Part I

Fundamentals

In Part I we discuss the general background of problem-solving in organizations. We start by describing the characteristics and general setup of problem-solving projects, which aim to improve the performance of a certain business system on one or more performance indicators in the real world. We compare this with business research projects, which aim to develop general knowledge. We then discuss the characteristics of the methodology for business problem-solving presented in this handbook, and compare this with other problem-solving strategies. As design is a key activity in our approach, we provide some general design theory plus some theory on social system design. Finally, we discuss the various sources of knowledge to be used in business problem-solving, and the development of general design knowledge through scholarly research.

1 Scope and nature of this handbook

1.1 Objectives and target audience

This handbook gives a design-focused and theory-based methodology for business problem-solving projects, be they large or small, driven by one or a group of business students in consulting roles. Our methodology has been developed for university business programmes such as MBA programmes, for which the development of student competences to solve real-life business problems is a key objective. Or, in other words, for business courses that aim to educate professionals. The core competence of the scientist is research, but for professionals such as doctors, lawyers and engineers, it is problem-solving in the field. For the business student the development of that competence can be supported by in-house courses on problem-solving methodology and courses based around written case-studies, but in our opinion its key component should be business problem-solving (BPS) in a real-life context. This can be achieved either by a trainee within a company taking on a BPS project of six months or so, or as a smaller project undertaken by a group of students visiting a company on a few occasions to do their analysis and present their proposals.

This handbook can be used in a general classroom course to prepare for business problem-solving fieldwork, and subsequently as a sourcebook for preparing and running actual field projects. It can also be used as additional reading (possibly with one or more classroom training sessions) for a disciplinary course aiming to combine theory with the application of that theory in practice.

The methodology of this handbook has been developed based on more than ten years' experience in supervising business problem-solving projects by students of the techno-MBA course at Eindhoven University of Technology. These included short group assignments in BPS in the field, but most were six- to nine-month graduation projects, aimed at further developing

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students' competences in theory-based BPS. The business problems to be solved typically had a significant technical-economic content. However, this handbook deals with the conceptual and technical setup of the project itself, not with methods related to the content of the problem. Unlike many books on consulting (see for example Albert 1980; Kubr 1996), this book does not have sections on problem-solving in different disciplinary contexts. Typically in the context of a university course, university supervisors will provide students with the necessary disciplinary support. Chapter 3 provides further discussion on the nature and application of our methodology for business problem-solving.

1.2   Design-focused and theory-based business problem-solving

As will be discussed in more detail in Chapter 2, a BPS project typically consists of an analysis and design part, an organizational change part, and a learning part, during which the organization learns to realize improved performance on the basis of the designed solution. The methodology presented in this handbook focuses on the design of the solution for the business problem, the design of the change process needed to realize that solution in new or adapted roles and procedures, and the analyzes needed to make those designs. Hence the term 'design-focused'. We will only briefly discuss the change and learning part, reflecting the actual practice of business students undertaking a business problem-solving project. Typically they will focus on the two designs (and work on organizational support for these designs), but will leave the – possibly quite protracted – change and learning parts to the organization itself. Therefore our focus is largely on the design part of the BPS project.

'Theory-based' means that in this approach problem-solving is not done in a craftsman-like way, largely relying on one's own experience and informed common sense. Rather, it is theory-based, using state-of-the-art literature. The literature to be used in business problem-solving entails two complementary aspects:

– *object* and *realization knowledge*: knowledge of the *object* of problem-solving, that is, knowledge of organizations and management in general, and of various business systems and functions such as marketing, operations, innovation and finance in particular; and knowledge of the *realization* of business solutions through planned change;

– *process knowledge*: that is, knowledge of approaches and methods to be used in the analysis and design of business solutions and change plans, from

problem definition to decision-making on proposed solutions and change plans.

This handbook focuses on the second category, that of process knowledge for business problem-solving. It also discusses some elements of realization knowledge in the context of change plan design, but it does not discuss object knowledge as this will be provided by the disciplinary courses of the business programme, supported by the university supervisors of the BPS project.

'Theory-based' does not, of course, mean copying theory into particular cases. Theory is by definition general and must always be contextualized for use in actual problem-solving. Theory-based in BPS within an academic programme specifically means the *comprehensive, critical and creative use of theory*:

– *comprehensive*: because problem-solving should be based on a systematic review of the existing literature on the issues in question;
– *critical*: because one should judge the value and limitations of existing literature, among other things on the basis of the evidence given (for instance the design of business solutions may be informed by management literature, as long as one is aware of its limitations);
– *creative*: because one should not just use theory, but aim to build upon it, play with it, and add to it in order to produce appealing designs.

Theory-based design can be seen as design on an academic level, in which theory is very important, but at the same time with an awareness of its limitations.

1.3 How to use this handbook

This handbook provides theory on how to set up and drive a BPS project. It should be used in a comprehensive, critical and creative way. By comprehensive we mean that the theory should not be used as a menu by which readers pick and choose certain elements. Rather the approach as a whole should be followed. At the same time the theory should be used critically, as far as is appropriate for the business problem in question. Chapter 3 supports the critical use by discussing the limitations of this theory and the types of problems for which it can be used. The creative use means that the approach given in this book is not simply to be copied, but that it is to be contextualized. The approach given in this handbook should be regarded as a 'design model'; a general model to be used as the basis for the design of the specific setup of a BPS project for a specific setting. The approach of this handbook is a

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kind of 'norm process'; a well-tested example of how to do it, described in terms of a 'standard setting'. In reality no setting is standard, so one always has to make one's own, specific project design. At the same time one should be able to justify any deviation from the norm process on the grounds of the requirements of the specific setting, or on the grounds of the recognized limitations of the norm process itself.

Although in our experience graduate students are quite able to use a hand-book such as this in self-study, to prepare and manage their BPS projects in the field, a good way to learn this approach is to follow a classroom course using this book. We use it in a course consisting of a few explanatory lectures, self-study, and a number of training sessions in which written case studies are used to train for activities such as problem definition, designing a problem-solving approach, and preparing a project proposal. However the real learning experience should be in the field: defining problems, capturing data and exploring solutions in the messy, political and sensitive world of real-life business, thus developing the tacit knowledge needed to apply the codified knowledge of the business programme. No written case study can give the student that learning experience. Even students with previous business experience, who tend to tackle problems on the basis of their experience and common sense, can benefit from this theory-based, design-based approach to business problem-solving.

2 Problem-solving projects in organizations

2.1 The nature of business problem-solving projects

The objective of this handbook is to discuss the methodology of business-problem solving (BPS) projects, carried out by business students. Examples of such projects are:

– improving the delivery performance of the spare part inventory control of a capital goods company;
– developing a cost control system for a distribution centre of a postal service;
– improving the performance of a recently introduced e-procurement system for a small company;
– developing a decision support system for the allocation of resources to research and design projects for a small, high-tech company;
– developing a system for measuring the performance of a marketing and sales department;
– improving the effectiveness and efficiency of training courses for the human resources management department of a large company;
– developing a system for measuring the reliability of new software in a software development department;
– improving the quality control system of a production department by introducing statistical process control.

Business problem-solving projects are started to improve the *performance* of a business system, department or a company on one or more criteria. Ultimately it should impact the profit of a company (or a comparable overall performance indicator if it is a not-for-profit-organization), but usually the actual objectives of a BPS project are of a more operational nature, related to the effectiveness and/or efficiency of operational business processes. The approaches discussed in this handbook can generally also be used for business improvement projects of a more strategic nature, although we do not discuss the

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additional technical-economic, political and social complexities of such projects here.

BPS projects are undertaken to improve the performance of a certain business system or organizational unit. With respect to the logic of their setup we will follow the classic problem-solving cycle as elaborated in the *regulative cycle* by Van Strien (1997). This regulative cycle has five basic process steps (see figure 2.1 below):

– problem definition;
– analysis and diagnosis;
– plan of action;
– intervention;
– evaluation.

This is the logic of the regulative cycle from the perspective of the student. From the perspective of the client organization a full BPS project has three parts:

– a *design part*, in which a redesign of the business system or organizational unit is made based on the problem definition, analysis and diagnosis; a change plan for introducing the redesign; and the development of an organizational support structure for the solution and change plan (steps 1, 2 and 3 of the regulative cycle);
– a *change part*, in which the redesign is realized through changes in organizational roles and routines, plus the possible implementation of new tools or information systems (step 4 of the regulative cycle);
– a *learning part*, in which the client organization learns to operate within the new system and with the new instruments, and learns to realize the intended performance improvement. An organization needs time to recover after a significant change. People have to relearn how to work effectively and efficiently within their new situation, which takes time, effort and management attention. Of course, if the change has been limited, the recovery period can also be limited. (This part of the process may be subsumed under step 5 of Van Strien's regulative cycle.)

Usually the student leaves the company after the design part, having created as far as possible the conditions for a successful outcome of the two subsequent parts. Thus the focus of this handbook is on the design part of the BPS project.

A problem can be defined as the result of a certain perception of a state of affairs in the real world with which one or more important stakeholders are dissatisfied. Business problems have a number of characteristics, many of them very different from research problems. These include the following:

– business problems are not given, cannot be 'discovered' in reality, but are the result of *choices* of influential stakeholders: in the context of a 'mess' of issues, of opinions and value judgments on those issues, of interests, power and influence, these stakeholders choose an issue, or combination of issues, to work on (see Ackoff 1981a, on the problem mess);

– these influential stakeholders are dissatisfied on the basis of a comparison of their *perception of the performance* of the business system in question on certain implicit or explicit *performance indicators* with some implicit or explicit *norms*, and they choose the problem to work on because they have the impression that significant performance improvement is feasible within acceptable constraints on time and effort;

– business problems, like all design problems, are open-ended: typically there is not one unique solution to a business problem, but there can be several good solutions;

– they are not intellectual questions, but are charged with values, interests and power, that is, they are strongly dependent on value judgments of various stakeholders and they are connected with material and immaterial interests of these stakeholders, who may use their formal and informal organizational power to protect those interests;

– typically business problems are solved within (often tight) constraints of time and effort, so analysis and design are done on a satisficing basis, in other words on a 'good enough' basis (even in high-quality, theory-based business problem-solving);

– business problems are selected from a 'problem mess' and subsequently 'solved' through a 'change muddle'. Even if based on a sound solution design and a sound change plan, the actual change and subsequent learning processes are subject to all kinds of external and internal interferences, so that corrective actions and improvisations still play an important role during these change and learning processes, hence the term 'change muddle'.

An important part of problem definition during the course of a BPS project is to make explicit the perceptions, performance indicators and norms used by the various stakeholders in defining their own version of the problem. The problem definition should lead to a definition of a *real problem*. One should avoid doing a BPS project on a *perception problem*; a problem defined on the basis of inaccurate perceptions of the performance of the business system in question. One should also not take on a project on a *target problem*, that is a problem defined on the basis of unattainable norms.

Most business problems are solved by responsible management and/or by the organizational members affected by the problem. However, this handbook

takes the perspective of a business student – an involved outsider to the organizational setting in question – whose help is enlisted to solve the problem in a consulting role. Graduate business students are people with the expertise and drive to analyze the problem, design a solution, design a change process (usually in cooperation with people from the business system in question), and mobilize organizational support for the solution and change plan. However they do not have the authority and power to commit organizational resources or to change the business system, in which case they would also have responsibility for its performance. So they have an *effort commitment*, but not a *result commitment*.

Because of the characteristics of business problems, discussed above, a BPS project driven by one or more business students has a number of properties, including the following:

– the project is not based on an agreement to perform an agreed activity, but an agreement to help solve a well-defined business problem;

– definition of the problem is an essential part of the project; the student is not someone who simply does what has been asked, but a partner in the problem-solving process;

– the problem is demarcated in a such a way that it is large enough for its solution to have a significant impact on the performance of the business system in question, but small enough for its solution to be feasible in view of the time and effort committed by the client organization and the student themselves;

– the objective of the project is the realization of an actual performance improvement, not the report describing the solution and its implementation, nor the solution itself;

– the student has an *effort commitment*, not a *result commitment*, because, as an involved outsider, he/she does not have the authority to commit and manage the resources needed to implement the solution and to secure its outcomes.

A student BPS project should be interesting enough for the client organization to invest in it time and management attention (and funds), for the student to have an important learning experience, and ideally for supervisors to gain additional insight in current field issues in their research domain. Nevertheless, normally a student BPS project has a fairly limited scope, although, sometimes students are asked to address problems that are quite important for the client organization. Student BPS projects are generally low-profile projects for the client organization, and management may therefore prefer to ask a student, rather than a well-known consultancy firm, to address a problem that might be

sensitive. Typically a student's arrival in a firm is not experienced as disruptive by the organization as is that of a consultancy firm, and interviews by students may more easily get the real story from people than interviews by senior consultants. Therefore, student assignments can address problems that are of importance for the organization.

A business problem-solving project involves the analysis of the problem and its context. This analysis is not an end in itself, but 'analysis for design': made to support the solution design. So all kinds of decisions on the scope, level of detail and perspectives to be used in the analysis are to be based on a need-to-know-for-design. Often this makes it necessary to explore some possible solution concepts early on in the analysis, after which the analysis is continued to enable the choice of solution concept and to prepare the subsequent detailed design of the solution.

The designed solution is also not an end in itself, but a means to improve performance: the whole project is focused on performance improvement and not on the beauty or intellectual appeal of the design. A full BPS project entails the analysis of the problem and its context, the design of a sound solution for that problem, the actual change of organizational structures and/or work processes, and the subsequent management of the new situation, in order to produce the intended performance improvement.

In the course of a BPS project the student generally produces three designs:
 – a *project plan*: the design of the process that is to produce the solution design and the change plan design, the actions to take and the actors involved (not only the student but also various others who may be involved in analysis and design), and the design of the approach to the analysis and diagnosis of the problem;
 – a *solution (or object) design*: the design of the solution of the problem, for example in the form of a new organizational structure, a new work process or a new business information system;
 – a *change plan (or change process design)*: the design of the process that is to realize the object design (in terms of the actions to be taken and the actors involved).

The client organization may generally expect the following deliverables:
 – a problem definition;
 – a problem analysis and a diagnosis of the major causes and consequences of the problem;
 – an exploration of potential solutions for the problem;
 – an elaboration of one of them in a detailed solution design and a change plan;