not the task of influencing customers should be distributed between different employees.

In Type A' configurations, where customers participate very little in the transformation process, this means that opportunities for direct **personal** influence are limited (cf. Section 5.5.3.3). Under circumstances of this kind, the task of determining and possibly influencing customer/client needs and preferences and implementing them (including devising the necessary organizational structure) therefore generally devolves on a specialist or a specialist department ("marketing department").[1]

In Type B' configurations, in which there are intensive interactions with the customers, the task of influencing customers must be spread between all centres in the organization. The principle of customer orientation must become part of the organization's philosophy and be iuternalized by all employees.[2]

1 Cf. Section 5.5.3.3.2.1 on the term marketing. In the author's view, there are three main reasons why departments performing this type of marketing task in irrigation are rarely encountered in Type A' configurations:
a) Marketing in non-profit organizations is a topic increasingly discussed only in recent years, under American influence. Marketing has not so far gained acceptance in the development cooperation field, as it is generally associated with profitmaking objectives. Cf. KOTLER (1978) on marketing in non-profit organizations.
b) So far, there has been no genuine perception of water users as customer/clients in third world irrigation.
c) The lack of situational differentiation of water user participation means that participation is generally aimed at in irrigation even where the situational constraints mean that partial exclusion of water users from the organization itself, accompanied by additional marketing efforts, would be the better strategy (Cf. Section 5.5.3.3.2.2.2).
2 The importance of these aspects is emphasized by virtually the entire service management literature. In irrigation, however, such aspects have so far rarely been discussed, for the reasons indicated in the previous note.

5.4.3 Configuration

5.4.3.1 Introduction

In larger organizations or organizational units there is generally a far-reaching horizontal and vertical differentiation. The kind of sub-division thus created, reflected in the organizational structure and represented in organigrams, is known as the "configuration".[1] The configuration thus represents the structure of authority relationships within the different levels of the organizational hierarchy.[2]

Configuration as the external manifestation of organizational differentiation is usually described by reference to various idealized organizational structures.[3]

These structural types will not be discussed in detail here, since there are scarcely any propositions on the situational differentiation of authority relationships which indicate contingent advantages of particular structural types, especially in the service sector.[4]

A contingency view of configuratiou is nonetheless possible if attention is confiued to those configuration variables which have formed the main object of previous empirical studies:[5]

- the **span of control** or span of authority,
- the **depth of vertical differentiation.**

According to KIESER and KUBICEK, the "span of control" denotes the number of positions directly subordinate to a particular manager or organ of management, while the "depth of vertical differentiation" expresses the number of levels in the hierarchy.[6] The span of control and the depth of vertical differentiation are interrelated inasmuch

1 Cf. KIESER and KUBICEK (1983), p. 132 and STAEHLE (1985), p. 418.
2 Cf. KIESER and KUBICEK (1983), p. 133.
3 The following ideal types of structure are of particular importance (Cf. KIESER and KUBICEK (1983), pp. 133 ff., ULRICH and FLURI (1984), pp. 155-156 and HILL et al. (1981), p. 206):
- **line organization**, based on the principle of the "unity of command". Each position should be bound by directions from only one superior position.
- **functional organization** ("multi-line system"), based on the principle of "management specialization". Authority is divided between a number of specialized positions/departments ("multiple command structure").
- the **line-staff organization** attempts to combine the advantages of a clear structure of authority and responsibility found in the line system with the advantages of specialization found in functional organization. This is achieved by creating staff units, i.e. management support units with no independent line authority.
- unlike the above one-dimensional hierarchical structures, the **matrix organization** is two- or multi-dimensional. The principle of "unity of command" is replaced by a sub-division of authority according to dimensions (e.g. projects, products, functions and markets or customer groups).
4 A simplified appraisal of preference for various types of structure as a function of situational constraints is provided by ROBBINS (1984), p. 201. A detailed comparison of their advantages and disadvantages appears in STAEHLE (1985), p. 449.
5 Cf. KIESER and KUBICEK (1983), pp. 191 ff. Another important criterion of the configuration is the "ratio of positions". These ratios indicate the ratio between certain types of position in an organization. Cf. ibid. This concept will not be discussed further in the present study.
6 KIESER and KUBICEK (1983), p. 154.

as, given constant size, the depth of vertical differentiation of an organization or organizational unit will increase as the span of control decreases.[1]

5.4.3.2 The Span of Control and the Situation

The span of control is a structural variable which has in the past been the object of particularly intensive empirical research.[2] Research into the influence of technological variables on the span of control played an important rôle in JOAN WOODWARD's classic investigations into the relationship between technology and structure. This work has already been discussed in Section 3.2.6.3.2.

It is important to note that this research and the follow-up studies referred to indicate that the size of the span of control and the complexity or problem-solving requiremeuts of the task vary in inverse proportion to one another.[3] The span of control likewise tends to widen as the organization grows in size, owing to the greater specialization iuvolved.[4]

A transition from Type A to Type B configurations will therefore tend to result in a reduction of the span of control.

Recent studies by MILLS indicate that similar interrelationships do not exist in the service sector.[5] MILLS investigated 41 service organizations, contrasting organizations which can roughly be assigned to the Type A' and Type B' configurations described here: on the one hand organizations in which tasks with low problem-solving requirements and low contact requirements predominate (Type A')[6] and on the other hand organizations in which complex task fields with intensive client interaction predominate (Type B').[7] MILLS' studies, based on average spans of control, show that[8]

- there are no significant differences between the spans of control in the two types of organization;
- spans of control are smaller than for operations of comparable size in batch and mass production of manufactures.

MILLS ascribes the difference in spans of control between manufacturing and service operations to greater complexity of tasks as a result of customer/client integration. Customer/client participation in the transformation process and the associated higher environmental uncertainty and additional interaction requirement of the task mean

1 Ibid.
2 A problem is that spans of control in reality vary from post to post, so that in general only the average span of control or the control spans for specified levels of the hierarchy can be stated (e.g. for the top or bottom management levels). Cf. KIESER and KUBICEK (1983), p. 193.
3 The U-hypothesis referred to in Section 3.2.6.3.2 applies.
4 MINTZBERG (1983), p. 125.
5 MILLS (1986), pp. 63 ff. MILLS does, however, refer to earlier studies by BELL (1965), confirming the hypothetical relationship between the span of control and the complexity of the task for various departments in a large hospital. Conversely, investigations in the retailing sector carried out by OUCHI and DOWLING (1975) showed no demonstrable correlation between the variables. Cf. MILLS (1986), p. 64.
6 Included were banks, insurance companies and wholesaling and retailing operations. Cf. MILLS (1986), pp. 61-62.
7 Engineering consultants, marketing, maintenance firms and estate agents. Cf. MILLS (1986), p. 62.
8 MILLS (1986), p. 83.

that a managerial position has more difficult leadership and controlling tasks to perform here than in manufacturing production. The result will be a smaller average span of control.[1]

On the basis of his studies, MILLS also concludes that the span of control for first line managers does not change significantly in different size categories.[2]

Adopting MILLS' results, this meaus that in configurations of the A' or B' type there will be a tendency for spans of control to be smaller than under Type A or Type B constraints. There will also be no significant differences between spans of control in Type A' and Type B' configurations.

5.4.3.3 Depth of Vertical Differentiation and the Situation

As noted, the depth of vertical differentiation is expressed by the number of hierarchical levels in an organization or organizational unit. One problem involved in measuring the depth of vertical differentiation is, however, that the number of levels may differ greatly as hetween different areas of the organization.[3] In irrigation organizations there is also generally a variation in the depth of vertical differentiation between different departments or fields of activities.[4]

WOODWARD's studies referred to above indicate that the average depth of vertical differentiation in mass production operations comparable to Type A configurations is greater than that in batch production operations similar to Type B.[5]

MILLS' investigations show that average depth of vertical differentiation appears to be lower in the service than in the manufacturing sector.[6] This means that fewer hierarchical levels are to be expected in Type A' and Type B' sitnations with their relatively flat organizational structures. MILLS attributes this to the higher environmental uncertainty associated with interactive tasks and the high autonomy which the implementation level of the front-office organization requires in order to be able to react with sufficient flexibility to customer demands.[7]

5.4.4 Delegation

5.4.4.1 Introduction

If a position is to perform the tasks assigned to it, it must be equipped with **authority**, i.e. the legitimation to take the actions necessary for task fulfilment.[8] When tasks and authority are conferred on a position, they automatically create responsibility, i.e. an

1 MILLS (1986), p. 83. This explanation should, however, be accepted only with reservations. MINTZBERG points out that spans of control are also dependent on the type of coordinating mechanism employed. Cf. MINTZBERG (1983), pp. 66 ff.
2 MILLS (1986), p. 73.
3 A distinction must therefore be made between average, maximum and area-specific depths of vertical differentiation. Cf. KIESER and KUBICEK (1983), p. 193.
4 Cf. WALKER (1981), p. 180.
5 Cf. ROBBINS (1984), p. 177.
6 MILLS (1986), p. 72.
7 Ibid.
8 HILL et al. (1981), p. 124.

obligation to perform the tasks and use the authority in the proper way.[1] Responsibility simultaneously results in "**accountability**, i.e. liability for negligent or deliberate errors, for the non-exercise of authority and for failure."[2]

Tasks, authority and responsibility should be mutually compatible.[3]

Delegation denotes the allocation of duties, authority, responsibility and accountability to subordinate positions.[4] Of importance is the fact that, although delegation of authority also implies delegation of responsibility for its proper, the ultimate responsibility for fulfilment of tasks[5] cannot be delegated.[6]

The most important forms of authority transferred include the authority to make decisions and the authority to issne instructions.[7] Authority to issue instructious is implicit in decision-making authority, since the authority to make decisions is meaningless unless accompanied by the authority to give instructions.[8] Authority relationships are structured within the framework of configuration already discussed above. The actual degree and content of decision-making is, on the other hand, distributed between different positions by means of delegation (of decision-making authority).[9] In the English and American literature, this discussion is generally conducted in terms of "centralization" and "decentralization".[10]

Discussing featnres of the structural dimension of delegation, HILL et al. conclude that:[11]

> *"It is scarcely possible to define fundamentally different forms of delegation; one can only establish criteria for the extent to which (i.e. to how low a level) authority may be delegated. Possibilities for delegation depend primarily on the fundamental principle that the qualifications of the person holding a post and the formal authority to make and to participate in making decisions implicit in his position should be in balance with one another."*

This means that increasing delegation of authority to a position will increase the decision-making scope of this position and will thus impose higher task requirements on the employee(s) iuvolved.[12]

5.4.4.2 Delegation in Type A and Type B Configurations

It is evident from the above discussion that increasing problem-solving requirements in a positiou, implying increasing decision-making scope, will also demand greater delegation of authority to this position.

1 Ibid.
2 Ibid, author's translation.
3 Ibid., p. 125.
4 Ibid., pp. 224-225.
5 ROBBINS (1984), p. 217. Cf. Section 3.2.4.2.
6 Cf. HILL et al. (1981), p. 125.
7 HILL et al. also distinguish between: implementing authority, the authority to dispose of resources, the authority to submit applications, the right to participate in decision-making and representative authority. Cf. HILL et al. (1981), pp. 125 ff.
8 KIESER and KUBICEK (1983), p. 157.
9 Ibid., p. 158.
10 These terms are frequently misused, since they may connote either the centralization (decentralization) of processes ("process centralization") or the concentration of processes in a particular location ("local centralization"). Cf. STAEHLE (1985), p. 406.
11 HILL et al. (1981), p. 226.
12 HILL et al. (1981), p. 377.

A transition from A-type configurations, in which tasks with low problem-solving requirements and high routinizability predominate, to B-type configurations, with high task requirements, will therefore tend to be associated with increased delegation. This relationship is supported by empirical findings.[1]

Less clear is the influence on delegation of an organization's size. Here it may be expected that, as the organization grows, there will be an increasing tendency for top management to be flooded with information if it wishes to make all important decisions itself. The consequent increase in delegation with increasing size is also empirically supported.[2]

Both KIESER and KUBICEK and MINTZBERG point out, however, that such an increase in delegation is frequently associated with the substitution of technocratic coordination mechanisms such as rules and programmes for decision-making authority (cf. Section 5.4.5).[3]

Delegation will then not necessarily be associated with an increase in the decision-making scope of the organization members of the kind which may normally be assumed. In such instances, delegation implies only that employees are given the anthority *"to implement decisions formally within an established framework"*.[4]

For large organizations in a stable system environment, in which highly routinizable tasks predominate and where there is a large degree of formalization - i.e. under A-type constraints - MINTZBERG therefore assumes on the basis of the above facts that there will be a *de facto* centralization of decision-making authority, i.e. a low delegation of decisions.[5]

5.4.4.3 Delegation in Type A' and Type B' Configurations

In terms of service operations in B'-type configurations, the fundamental principle referred to above, that there must be a balance between the degree of delegation and the qualification or problem-solving potential of the person holding the post, has the following implications:

The intensive participation of the client in the transformation process results in high environmental uncertainty. In order to solve the new problems which constantly arise under such circumstances, there is a high need for information on the new situation created in each case. A low degree of delegation, with centralization of decision-making anthority at a high management level, wonld rapidly overload the information processing capacities of these management positions. In consequence, a particularly high degree of delegation is to be expected in B'-type situations.[6]

In A'-type configurations, delegation is correspondingly less marked, and will tend to decrease still further with the transition from the front-office to the backroom organization.[7]

1 Cf. MINTZBERG (1983), p. 138.
2 Cf. KIESER and KUBICEK (1983), p. 272.
3 Ibid. and MINTZBERG (1983), pp. 102 and 163 ff.
4 KIESER and KUBICEK (1983), p. 272, author's translation.
5 MINTZBERG (1983), p. 164.
6 MILLS (1986), p. 75.
7 Cf. MILLS (1986), p. 75.

5.4.5 Coordination

5.4.5.1 Introduction

The distribution of tasks and authority between different positions discussed in the preceding sections demands **coordination**, i.e. the mutual adaptation of the separate processes and the orientation of individual activities towards overriding objectives.[1]

The following important coordination mechanisms are identified in the literature:[2]

a) Coordination by personal instruction;

b) Coordination by rules and programmes;

c) Coordination by plan;

d) Coordination by mutual adjustment.

As KIESER and KUBICEK stress, *"all coordination mechanisms are essentially based on design decisions by certain persons"*.[3] This fact will generally be less apparent to the organization members affected by coordination in the case of mechanisms b) and c) listed above. These are therefore frequently termed **impersonal** in contradistinction to mechanisms a) and d), which are termed **personal.**[4] The four types of coordination mechanism may supplement or partially replace one another. They can also be used as partial surrogates for the leadership function of management.[5]

5.4.5.2 Coordination in Type A and Type B Configurations

As the complexity of tasks increases, as it does with the transition from A-type to B-type situations, the type of coordination mechanism employed will tend to shift from (a) to (d) in the above list. This means that the "complexity range" of the coordination mechanism increases.[6]

Personal instructions from higher management are suitable as a primary instrument of coordination only for low-complexity tasks. As complexity and thus information needs increase, a stress on personal instructions quickly overloads management and the vertical channels of communication.[7]

Rules and programmes are here to be understood in the sense of regulations or procedural guidelines laying down the sequence of steps by which the system is to respond to the tasks with which it is confronted.[8] Rules and programmes generally require stable, predictable environmental conditions and simple tasks with high rontinizability.[9]

In his discussion of **coordination by plans**, STAEHLE concludes that plans are a considerably more flexible form of coordination mechanism than rules and pro-

1 Cf. STAEHLE (1985), p. 432 and KIESER and KUBICEK (1983), p. 104.
2 Cf. among others KIESER and KUBICEK (1983), p. 112; STAEHLE (1985), p. 436 and MINTZBERG (1983), p. 139.
3 KIESER and KUBICEK (1983), p. 112.
4 Ibid., p. 113.
5 Cf. STAEHLE (1985), pp. 619 ff.
6 Cf. STAEHLE (1985), p. 436, MINTZBERG (1983), p. 139 and KIESER and KUBICEK (1983), pp. 113 ff. Delegation increases simultaneously; cf. MINTZBERG (1983), p. 139.
7 KIESER and KUBICEK (1983), p. 114.
8 Definition modelled on SIMON, quoted in STAEHLE (1985), p. 437.
9 Cf. STAEHLE (1985), p. 436.

grammes, because they are valid for only a limited period, whereas rules and programmes lay down fixed, permanent process sequences.[1] Planning as a coordination instrument is a form of institutional planning, i.e. its instructions for action are devised according to fixed procedures within the framework of an institutionalized planning process.[2]

Owing to the complex processes involved in drawing up and revising plans, planning is considered an expensive and time-consuming coordination instrument, which will be applied only when organizations have reached a certain size and a certain level of task requirements.[3]

Coordination by mutual adjustment involves mutual adjustment based on group decision between units whose activities are dependent on one another.[4] Since group solutions are generally superior to individual solutions for complex, variable tasks,[5] mutual adjnstment is encountered primarily in situations approximating to Type B.

MINTZBERG hypothesizes that, as size and environmental stability decrease - i.e. in the transition from A-type to B-type situations in the terms used here - preference will tend to shift from rigid towards flexible coordination mechanisms, i.e. from rules and programmes to plans and eventually to personal instructions and mutual adjustment.

Rules and programmes which are, as noted, of a permanent nature, permit correspondingly little flexibility. Planning is considerably more flexible, as its content may be altered from planning period to planning period (*vide supra*). Both personal instructions and mutual adjustment possess a high degree of flexibility, allowing spontaneous reaction to short-term changes.

To sum up, this means that in Type A situations, rules and prgrammes will be of particular relevance for coordination. Plans will gain in importauce with a transition from Type A to Type B, with coordination by mutual adjustment predominating in Type B situations.

5.4.5.3 Coordination in Type A' and Type B' Configurations

5.4.5.3.1 Introduction

As repeatedly noted above, the majority of tasks in B'-type situations will be characterized by high variability and especially low routinizability, owing to the high level of customer/client participation in the transformation process.

Because of the presence and participation of the customers/clients, however, coordination by personal instructions to members of the organization is possible only to a limited extent. This is equally true of mutual adjustment based on group decisions. For their part, less flexible coordination mechanisms, such as coordination by plan or even by rules and programmes are ill-adapted to this type of situation with its high task complexity and variability.[6]

1 Ibid., p. 436 and KIESER and KUBICEK (1983), p. 124.
2 KIESER and KUBICEK (1983), p. 124.
3 STAEHLE (1985), p. 454.
4 Ibid., p. 115.
5 Cf. MÜLLER and HILL (1977), p. 366.
6 Cf. MILLS (1986), pp. 113 ff. and COWELL (1984), p. 25.

A second coordination problem arises in the case of services.

Here, the question is no longer merely one of coordinating the specialized activities of **organization members** towards attainment of a common objective. Rather, the partial participation of customers/clients in the transformation process demands coordination of the activities of organization members and customers/clients alike.

Services therefore present a **double coordination problem** which irrigation management must also take into account.

5.4.5.3.2 Internal Coordination Problems in Service Organizations

As pointed out above, none of the coordination mechanisms under discussion is fully applicable to tasks involving intensive customer/client contacts of the kind found in B'-type situations. This coordination problem is itself a contingent one: with the trausition from B'-type to A'-type situations, less flexible coordination mechanisms can be used with increasing snccess.[1]

Under B'-type constraints, only one instrument for coordination, as yet unconsidered and little discussed in the literatnre, remains available - the use of "non-structural" coordination.[2] Coordination mechanisms in this category are termed "non-structural" because, unlike those detailed above, they cannot be regarded as part of the formal organizational structure.[3]

Of importance in this connection and in regard to irrigation are, on the one hand the "standardization of skills"[4], i.e. the learning of implicit programmes and procedures through vocational standards and training.[5] Such standardization of skills can ensure coordinated procedures even without structural coordination (e.g. the coordinated behaviour of an advisory team in the customer/client contact situation).

Also of importance as a non-structural coordination instrument in service operations is "internalization", i.e. the identification of the member of the organization with predetermined (quality) objectives.[6] SASSER et al. see the internalization of quality objectives on the basis of an appropriate organizational philosophy as a fundamental prerequisite for the successful provision of services.[7]

5.4.5.3.3 Coordination between the Organization and Customers/Clients

The transition from primarily product-oriented A-type or B-type situations to A'-type or B'-type configurations with the accent on service orientation implies the introduction of an additional coordination task: coordinating the activities of the organization with those of the customers/clients.

1 Cf. SASSER et al. (1978), pp. 401-403.
2 Cf. KIESER and KUBICEK (1983), pp. 128 ff.
3 Ibid.
4 Ibid. and MINTZBERG (1983), pp. 4 ff.
5 KIESER and KUBICEK (1983), p. 132.
6 Cf. MILLS (1986), p. 134; LEARNED and SPROAT, quoted in KIESER and KUBICEK (1983), p. 129, refer in this context to the "coordination of ideas". KIESER and KUBICEK themselves speak rather of "coordination by indoctrination" and point out that this form of identification with the organization's objectives can be used to force acceptance of the objectives of the legitimated decision-making "core group" by members without decision-making authority. Cf. KIESER and KUBICEK (1983), p. 129.
7 SASSER et al. (1978), p. 403.

This coordinating function must largely be delegated to the members of the organization making contact with the customers. The resultant difficulties for this group, arising from the need to coordinate two different "worlds", that of the organization and that of its customer-specific environment, is extensively stressed in the literature ("boundary spanning rôle of service employees").[1]

Special attention must therefore be paid to ensuring that this coordinating function is performed adequately in a service operation.

LAYCOCK sees a lack of attention to this coordination task as one of the main management problems in smallholder irrigation projects.[2]

The task of coordinating organization and customers/clients is also of particular importance in irrigation because the way in which it is carried out largely decides the level of customer/client participation in the transformation process and thus water user participation in general.[3]

5.4.6 Formalization

The term "formalization" refers to two distinct aspects of organization:

- Firstly, formalization relates to the purpose of the organizing function itself, i.e. to the formal regulation of the behaviour of organization members through the creation of certain behavioural expectations. "Formalization" in this sense is therefore the essence of organization itself.[4]
- Secondly, formalization may connote the "*use of written rules in the form of organization charts, manuals, guidelines, job descriptions, etc.*"[5]

It is important to note that formal rules in the first of these two meanings must by no means always be "formalized" in the sense of being written down,[6] although this will in most instances be the case (cf. Section 3.2.4.1).

Formalization need be dealt with only briefly in the present context. It will be evident from the above remarks that formalization in the first sense, and thus also formalization in the form of written rules, will tend to be more prevalent in A-type than in B-type situations.[7]

It need therefore occasion no surprise that ESMAN and UPHOFF come to the following conclusion in their studies of a number of local water user organizations - which usually operate under conditions similar to B-type constraints:

> "*We ... found a significant and positive correlation between the organizations' performance and their working more informally*".[8]

1 Cf. BOWEN and SCHNEIDER (1985), in CZEPIEL et al. (1985), pp. 127 ff.
2 LAYCOCK (undated), p. 1191.
3 Cf. WALKER (1981), pp. 200 ff.
4 Cf. ULRICH and FLURI (1984), p. 139.
5 KIESER and KUBICEK (1983), p. 165, author's translation.
6 Ibid.
7 Cf. STAEHLE (1985), p. 476; KAST and ROSENZWEIG (1982) and ROBBINS (1984), pp. 173 ff.
8 ESMAN and UPHOFF (1984), quoted in UPHOFF et al. (1985), p. 36.

Similar conclusions apply to the comparison between A'-type and B'-type situations.[1] In relation to service organizations, however, MILLS notes that their level of formalization is generally lower than that of organizations of comparable size in the manufacturing production sector.[2] He cites customer/client participation in the transformation process and the associated higher environmental uncertainty as the causes.[3]

1 Cf. SASSER et al. (1978), pp. 400-401 and MILLS (1986), p. 74.
2 MILLS (1986), p. 74.
3 Ibid.

Structural dimensions	Ideal Types of Situational Configuration			
	A	A'	B'	B
Specialization - Level of specialization	high	backroom organization: medium/high contact organization: medium/low	extremely low	low
- Form of specialization	tendency to functional sub-division	backroom organization: tendency to functional sub-division contact organization: tendency to regional sub-division	tendency to regional sub-division	tendency to divisional structure
- Independence of posts from those holding them	high	high	low	high
Configuration - span of control	large	backroom organization: medium contact organization: small	extremely small	small
- Depth of vertical differentiation	medium	backroom organization: medium/low contact organization: low	low	low
Coordination - main coordination mechanisms	especially through rules and programmes	backroom organization: especially through planning contact organization: especially through personal instructions and internalization of (quality) objectives	especially through professionalization and internalization of (quality) objectives	especially through mutual adjustment and professionalization
Formalization	high	backroom organization: medium contact organization: low	extremely low	low
Delegation	low	backroom organization: medium contact organization: high	extremely high	high

Table 5.4-2: Situational Differentiation of Organizational Structure

5.5 Leading

5.5.1 Introduction

The way in which management performs its **leading function** is frequently regarded as the most important factor in the success of management activities.[1] It is not surprising, therefore, that leading is one of the phenomena which *"has been researched the most, the most intensively and at the greatest length within the framework of the social sciences."*[2] Nonetheless, the management literature stresses the striking disproportion between the mass of material available and the number of leadership concepts which may be termed relevant for practice.[3] MÜLLER and HILL note that:[4]

> *"Anyone who has struggled to arrive at a fairly clear understanding of leadership problems need only cast a glance at a moderately representative summary of theory and research in this field in order to return to a state of thorough confusion."*

It is easier to orient oneself if "leading" is considered in close connection with "organizing", since the function of these two management activities is basically the same.[5] The fundamental difference is solely one of form:[6] Organizing influences the behaviour of members of the organization through the establishment of formal rules laying down the organization's behavioural expectations in regard to its members irrespective of individual persons. Leading, in contradistinction, is the **personal influencing of the behaviour of others towards defined objectives.**[7]

This definition makes apparent the basic **leadership problem** that differing claimant groups may pursue different objectives.[8]

5.5.2 Contingent Attributes of the Leading Function

The contingent attribute of leadership - i.e. the dependent variable of the leading function - regarded as of primary importance is **leadership behaviour.** This can be expressed through a variety of behavioural alternatives or **"styles of leadership"**.[9]

1 BOWER (1967), quoted in MÜLLER and HILL (1977), p. 353.
2 MÜLLER and HILL (1977), p. 353, author's translation.
3 Ibid.
4 Ibid.
5 Ibid.
6 MÜLLER and HILL (1977), p. 353. Cf. also ULRICH and FLURI (1984), p. 213.
7 ULRICH and FLURI (1984), p. 139.
8 Cf. Section 4.4.2.3.
9 LUTHANS also sees the leader and his cognitive processes as a dependent variable of the situation. In his "social learning theory", LUTHANS assumes reciprocal influences of the situation, the leader and leadership behaviour on one another, expressing the notion that leaders *"create through their own behaviour situational constraints which contribute to influencing their behaviour."* LUTHANS (1979), quoted in STAEHLE (1985), p. 594, author's translation.

Postulates on styles of leadership and pragmatic leadership models developed from them occupy much space in management literature.[1] They attempt to answer the question of what form of leadership behaviour will contribute towards the most effective possihle performance of leadership tasks.

In essence, three different approaches have been adopted:

a) Some studies of leadership style assume that leadership behaviour is **not** contingent. Leadership style is seen as leadership behaviour which does not vary according to the situation and is primarily characterized by a basic personal attitude towards subordinates.[2]

b) A leadership model[3] much quoted in modern management literature presumes that the leadership behaviour of the individual leader remains essentially unchanged, but produces different results in different situations.[4]

c) Other approaches assume that, like other factors, leadership behaviour must be changed to meet the leadership situation if the leadership problem is to be solved and an effective attainment of objectives aimed at.[5]

The following remarks are oriented on approaches of the latter type, in accordance with the basic philosophy of the contingency approach.

Most of these concepts agree that leadership behaviour is expressed most evidently in two attributes which may be described as **"task-orientation"** and **"relationship-orientation"**.[6]

Task-oriented leadership behaviour gives priority to influencing gronp members towards performance of tasks ("locomotive function"). A relationship-oriented leadership style, by contrast, emphasizes the "group-sustaining" function of management, i.e. personal influencing of the gronp and its members directed towards strengthening the group and its action potential ("cohesive function").[7]

There are differences of view as to whether these two attributes of leadership behaviour should be regarded as ends of a continnum or as two independent dimensions.[8]

1 In the German-speaking literature in particular, leadership typologies are discussed in great detail. Cf. STAEHLE's list of references.
2 To this category may be assigned, for example, NEUBERGER's typology (1979) distinguishing between "patriarchal", "charismatic", "autocratic" and "bureaucratic" styles of leadership. Cf. STAEHLE (1985), p. 543.
3 This is the contingency model of leadership proposed by the American FRED FIEDLER. Cf. HODGETTS (1981), p. 243; ROBBINS (1984), p. 340 and STAEHLE (1985), p. 578.
4 FIEDLER differs from other authors in proposing, not that leadership behaviour should be adapted to the situation (through training, selection, etc.) but that the situation should be adapted to the leader on the basis of the leadership style he is shown to have ("change the job to fit the man"). Cf. STAEHLE (1985), pp. 580-581.
5 These include, for example, the "autocratic-democratic" continuum of leadership behaviour in TANNENBAUM and SCHMIDT (1958), quoted in ROBBINS (1984), p. 340, and the contingency leadership models in REDDIN (1967, 1970) and HERSEY/BLANCHARD (1977), which describe certain leadership styles as functions of certain situational conditions. Cf. STAEHLE 1985), pp. 559 ff.
6 Cf. ROBBINS (1984), p. 346.
7 The terms "locomotive function" and "cohesive function" derive from CARTWRIGHT and ZANDER (1953). Cf. MÜLLER and HILL (1977), p. 354.
8 Cf. STAEHLE (1985), p. 551.

A frequently quoted contingent differentiation of leadership behaviour often referred to in the irrigation context presumes that there is a continuum. This distinguishes between "authoritarian" and "participative" styles of leadership.[1]

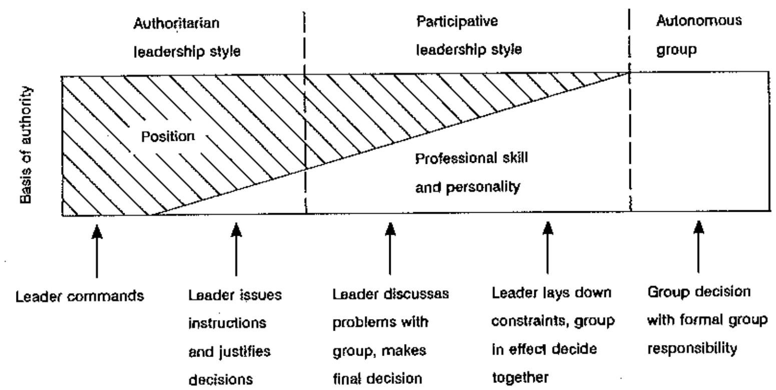
Here, the extreme of an exclusively task-oriented leadership style, neglecting any form of group or relationship orientation, is termed **"authoritarian"**. In this case, the leadership prohlem referred to above is solved by utilizing the authority conferred by a leadership position ("position authority") and the associated power to apply sanctions.[2]

This is contrasted at the other extreme with a **"participative"** leadership style in which the leader attempts to solve the leadership prohlem through "goal integration". This means that he tries to reconcile the formal goals and associated tasks with the personal goals of his subordinates.[3] This cannot be brought about solely by using the authority of his position, since the necessary goal integration cannot be brought about by compulsion. A partially participative leadership style therefore assumes that the leader will also make use of his professional and personal authority to motivate his subordinates and gain their trust.[4]

A still more participative style would finally mean the creation of an autonomous working group, in which the leader's claim to authority is legitimated solely by the group. Only in this instance can the leader be considered to have earned this title in the narrower sense. The formal responsibility of the superior is replaced by formally-acknowledged group responsibility for the fulfilment of its tasks.[5]

These leadership styles may be summarized in the form of the diagram shown in Fig. 5.5-1:

Fig. 5.5-1:Styles of Leadership and their Base of Influence
Source: ULRICH and FLURI (1984), p. 204



1 Cf. for example ULRICH and FLURI (1984), pp. 200 ff.
2 Ibid., p. 201.
3 Ibid.
4 ULRICH and FLURI (1984), p. 201.
5 Ibid., pp. 202-203.

The diagram indicates that, except at the idealized extremes of the continuum, leadership will always be to a greater or lesser extent both authoritarian and participative. The choice of a leadership style in conformity with the situation is not an "either-or" decision. It consists in finding the appropriate "mix" of authoritarian and participative leadership behaviour.[1]

5.5.3 The Leading Function and the Situation

5.5.3.1 General

There are widely differing views as to which factors exert a significant influence on leadership.[2] An approach which attempts to integrate various opinions attaches special importance to three influencing variables:[3]

a) the type of task,

b) organizational structure,

c) conflict poteutial of the situation.

In more detail:

a) As far as the **type of task** is concerned, it may be stated that, as routinizability decreases, i.e. as the problem-solving requirements of the task iucrease, group solutions promise greater effectiveness than indiviual problem solutious. The superiority of the group solution results from the synergetic effects of combining the problem-solving potentials within the group.[4] As the complexity and variability of tasks become greater, a participative orientation of leadership behaviour will therefore represent the more situation-adapted solution.

b) As already noted, there is a close relationship between the organizing and the leading function in management.[5] For example, an **organizational structure** with marked vertical differentiation and a high level of formalization establishes rules which largely predispose the system towards a leadership style oriented on position authority.

   The overlaps between organizing and leading are so great that a substantial degree of **substitutability** exists. A high level of standardization of the work

1 MÜLLER and HILL (1977), p. 363.
2 Cf. the overview of contingency leadership concepts in STAEHLE (1985), pp. 557 ff.
3 The approach presented here follows the discussion in MÜLLER and HILL (1977). These authors emphasize the factors 1) "type of task", 2) "relationship between the leader and the subordinate" and 3) "conflict potential of the situation". They thus integrate the most important contingent elements of FIEDLER's contingency model and the interaction theory. The contingency model stresses the factors "type of task", "leader-subordinate relationship" and "position authority", while the interaction theory emphasizes the following factors: the personality of the leader, the personality of the subordinate, the group as a whole and the situation. Cf. MÜLLER and HILL (1977), p. 366 and ROBBINS (1984), p. 340. The "leader-subordinate relationship" is here replaced by the mediating variable "organizational structure", in order to underline the much-emphasized influences of organizational structure on leadership. Cf. STAEHLE (1985), pp. 618 ff.
4 MÜLLER and HILL (1977), p. 366.
5 Leadership research has, however, largely neglected organizational structure aspects. Organizational theories have likewise paid little regard to the importance of leadership behaviour. Cf. STAEHLE (1985), p. 618.

process, for example, with substantial routinization of tasks and a predetermined work pace, may largely act as a surrogate for task-oriented leadership.[1]

c) According to MÜLLER and HILL, the **conflict potential of the situation** is to be regarded as the most important contingency factor for the leading function,[2] because in different conflict situations different forms of leadership behaviour will tend to contribute to better performance of the leadership task.[3]

   MÜLLER and HILL distinguish between two classes of conflict situatiou:[4]

   - the **ends conflict**, in which irreconcilable goals of the parties to the conflict confront one another;
   - the **means conflict**, in which the parties implicitly or explicitly agree on a common goal, but differ on the means to be used to achieve it.

   Means conflicts may basically be regarded as cooperative situations, since there is agreement as to the overriding goal. Such conflicts can frequently be resolved through confrontation between the differing standpoints, confrontational solutions suggesting themselves due to the observed fact *"that interaction - always provided that there is a common overriding objective - exerts pressure towards a consensus."*[5]

   A participative leadership style is, however, necessary iu order to ensure a constructive confrontation.[6]

   Ends conflicts, on the other hand, are considerably more difficult to resolve, especially when they constitute so-called "zero sum situations", in which one party's advantage is always the other party's disadvantage (e.g. where resources are limited).[7]

   Since the standpoints are fundamentally irreconcilable, such conflicts can be resolved only by negotiation. Each party attempts to maximize its advantage, i.e. to minimize any departure from its owu viewpoint in the search for compromise. Invariably, the outcome of negotiatious is not fully satisfactory to either party.[8] Such a situation means that the leader must resort to authoritarian leadership behaviour unless he succeeds in transforming the conflict into a non-zero-sum situation, enabling the parties to work towards a common goal.[9]

5.5.3.2 The Leading Function in Type A and Type B Configurations

The above propositions mean that in organizations and organizational units approximating to Type A configurations there will be a tendency towards more authoritarian styles of leadership. In such situations, the high routinizability of tasks and high level of formalization favour an authoritarian style oriented towards position authority.

1 Under such conditions, a markedly task-oriented style of leadership may lead to "over-structuring" of the tasks, contributing to employee dissatisfaction. Cf. STAEHLE (1985), p. 621.
2 MÜLLER and HILL (1977), p. 373.
3 Ibid.
4 MÜLLER and HILL (1977), p. 373.
5 Ibid.
6 Ibid.
7 Ibid., p. 374.
8 Ibid.
9 MÜLLER and HILL (1977), p. 374.

This is especially likely to be the case where there are ends conflicts between the leader and the subordinate corresponding to a zero sum situation.

In organizations resembling the Type B configuration, on the other hand, a participative style of leadership will tend to be emphasized. Low routinizability of tasks and the stress on mutual adjustment as a coordination mechanism require management to accentuate its group-sustaining function. This will be particularly true if the situation between the leader and the subordinate is characterized by commonly-accepted goals.

5.5.3.3 The Leading Function in Type A' and Type B' Configurations

5.5.3.3.1 Introduction

The leadership problem becomes extremely complicated in situations involving tasks with a customer/client contact element. The first difficulty is that direct influencing of a subordinate by the leader is made difficult or impossible by the presence of the customer. As noted, the customers/clients are highly uncertain about the quality of the intangible "product" of a service, especially in the initial phase of interaction. The customer/client will therefore be on the lookout for potential surrogate indicators enabling him to judge service quality. It must therefore be assumed that corrective influencing of a subordinate in the presence of a customer will be interpreted as an indication of low service quality. Direct behavioural influencing of a subordinate during task performance is therefore largely inapplicable as a leadership tool.

In addition, the frequently mentioned presence criterion, i.e. the need for service-provider and customer/client to be present at the same time and place, frequently means that the service must be provided in the customer/client's vicinity. It will theu, however, be provided at a distance from the leader and outside his field of observatiou.

These remarks show that, to a large extent, service management is compelled to revert to "indirect" leadership techniques. This applies particularly to situations where the leader and the subordinate are distant from one another while the service is being performed, and where the service itself requires intensive iuteraction with the customer and is therefore difficult to plan.[1]

Here it will be the task of the leading function to induce the highest possible degree of identification of the employee with his task and thus encourage self-control.[2] Opportunities for this kind of indirect leadership are, for example, to be found in a special stress on personnel selection, in carefully-targeted trainiug and advanced training, and particularly in increased motivation of subordinates. Above all, it seems important to encourage the identification of the subordinate with the concerns of the organization. In this context, the concepts of "organizational culture" and "organiza-

1 Cf. Section 5.2.2.2.3.
2 Cf. Section 5.3.2.3.3.2.

tional philosophy" are currently acqniring special significance in modern service organizations.[1]

It is not only the increased difficulty of **leading staff** in service-oriented as opposed to manufacturing organizations which complicates the leadership function of management. The problem of **leading customers** is a further complicating factor.[2]

The first problem in this respect is that leadership of customers, especially in connection with services requiring intensive interaction, must largely be delegated by management to the members of the organization who are in contact with customers/clients. Such members must therefore possess special customer leadership skills in addition to their professional competence.[3].

Section 5.5.1 referred to the fundamental **leadership problem** that leading denotes personal influencing of behaviour in respect to defined goals, but that conflicts may arise between the goals of the leader and the subordinate. In relation to internal conditions within the organization, this means that a discrepancy may exist between the formal goals of the organization and the personal goals of the organization members ("real goals"). As explained above, the form of leadership behaviour is substantially determined by the existence and type of such conflicts between goals.

Extending this discussion to include the provision of services and the relationship between the organization and its customers/clients aggravates the leadership problem; leadership is now confronted with conflicts not only internally but between the goals of the organization and those of the customers/clients.

This means that leadership in service organizations can be regarded as successful only if this **double leadership problem** can be solved.[4] This special leadership problem in the service sector is complicated by the fact that, depending on the degree of participation in the transformation process, the customers/clients will no longer form part of the controllable environment of the organization.[5] Management can thus make only restricted use of conventional leadership techniques aimed at orienting the behaviour of organization members towards predetermined goals and objectives. Here again, leadership must resort to "indirect" methods.[6]

A further difficulty for leadership under service couditions is that the leadership task of adapting customer behaviour to its goals must be combined with the task of preventing **customer withdrawal**. Leadership behaviour must therefore perform a

1 "Organizational culture" may be understood as the sum of behaviour-determining values and standards in an organization. ULRICH and FLURI (1984), p. 26. An "organizational philosophy" functions as an "*action-oriented value system of management*" with which the "*social legitimation of organizational action can credibly be justified.*" ULRICH and FLURI (1984), p. 39, author's translation.
2 MILLS employs the term "leadership of clients/customers", but restricts it to intensive interactions with clients. Cf. MILLS (1986), p. 121. The term "leading customers" is used here in the general sense of personal behavioural influencing of the customer/client by organization members or by "the organization".
3 Cf. Section 3.2.8.3.2
4 This is naturally a simplified and reductionist view, excluding goal conflicts with other claimant groups for the sake of simplicity. If other goal conflicts are taken into account in the leadership of irrigation organizations, management must follow the principles of "political rationality". Cf. SCHWARZ (1985), p. 102.
5 Cf. Section 3.2.5.5.
6 In this case consisting primarily of "marketing".

tightrope act between efforts to promote results and efforts to prevent customer withdrawal.[1]

In irrigation it has been and often still is implicitly assnmed that the mouopoly position which the irrigation organization frequently enjoys, in conjunction with the geographical immobility of the water users, will prevent any withdrawal of water nsers as customers. The current problems of irrigation in developing countries show, however, that here, too, there are various possibilities for customers to become alienated from the organization. These include non-compliance with agreed rules and regulations, a partial or complete return to traditional rain-fed cultivation, partial "emigration" from irrigated agriculture, which is then practised only as a secondary occupation, leasing land, etc.

ADAMS reports on an extreme form of water user withdrawal in irrigation, describing the behaviour of farmers ou the Bakalori Project in Nigeria, who reacted to the introductiou of irrigation as they would normally respond to a period of extreme drought, namely by turning to non-agricultural activities.[2]

5.5.3.3.2 Situational Differentiation of Customer Leadership

5.5.3.3.2.1 Introduction

There are two opposed views on the appropriate type of customer leadership in service-oriented organizations:[3]

1) It is argued that customer iufluences are disturbing influences of the environment against which the most important transformation processes must be shielded. This view ascribes to the customers a negative effect on the efficient implementation of transformation processes.
2) It is also argued that customer participation in the transformation process is a means of improving productivity. This argument is used particularly in regard to water user participation in irrigation.

If management subscribes to the first of these two views, it will attempt to minimize customer participation in the transformation process and to keep the customer as far as possible outside the system bouudaries of the organization. In this context, KIRSCH et al. refer to a "gate-keeping" function of management.[4] Customer behaviour will nsually be infloeuced by means of leadership surrogates such as fixed rules and regulations for customer behaviour, e.g. "first come, first served", etc. In the irrigation sector, these may for instance include rigid water distribution rules.

1 KIRSCH et al. emphasize that this can also be transposed to internal leadership considerations. Organization members can also articulate their needs by voicing objections or leaving the organization. The question of customer withdrawal is, however, generally more acute, since it is less easy to control. This requires special sensitivity of the organization to customers' needs. Cf. KIRSCH et al. (1979), p. 303.
2 ADAMS (1983), p. 3.
3 Cf. KIRSCH et al. (1979), p. 300 and BOWEN and JONES (1986), p. 429.
4 KIRSCH et al. (1979), p. 308.

The danger for management in this kind of "indirect" customer leadership is the potential customer withdrawal referred to above. Where this kind of leadership behaviour is practised, therefore, the leadership system must develop special sensitivity to customers' needs, resulting in special efforts in the field of research into customers needs and preferences, generally institutionalized in the form of a marketing department.[1]

A management which subscribes to the second of the two views on appropriate customer leadership outlined above will promote a more or less intensive integration of the customers/clients in the organization. According to MILLS, in snch approaches to customer leadership, the customer/client may be regarded as a partial employee of the organization during the period of his participation.[2]

As already noted, MILLS then identifies two significant options for customer leadership:

a) supervising customers/clients (client supervision)
b) leading customers/clients (leadership).

In its extreme form, customer/client supervision may extend to the form of gate-keeping referred to above; the employee of the organization can exploit his status or position authority to enforce "obedience" on his customer. In this case, there will at best be "pseudo-participation".[3]

In a more participation-oriented form of customer/client supervision, the employee will try to respond more actively to customers' needs and will also perform corresponding "consummatory" actions,[4] attempting in this way to secure the customers' loyalty to the organization.

Where there is intensive interaction with the customers/clients, "leadership" in the sense used by MILLS (see b) above) will consist of still greater integration of the customers/clients in the organization.[5] In this instance, leadership of the customer takes place within the framework of interaction with the customer, who here possesses the status of a client helping to shape the interaction. In extreme cases, this form of customer leadership may lead to authentic participation, in which the participant is genuinely involved in decisiou-making and bargaining processes.[6]

These observations are summarized in Table 5.5-1.

The diagram shows clearly that the various forms of customer leadership in fact consist of different degrees of customer integratiou in the organization, i.e. in different degrees of emphasis on participation.

1 Traditional marketing tries to optimize sales tools and sales management. More recent concepts, by contrast, regard marketing as "*a philosophy encompassing the entire organization*". KIRSCH et al., p. 58, author's translation. KIRSCH et al. see marketing generally as an alternative to providing genuine opportunities for participation, and therefore always associate it with a "gate-keeping" function. Cf. KIRSCH et al. (1979), p. 308.
2 Cf. MILLS (1986), p. 121.
3 According to KIRSCH et al., "pseudo-participation" exists when "*neither the values nor the needs nor the knowledge of the participants are involved, participation serves only to improve human relations, and the hope is that the participants will in any case identify with the leadership decision.*" KIRSCH et al. (1979), p. 298, author's translation.
4 Cf. Section 3.2.8.3.2.
5 Cf. MILLS (1986), p. 121.
6 KIRSCH et al. regard participation as authentic if it is intended to permit "both the articnlation and consideration of needs and values and the mobilization of the participant's knowledge". KIRSCH et al. (1979), p. 229.

Attribute	Ideal Types of Situational Configuration			
	A	A'	B'	B
Leadership behaviour	Tendency to authoritarian leadership style, especially where there are goal incongruences between leaders and subordinates	Leading staff: "leadership-mix": - in backroom organization as in A/B - in contact organization: significance of indirect leadership, especially through motivation Leading customers: If there is congruence with customer/client goals: - leadership through relations-oriented client supervision If there is goal incongruence: leadership through leadership surrogates (e.g. external legal or price regulation)	Leading staff: mainly indirect leadership (selection, training, motivation); special significance of internalization of organization's goals by staff Leading customers: If there is congruence with customer/client goals: relations-oriented customer leading If there is a goal incongruence: no opportunity for leading customers, except by compulsion, organizational subordination and authoritarian leadership style	Tendency to participatory leadership style, especially where there is congruence between management and staff goals
Water user status	Subordinate organization members	Given goal congruence: customers Given goal incongruence: consumers	Given goal congruence: clients Given goal incongruence: customer withdrawal	Independent users/participants
Level of water user participation	Participation as organization members (tendency to "pseudo-participation")	Given goal congruence: tendency to encourage partial customer participation Given goal incongruence: tendency to exclude customers/clients (gatekeeping)	Given goal congruence: tendency to high customer/client participation Given goal incongruence: no opportunity for customer participation except by compulsory subordination	Authentic participation

Table 5.5-1: Situational Differentiation of Attributes of the Function "Leading"

The different forms of customer leadership thus simultaneously represent varying intensities of customer participation.

A consideration of the situational differentiation of customer leadership in irrigation is therefore at the same time a consideration of the extremely important question of water user participation. This question has already been referred to in Section 4.4.3.

It will be evident that the much-discussed question of water user participation cannot be discussed in detail here. Where aspects of the situational differentiation of participatiou in irrigation are touched on below, they are intended to indicate certain lines of thought, and not as a complete treatment of the topic of situational differentiation of water user participation.

5.5.3.3.2.2 Notes on Water User Participation in Irrigation

5.5.3.3.2.2.1 Introduction

The demand for active participation by target groups in rural development projects is currently one of the standard requirements in the development cooperation field.[1] Participation is intended to strengthen the individual initiative of the participants and to allow them to identify with the project. In addition, attempts at target group participation are frequently aimed at relieving the workload of state administration by promoting self-administration.[2]

Experience indicates, however, that participatory approaches have not always been successful. In numerous cases, target group participation has failed to advance beyond the first stage, or farmers have evinced little willingness to make use of the participation offered. Warnings have therefore been voiced against expecting too much from increased participation or regarding it as a "magic formula" for rural development.[3]

In irrigation, a demand for situational differentiation of participation is increasingly put forward.[4] Hitherto, however, there have been few suggestions as to the contingencies under which approaches to participation should be differentiated and the way in which this should be done.[5]

In regard to the contingency factors on which the type of water user participation depends, UPHOFF et al. emphasize that:[6]

> *"Probably the overriding aspect of policy affecting farmer participation is the extent to which the government's and water users' goals coincide."*

This view is also subscribed to by the participants in au expert cousnltation on the topic of participation in irrigatiou carried out by FAO in 1984.[7] This group of experts

1 Cf. v. BLANCKENBURG (1979), p. 323.
2 Cf. v. BLANCKENBURG (1979), p. 323.
3 Ibid.
4 Cf. for example FAO (1985), p. 12 and UPHOFF et al. (1985), p. iii.
5 Initial concepts are to be found in UPHOFF et al. (1985).
6 UPHOFF et al. (1985), p. 24.
7 FAO (1985), p. 16.

also pointed out that the complexity of the task is an important factor influencing water nser participation.[1]

BOWEN and JONES likewise stress the fact that the goal congruence between the organization and the customers/clients, together with task complexity, decisively influence the situational differentiation of participation in service provision.[2]

These authors focus attention on an aspect of task complexity of importance from both the organization's and the customers' viewpoint: the **observability** of task performance (BOWEN and JONES refer to "performance ambiguity" in this context).[3]

The observability of task performance is covariant with task complexity. It tends to decrease as task complexity grows.[4]

On the basis of a discussion of "goal congruence" and "observability of task performance", BOWEN and JONES develop a model which attempts to estimate the situational differentiation of cnstomer participation and customer leadership ("transaction costs model").[5]

BOWEN and JONES presnme that both the organization and the cnstomers/clients nndertake cost-benefit evalnations in regard to participation. Within the framework of participatory provision of services, therefore, not only the benefits but the costs of the exchange between the two parties - the transaction costs - are taken into account. The level of participation will then be determined by the requirement that there should be an optimum cost-benefit ratio for both sides under the prevailing constraints.

UPHOFF et al. take a similar view in the following remarks:[6]

> *"Farmer participation in irrigation management can vary greatly in kind and degree. The objective - from [the] farmers' as well as an agency's viewpoint - should be "optimum" rather than maximum participation because participation entails costs as well as benefits. Possible benefits include increased production, improved water distribution, reductions in conflict, greater resource mobilization and system sustainability over time."*

From this cost-benefit standpoint, the contingency factors "observability of task performance" and "goal congruence" appear as follows:

A. Observability of Task Performance

The lower the observability of task performance, the higher will be the transaction costs for the organization if the customers/clients participate in performing the task. Precise specification and evalnation of the cnstomers' contribntion will then be difficult and supervision costs will be high.

1 Ibid.
2 Cf. BOWEN and JONES (1986), p. 430.
3 The observability of task performance indicates the extent to which the solution of a problem or the performance of a task is visible and/or measurable and verifiable. Cf. OUCHI (1981), quoted in BOWEN and JONES (1986), p. 431.
4 KUNZE (1983), p. 100.
5 BOWEN and JONES speak of the "Transaction Cost-Analysis of Service Organization-Customer Exchange". Cf. BOWEN and JONES (1986).
6 UPHOFF et al. (1985), p. iii.

Conversely, low observability of task performance also poses a problem for the customer. Where tasks are complex and hard to observe it becomes difficult for him to judge whether he is being well or badly served by the organization. The inputs and time which the organization expends in performing the tasks, and therefore the appropriateness of the service, are hard for him to evaluate.

This problem of appraisal forces the customer/client to acquire additional information (e.g. by questioning third parties, by comparing offers from varions sonrces, etc.) in order to be able to evaluate the organization's performance. This information gathering may involve him in high transaction costs.

B. Goal Incongruence

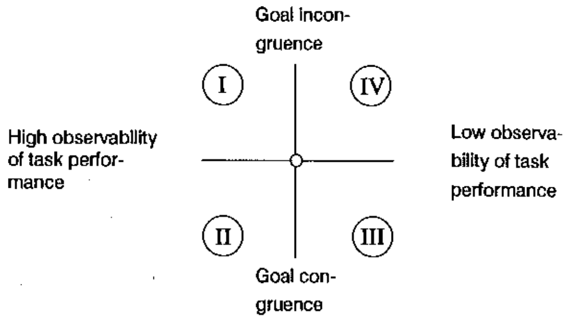
As noted above,[1] **incongruence of goals** ("ends conflicts") between the two parties force them to negotiation and compromise. In a zero-sum situation[2], in which one party's advantage is always the other's disadvantage, there will be a tendency to behave opportnnistically or even to steal a march on the other side. Goal incongruence, i.e. incompatibility of the parties' goals, will therefore generally entail high effort and high transaction costs for both sides in order to ensure that the negotiated compromise is adhered to.

On the basis of these considerations, BOWEN and JONES' model can be applied to the situational differentiation of participation in irrigation.

5.5.3.3.2.2.2 Situational Differentiation of Water User Participation

On the basis of the above analysis and following BOWEN and JONES, the situational possibilities are as depicted in Fig. 5.5-2:

Fig. 5.5-2: Basic Configuration for the Situational Differentiation of Water User Participation; Source: Modelled on BOWEN and JONES (1986), p. 434



I) In A'-type configurations, low complexity tasks predominate. The associated high observability of task performance means that the customer has no special diffi-

1 Cf. Section 5.5.3.1
2 Cf. ibid.

culty in evaluating the tasks performed for him by the organization. If there is a goal incongruence in such a situation, however, both the organization and the customers will try to promote their own interests to the maximum within the framework of the exchange-relationship.

For the organization, this means that customer participation will involve it in substantial snpervision work, as the only means of preventing the customers from trying to maximize their own returns from the relationship (e.g. by taking as much water as they can get.

Participation also provides little incentive for the customers. Owing to the observability of the task, they can quite well judge the quality of the service without needing to participate intensively in providing it.

Under sucb circumstances, there will be a tendency to adopt a form of customer leadership in which customer participatiou is low and the customers remain largely outside the boundaries of the system, acting virtually as consumers of the service provided by the organization. Interaction between the customers and the organization will be primarily by means of leadership surrogates.[1]

An example of this type of exchange situation may be found in the canal irrigation system of Northern India, where the traditional *Warabandi* rotation system is practised.[2] These irrigation systems were created during the period of British colonial rule, as a measure to counteract periodically recurring drought disasters. The objective of the irrigation organization is to distribute tbe little water available to the greatest possible number of users during such periods of drought (drought-protective irrigation).[3]

Iu times of great water scarcity, an incougruence between the objectives of the organization and the water users must therefore be presnmed; whereas the former wishes to minimize the water allocated to individual users in the interests of equitable distribution, the objective of each individnal farmer is to get as much water as possible. Under these circumstances, a high level of water user participation in water distribution would involve a risk of individual farmers manipnlating the system to their own advantage. Snpervision and enforcement of equitable distribution would entail high transaction costs for the organization.

The traditional *Warabandi* systems have, firstly, established an extremely simple water distribution schedule based on irrigation at regular intervals. Water distribution is simplified by means of a constant discharge at the farm outlets. This gives the water nsers exceptionally good **observability** of the service provided by the organization.

Secondly, an extremely strict water distribution law has been enacted as a "leadership surrogate" in the *Warabandi* framework.[4] Although the status of the water users is solely that of consumers of the allocated water, and virtually no

1 These may, for example, consist of legal regulations or price mechanisms governing the exchange between the two parties. Cf. BOWEN and JONES, p. 435. Cf. also the general overview of (non-customer-specific) leadership surrogates in STAEHLE (1985), pp. 619 ff.
2 Cf. WALKER (1981) and HUPPERT (1983). The word "*Warabandi*" means roughly "fixed turn".
3 HUPPERT (1983), p. 81.
4 In the form of the "Northern India Canal and Drainage Act" of 1973. The penalties for infringing this law are described by SECKLER as "draconian". Cf. SECKLER (1981), p. 26.

participation takes place, the cost-benefit ratios have to a large extent been optimized for both parties. Unsurprisingly, the traditional *Warabandi* systems are renowned in India for their high efficiency of water distribution.[1]

II) In Type A' situations, with high goal congruence, the customer-organization exchange will present fewest problems. Task performance is readily observable on both sides, and the close fit between the goals of the organization and of the water users means that neither party need fear being disadvantaged by the other.

In this situation, integration of the customer as a partial employee of the orgauization and relationship-oriented customer leadership through customer supervision of the kind described above will best optimize the cost-benefit ratio for both parties. Supervision costs for the organization are low in view of the good observability of task performance and the identical goal-orientation of the water users. These costs are compensated by the benefits to the organization of a good personal relationship with its customers and the resulting customer loyalty.

For the customers, there is little iucentive to participate **intensively**, since the service the organization provides can be judged without difficulty. **Partial** participation, on the other hand, has the advantage for the customers that the organization can cater for their special preferences (preferences for "regular customers").

Under situational constraints of this type, external leadership surrogates are supplemented or replaced by relationship-oriented customer supervision. The integration of the customer as a partial employee may be regarded as a limited form of participation.

A situation of this kind may tend to occur in irrigation where a high "relative water snpply" (RWS)[2] encourages a close goal congruence and water is distribnted to small gronps under conditions of good observability. This is, for example, the case for Northern Indian well systems with piped distribution, where water is tapped at communal hydrants belonging to the group.[3]

In these systems, generally operated with few irrigation organization employees, relationship-oriented customer supervision and the sitnational constraints described above combine to achieve high optimization of the transaction costs for both parties. These systems are currently so snccessful that the Indian irrigation ministry aims to step up conversion of well irrigation to piped distribution systems in Northern India.[4]

III) In Type B' configurations, i.e. those with high task complexity and low task observability, the excbange relationship between the customers/clients and the organization is attended with great difficulties. If there is a close conguence fit between goals, the existing problems of observing and evaluating services will lead to **means conflicts**[5] between the organization and the customers/clients. Intensive cooperation helps to avoid and resolve such conflicts.

1 Cf. SECKLER (1981), p. 10.
2 Cf. Section 5.3.2.2.3.
3 For example in the "Utar Pradesh Deep Well Projects" near Lucknow in Northern India.
4 Personal conversation with Mrs. Priya Prakash, Joint Secretary, Ministry of Irrigation, New Delhi, in July 1985 in Kandy, Sri Lanka.
5 Cf. Section 5.5.3.1.

In situations of this type, intensive customer/client participation will therefore generally appear appropriate to the situation from the point of view of both parties.

In irrigation, this configuration will tend to exist where water users aided by a committed advisory service cooperate in solving problems of irrigated agriculture which they themselves have articulated.

IV) If there is goal incongruence in Type B' configurations, i.e. those with high complexity and low observability of task performance, an exchange relationship between customers/clients and the orgauization will occur only in exceptional cases.[1] Uuder such complex constraints, it will scarcely be possible to establish external regulations as leadership surrogates. At the same time, customer/client participation and the resulting need for the organization to negotiate, supervise and promote compromises entail excessive transaction costs for the organization.

From the viewpoint of the customers/clients, the difficulty of evalnating the organization's services and the awareness of a goal incongruence with the organization entail considerable uncertainty. This uncertaiuty is still further increased if the service is made more difficult to observe - as is often the case iu irrigation - because the organization has a monopoly position and the customers have no basis of comparison with other snppliers.

The only possibility for the organization uuder such constraints is to compel the customers/clients to accept a formal subordinate relationship and to force through its own objectives with an anthoritarian style of leadership. If this tactic is ruled out by a potential customer withdrawal, no exchange relationship can be established at all.

In irrigation, this situation is exemplified by a series of large-scale irrigation projects dating back to colonial days and curreutly plagued by enormous operational difficulties. The complexity of tasks concerned with water delivery, distribution and utilization is high, since multiple cropping at a high level of productivity is usnally the aim. If the goal-orientations of the irrigation organization (market-oriented, export-oriented) and the water users (needs-oriented, subsistence-oriented) conflict, an effective exchange occurs ouly if water users are can be placed in a position of enforced subordiuation to the organization. Since such nse of compnlsion in the sense of "closely-snpervised production" is virtually impossible under modern couditions, a partial withdrawal of water users or an attempt to secure individual interests at the expense of an efficieut irrigation operatiou are the result. A stable exchange relationship, optimized ou the basis of transaction cost considerations, and an efficient irrigation operation are therefore extremely difficult to achieve under snch conditions.

1 An exception of this kind arises if the organization is in a position to force its conditions on the customers/clients. Cf. BOWEN and JONES (1986), p. 436.

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