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PROJECT TITLE

**Effects of performance appraisal decisions in the public sector:
an evidence-based framework**

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1. Executive Summary

During the last decade, international research literature on the public and private sectors has universally reported a significant relationship between Human Resource Management practices and organizational performance (Gruen, 2001; Demmke et al. 2006; Michie and West, 2004; OECD, 2002;2004; Wright et al. 2005). The mechanisms and interactions through which Human Resource Management (HRM) leads to organizational success, however, remain largely unexplained (Becker and Gerhard, 1996; Guthrie and Datta, 2004; OECD, 2005).

This research project aims to explore further the relationship between HRM decisions and organizational performance in the public sector. One HRM activity, performance appraisal, is examined in particular detail. To this end, the following objectives were set:

- To review the international research literature on performance appraisal techniques in both the for-profit and the public sectors in order to identify and examine empirical studies analyzing the relationships between performance appraisal techniques and organizational successes.
- To build an evidence-based framework within the context of the existing literature, integrating the various partial explanations for the influence of performance appraisal techniques on organizational performance in the public sector.

A first analysis of the gathered data suggests that a specific combination of performance appraisal practices has the most positive impact upon organizational performance in the public sector. These practices include the implementation of regular review sessions, the use of behaviour-based rating, the introduction of career-path planning procedures, and the encouragement of employee-participation opportunities in the development and implementation of a performance measurement system. At present, however, there seems to be a widespread reluctance to develop precisely these HRM activities. Influenced by the practices of private firms, the public sector too often focuses only on performance-related pay schemes. Within this context, it is important to note that this study is not intended to promote the above-cited combination of performance appraisal activities as the over-arching solution to enhancing organizational performance in the public sector. This project

aims to offer insights on prioritizing performance appraisal practices. However, elements outside HRM activities may have an equal or superior impact upon organizational performance in the public sector. In fact in recent years several authors in the field have suggested that “software” elements of organizational management, such as leadership and organizational culture, most influence performance (Forest, 2006; Plamper, 2007; Wright et al. 2005).

2. Introduction

2.1. The Importance of Human Resource Management (HRM) in Public Service Organizations

In the last thirty years, public management research has been predominated by issues regarding the scarce ineffectiveness of the welfare state. Public service organization and action and the sector's ability to satisfy user needs, have been increasingly scrutinized (Forest, 2006; Lähdesmäki, 2006; OECD, 2005). Constantly criticized for overall performance, civil service entered a "crisis of legitimacy" (Forest, 2006). The continuous demand for both a better-functioning and smaller public service lead many countries to implement important reforms (Forest, 2006; OECD, 2003;2003b;2005). Within this context, HRM-based modernization projects progressively gained importance over the last decades (Lähdesmäki, 2006; OECD, 2002;2004; Pichault, 2006). International research literature universally reports a significant and positive relationship between HRM practices and public service performance (Gruen, 2001; OECD, 2002;2005). Furthermore, the European Group of Public Administration - EGPA (EGPA, 2007), founded a permanent study group dedicated to HRM issues (see **table 2.1a** below for a complete list of EGPA study groups). Like other areas of management research, human resources is a highly-contested field, with much discrepancy and numerous competing models. Even so, there is little controversy about the actual content of HRM. Virtually all writers agree on a set of core components: human resource planning, delineation of job descriptions, recruitment, performance appraisals, pay management, and training (Brewster, 1995; Devenna, 1984; Gruen, 2001; OECD, 2002; Michie and West, 2004; Wright et al. 2005). Some authors also integrate broader formal management practices into their HRM framework definition (Devenna, 1994; De Pietro, 2005; Gruen, 2001), including the organization of employment relations (e.g. collaboration with trade-unions, job security issues) and the management of employment reforms (e.g. redundancy planning).

In order to establish the HRM activities that are prioritized in public management practice, various reliable sources in the field are available for consultation. This report is the

culmination of a survey of all EGPA “Personnel Policies“ permanent study group papers on the subject “Human Resource Practices” that were accepted for publication at the last EGPA annual conferences (2005/2006), as well as data from recent major publications by both the World Bank Independent Evaluation Group (IEG) and the OECD. The information therein is summarized in the next **section 2.1.1**.

Table 2.1a Current EGPA Permanent Study Groups

1. E-Government: Information and Communication Technologies in Public Administration
2. Performance in Public Sector (Productivity and Quality in Public Sector)
3. ***Personnel Policies***
4. Local Governance and Democracy
5. Intergovernmental Relations
6. Governance of Public Sector Organizations
7. Ethics and Integrity of Governance
8. Third Sector
9. Public Administration and Teaching
10. Law and Public Administration
11. Regulation and Management of Public Utilities
12. Public Sector Financial Management
13. Evaluation

2.1.1. Performance appraisal and pay management activities in current public management practice

The work of Willems et al. (2005) focuses on pay management issues. Their thorough review of public service literature reveals a strong tendency towards reports on a recent shift in public sector pay management from a “traditional” career-based system towards “new” pay practices formerly seen only in the private sector. According to Willems et al. (2005) the reviewed literature is too concentrated upon performance-pay. In order to determine if pay system characteristics in public services follow a “private sector trend”, Willems et al. (2005) propose a theoretical division of “traditional” and “new” pay systems which integrates elements beyond performance-pay and includes competence pay, the degree of decentralization in pay, types of fringe benefits, pay determination, and the types of performance appraisal systems.

In line with Willems et al., Forest (2006), Lähdesmäki (2006), and Devorakova (2005) stress the crucial role of performance evaluation and performance-related pay within the performance management context. Forest’s report concentrates on France, wherein newly-enacted legislation regarding state services emphasizes results and evaluation. French civil servants’ work is now assessed on a regular basis by taking into account the performance and merit of each public servant. The most fundamental changes, however, are in the area of pay systems: personnel policies on performance-related pay have been introduced in various Ministries including the Ministry of Economy, Finance, and Industry, the Ministry of Justice, and the Ministry of the Interior. Lähdesmäki’s analysis concentrates on the present HRM-situation in Finnish government organizations and finds that performance appraisal and feedback are among the most useful public management tools. Along with performance-related pay, these tools represent a natural continuation of managerial reforms in the Finnish public administration and significantly increase organizational performance. Even so, this is preconditioned upon a proper application within the correct managerial context. Lähdesmäki (2006) thus dedicates her work to a review of leadership demands of new performance-pay systems. Devorakova’s work emphasizes the importance of performance appraisal activities in the promotion of public service quality in Czech public administration. According to Devorakova, recent management reforms in public administration promoting economy and efficiency had

adverse effects such as a decrease in traditional values and an increase in corruption among the elite of Czech public administration. Future human resource practice in Czech public administration should integrate ethics as a performance appraisal criterion in order to encourage ethical and uncorrupt behavior.

A recent paper by the OECD (2007) summarizes the information currently available on the “Management in Government” project, which aims to provide governments with high-quality comparative data on the public sector and includes a classification group dedicated to “Human Resources Management Arrangements”. Again in this report, pay management, and in particular performance-related pay, is regarded as a crucial element of HRM. While the report observes that as of yet no model of performance-related pay exists within the OECD public sector, several common trends are identified and the “prevalence of performance-related pay” is noted as a public sector activity indicator.

The final resource of this section of the literature survey, the World Bank’s Independent Evaluation Group (IEG), supports public service organizations in developing countries in strengthening their monitoring and evaluation (M&E) systems. In a recent report identifying key HRM trends the IEG includes result-orientated management systems among the most important reform priorities and links this with staff-appraisal processes and performance-pay elements (Mackay, 2007).

2.1.2. Job description activities in current public management practice

Harris's (2005) work underscores the importance of redefining job descriptions of the human resource (HR) specialist function within British local government. Public sector reforms, an agenda for continuous improvement in public services, and the need to continuously review working practices increasingly obliged HR specialists to take on a more strategic role within British local government. According to Harris, it is unrealistic to expect HR specialists to cope with these new functions since their own resources tend to be scarce. Harris thus strongly advocates devolving direct day-to-day operational responsibility to line managers, allowing HR specialists to perform a more strategic role.

Also Demmke et al. (2006) and Pichault (2006) highlight that the pressures on HR specialists to adopt a stronger strategic role will increase significantly in the near future and that a major issue for public administration will be the proper delegation of competences and authority to lower levels of management. It will thus become crucial to find an adequate balance between the need for decentralization and control requirements (avoidance of mismanagement) without losing strategic coherence. Demmke et al. point to the importance of differentiating between the rhetoric and the practice of decentralization. Among current researchers there is a nearly unanimous consensus in favor of decentralization, whereas the contemporary practice is still rather centralized with limited autonomy given to management regarding human resources decisions.

2.1.3. Employment relations in current public management practice

The research of Leisink (2006) and of Haatainan and Sihvonon (2006) do addresses issues of employment relations in contemporary public management practice in more detail. Haatinnan and Sihoven (2006) concentrate on possible effects of new management doctrines such as competitive tendering and contracting-out on employees' working conditions (e.g. job security and terms of employment). Leisink (2006) instead focuses on the concept of the state as a "model employer". He examines the prioritization of public worker retention in the Netherlands, and questions whether this is in fact aided by the promotion of human resources development and mobility practices, and the adaption of jobs to employees' capacities.

This chapter aimed to identify salient human resource management activities in current public management practice. In the light of this review, it can be concluded that the impact of human resources management on public service organization performance is widely accepted in the public management literature. In particular performance appraisal and (performance) pay management activities have become predominant issues in this context (see also **table 2.1b** below for a summary). Experts in the field do, however, highlight that the mechanisms and interactions through which such HRM activities lead to organizational success still remain largely unexplained (Becker and Gerhart, 1996; Guthrie and Datta, 2004; OECD, 2005). This project thus aims to explore further the following question: "How do HRM decisions influence organizational performance in the public sector?" The previously identified HRM activity "performance appraisal", will be examined in more detail for two reasons:

1. Performance appraisal¹ decisions seem to play a most influential role in the "HRM activities" – "public service performance" relationship (see **table 2.1b** below).
2. Having perennial experience as a middle-manager in a Swiss public health care organization, the author is interested in this subject for professional reasons: performance appraisal represents an HRM activity within his direct job responsibility.

¹ The "performance appraisal perspective" adopted allowed for the exploration of two types of key motivational effects: those triggered by review sessions in which employees receive information enabling them to perform better, and those produced by incentives including performance-pay and other HRM interventions.

Table 2.1b Prevalent HRM Activities in the Public Sector

Author(s)	Paper/publication title	Core HRM activities	Source type
Willems et al. (2005)	Central government pay systems in Europe. Pre- or post-NPM?	Performance appraisal/evaluation and pay management	EGPA annual conference paper
Forest (2006)	Work motivation and performance-related pay in the French Civil Service	Performance appraisal/evaluation and pay management	EGPA annual conference paper
Devorakova (2005)	HR Practices in the Czech Public Administration	Performance appraisal	EGPA annual conference paper
Lähndesmäki (2006)	The new pay system requires encouraging and performance-oriented leaders: The case of several Finnish State Government Organizations	Performance appraisal/evaluation and pay management	EGPA annual conference paper
OECD (2007)	Towards better measurement of government	Pay management	OECD working paper
Mackay (2007)	How to build M&E systems to support better government	Performance appraisal/evaluation and pay management	WORLD BANK Independent Evaluation Group report
Leisink (2006)	Public identity and human resource practices: The case of age-related personnel policies in the Netherlands	Employment relations (job security)	EGPA annual conference paper

Table 2.1b Prevalent HRM Activities in the Public Sector

Haatainen and Sihvonon (2006)	Competition in public services and its effects on employees	Employment relations (job security, terms of employment, working conditions)	EGPA annual conference paper
Harris (2005)	The changing nature of the HR function in UK local Government and its role as “employee champion”	Job description	EGPA annual conference paper
Demmke et al. (2006)	Decentralization of HR practices – a European comparative perspective	Job description	EGPA annual conference paper
Pichault (2006)	The problem of coherence in HRM-based modernisation projects	Job description	EGPA annual conference paper

2.2. Definition of terms

2.2.1. Performance appraisal

In this study performance appraisal was understood as a term including all activities with the objective to evaluate employees' overall performance on a regular basis. It aims to provide objective information to guide management decisions regarding incentives to encourage productive behaviour or sanction/measures taken in case of unproductive behaviour (Becker and Gerhart, 1996; ERC, 2006; OECD, 2004).

2.2.2. Public service/sector

According to the OECD (2004)

"Instead of "civil service" or "civil servants", many countries now use the terms of "public service" or "public servants". In some cases, the meaning is the same. In other cases, public service covers a wider group. Some countries... clearly differentiate civil servants from public servants, where civil servants are confined to employees working at the central government, excluding public servants who are working in local government, public schools, health services, and social security, etc."
OECD (2004) p.2

For the purpose of this study the broader "public service/sector" definition has been adopted. Public service/sector organizations are understood as including also state schools, health services and social security, besides institutions of the central government.

2.2.3. Organizational performance in the public sector

According to the OECD (2002b) performance in the public sector may be seen as the proficiency of an organization in acquiring resources economically and using such resources efficiently (input-output ratio) and effectively (output-outcome ratio). The terms inputs, outputs and outcomes were defined in more detail by the OECD (2002b), Varone and Giauque (2001), as well as by Guenoun and Goudarzi (2006), as follows:

Inputs include the labour assets (skills range, expertise as well as knowledge of employees), capital assets (land and buildings, vehicles and computer networks), financial

assets, and intangible assets (such as intellectual property) which are used in order to deliver outputs. Outputs include all goods or services which an organization provides for citizens (e.g. public infrastructure; advisory activities). Outcomes are the effects on society of outputs from governmental entities (e.g. detectable change in the situation of target groups such as an increase in quality of life or an increase in service user satisfaction). Outputs are potentially largely controllable and measurable either quantitatively or qualitatively. Outputs can thus be used for performance management more easily than outcomes (OECD, 2002b). In fact the most frequently used performance measure in the public sector is an output measure, namely productivity (OECD, 2002b; Perrin, 2003). For the purpose of this project organizational performance was understood as the ability of employees in an organization to produce a quantity of a service in a certain period of time. This definition is in line with the one by Wright for operational organizational performance measures which might include, for example, productivity contrary to financial performance measures focusing on expenses and profits (Wright et al. 2005).

2.2.4. Employee motivation

According to the psychological literature, motivation may refer to the direction, intensity, and persistence of a behaviour, such as acting as an employee in a goal-seeking or satisfying manner (PubMed, 2006). In the organizational sciences literature the term employee motivation is, however, frequently used interchangeably with the term affective employee commitment. Affective commitment reflects the extent of employees' identification with an organization and their degree of involvement in a work unit and the organization as a whole (Meyer and Smith, 2000; Tziner and Kopelman, 2002). In this project thus not only the literature regarding HRM activities and employee motivation was taken into consideration, but texts examining the HRM activities and affective-commitment relationship were also consulted. For reasons of simplicity, however, the author did only use the term employee motivation when building the evidence-based framework and the System Dynamics model.

2.2.5. Computer simulation

In this project the term computer simulation was understood as defined by Davis et al. (2005):

“... we define simulation as a method for using computer software to model the operation of real world processes, systems, or events. Simulation models are hence simplified pictures of the world, having some, but not all, of the characteristics of that world. Simulation involves creating a computational representation of the theoretical logic that links constructs together with these simplified worlds. These representations are then coded into software that is run under varying experimental conditions.”

(Davis et al. 2005 p.3-4)

3. Methodology

3.1. Research Problem

The impact of HRM on public service performance is widely accepted in conceptual and empirical work, the mechanisms and interactions through which HRM leads to organizational performance still remain largely unexplained.

3.2. Aims and Objectives

The overall aim of this research project was to explore the relation between performance appraisal decisions and organizational performance in the public sector. In order to achieve this aim the following objectives had to be planned for:

- Reviewing the international research literature on performance appraisal techniques in both the profit and the public sectors in order to identify and examine empirical studies analyzing the relationships between performance appraisal techniques and organizational successes.
- Building an evidence-based framework within the context of the existing literature, integrating the various partial explanations for the influence of performance appraisal techniques on organizational performance in the public sector.
- Developing a System Dynamics computer model delineating the effects of different performance appraisal practices upon organizational performance in the public sector.

3.3. Sampling the Research to be Reviewed

To identify original research professional journals are generally considered as a good source of information. They have the advantage of being up to date and of good quality as most have been refereed by an external reviewer before publication. A further advantage of articles in journals is that they are mainly reported by those who gathered the information (original source) and are thus less biased and more accurate than data from secondary sources. The use of computer databases is seen as an effective way to search journal literature over a wide time span or several disciplines (NHS, 2001). This approach was thus adopted as the main method of identifying original research for this project.

Online links of the University of Lugano were used to access the following relevant databases:

ISI Web of Knowledge 2000-2006

OECD publications 2000-2006

Another readily available database, namely JSTOR, was not searched because of the “moving wall” problem: there is typically a gap of five years between a journal’s most recently published issue and the content available through JSTOR.

The electronical journal search processes, as well as the research terms used, are described in more detail in **Appendix I**. In order to retrieve unpublished studies and books three experts in the field (all at professor level) of the University of Lugano were consulted.

3.4. Computer Modelling as a Research Method

3.4.1. Computer modelling and organizational theory

During the 1950s and 1960s several highly considered social and organizational scientists started to integrate computer simulations into social science methods. At this time computer simulation was often enthusiastically described as the “wave of the future”. In the following decades its impact on the international research agenda was, however, rather small. Simulation models became tolerated but only few studies were conducted and disseminated in mainline journals (March, 2001). More recently, however, computer simulation seems to have entered its “renaissance” period. Until the 1970’s, research in the organizational field put much emphasis on comparative methods and therefore on conventional mathematical models of analysis. More progressive perspectives started then to take into consideration dynamic complexity and hence non linear effects, such as mutual influence (feedback loops) and time delays (March, 2001; Sastry,2001; Sterman,2000; Sterman, 1992; Davis et al. 2005). As a consequence, computer simulations reemerged as a significant methodological approach and have been chosen in various important research projects as the primary method (Davis et al. 2005). The recent

success story of computer simulation should, however, not be merely attributed to issues of analytical complexity. Lomi and Larsen (2001), for example, highlight:

“...rather than specialized tools for problems of data scarcity or analytical complexity, computational models of organizations are frequently developed interactively with other sources of information, like experimental data, direct empirical observations, and the results of partial formal analysis. The multiplicity of information sources that can be exploited in the theory building process, and the possibility to specify explicit models based on fragmented knowledge, are distinctive features of computational models of organizations.”
(Lomi and Larsen, 2001 p.11)

But the computer modelling echo in international research literature has not only been positive. Simulation approaches have also been criticized for being unclear, controversial and inaccurate (Lomi and Larsen, 2001; Davis, 2005;). Lomi and Larsen (2001) do counter this argument by highlighting the fact that computer simulation models have played a key role in developing organizational theories from the onset: in one publication, which has been of central importance to define the field, simulation was considered to be as legitimate as other methods (field, experimental or mathematical) to study organizations (March, 1965 cited by Lomi and Larsen, 2001). Well designed computer models of organizations do distinguish themselves from other models merely by the specific language which has to be used. Validation issues can be considered as being not more or less problematic than those in other kind of models (Lomi and Larsen, 2001). Nowadays computer models are thus recognized as a legitimate way for studying the dynamics of complex social systems and hence for enhancing organizational theory building and testing (March, 2001; Davis, 2005).

The overall aim of this project was to explore the relation between performance appraisal decisions and organizational performance in the public sector. With a view to the above, computer simulation can be regarded as a valid tool for this purpose.

3.4.2. System Dynamics (SD) modelling as a simulation approach

After having decided to address the research question of this project by means of computer modelling, a simulation approach had to be chosen. There exist various well-known simulation methods (System Dynamics, NK Fitness Landscape, Genetic Algorithms, Cellular Automata, Stochastic Processes)² for theory building and testing (Lomi and Larsen, 2001; Davis, 2005). For this project the System Dynamics (SD) approach has been used. In the following section the SD modelling approach itself as well as the reasons that led to its choice will be described in more detail.

SD modelling was first developed by Jay Forrester in the 1950's at the Massachusetts Institute of Technology. Initially Forrester used the approach to study the behaviour of complex feedback systems, such as flight simulation systems and air defense systems, interacting with each other. At a later stage Forrester started to work at the newly-founded Sloan School of management and applied his knowledge to organizational theories. When analyzing firm processes, Forrester observed oscillations in production capacity to be related to time delays and circular causal loops, which were influencing decisional processes within the organization (Mollona, 2000; Sterman, 2000). Subsequently, Forrester developed mathematical models, and later computer programs, to simulate the way feedback processes of mutual influence and temporal features may impact on the behaviour of organizational systems (Mollona, 2000; Sterman, 2000; Sastry, 2001). In his SD approach, Forrester modelled the system of an organization by means of simple series of processes with circular causality (variable A influences variable B and vice versa). Such causal loops within a system were described as either being positive (reinforcing, amplifying) or as being negative (dampening, balancing). Furthermore the SD system included stock variables and flows (Mollona, 2000; Davis, 2005). A stock variable may act as a buffer and introduce time delays as its value increases or diminishes over time (t) depending on the strengths of inflows or outflows. Mathematically a stock (S) can be represented as an integration of a flow (F):

$$S_t = S_{t_0} + \int_{t_0}^t F \cdot dt$$

² see **Appendix II** for description of simulation methods other than System Dynamics

On the contrary, flows (F) can be described as the derivatives of a stock (S):

$$F = \frac{dS}{dt}$$

While each of the above processes may well be understood singularly, their interactions are frequently most difficult to anticipate without running a simulation model (Mollona, 2000; Davis, 2005). As a consequence, Forrester's SD modelling approach has become increasingly important to simulate the behaviour of organizational systems with complex causality and timing. Mollona (2000) cites several well-known authors, like Senge (1990), Sterman (1987, 1989) or Morecroft (1983, 1985), who have started to promote the use of SD-models in organizational research during the last decades.

In the performance appraisal literature processes of mutual influence (e.g. between firm performance and employee motivation) as well as time delays (e.g. slow accumulation and fast dissipation of employee motivation over time) are frequently described issues (Wright et al. 2005 and Mollona, 2000 respectively). As mentioned above, SD modelling is particularly applicable to explore the behaviour of organizational systems with complex causality and timing (Mollona, 2000; Davis, 2005) and can hence be regarded as an adequate simulation method for the purpose of this project. Other simulation methods seem to be less appropriate to model precisely this specific organizational behaviour. According to Davis (2005), genetic algorithms, for example, are more adapted to examine which factors might be the key to the speed and effectiveness of organizational change and cellular automata and NK landscapes are most valid to describe why macro-level phenomena emerge and change due to processes (e.g. diffusion, competition) operating at a micro-level (Davis, 2005).

In the sections above, the research problem along with the research aim and objectives were outlined. Furthermore arguments in support of developing an evidence-based framework and using computer modelling (System Dynamics) to achieve the aim set were described. According to Sterman (2000), after having articulated the problem to be

addressed, the researcher should proceed with an explanation of the dynamics characterizing the problem (formulation of a dynamic hypothesis or theory). For this purpose in the following chapter firstly the evidence from the international literature regarding the performance appraisal – organizational performance relationship was summarized narratively. In order to examine effects between key variables various propositions were formulated. Furthermore also variables not included in the framework (model boundary) were identified. In a subsequent step System Dynamics Modelling was used to represent graphically the causal structure of the framework by means of causal loop diagrams and stock and flow maps.

As it lies in the professional interest area of the author, this literature review includes texts on public health care management. The public health care domain is increasingly integrated into definitions of public service and is often studied and cited in research regarding public service provision (Haatainan and Sihvonen, 2006; OECD, 2004;2002d; Politt, 2005). In addition the literature review covers texts on the private sector: clearly the public domain can draw significant and important information and support from this body of work (Devenna, 1984; Lesink, 2006; Steen, 2005). Regarding the evidence based framework, however, the propositions of this report were developed solely on the basis of the best available evidence from studies in the public sector and from reviews integration studies conducted on public services.

4. Developing the Evidence-Based Framework

4.1. The HRM – Organizational Performance Relationship

Almost all organizational theories, concerning public and as well as private organizations, do retain certain forms of organization having a competitive advantage over other forms (Gruen, 2001). Yet regarding the details of these forms much controversy and competing models do exist. In the first third of the 20th century the state of the art was strongly influenced by the classical formulations. Despite differing perspectives the key idea at that time remained to discover a single, universally applicable model to manage organizations (Gruen, 2001; Buchanan and Huczynski, 1997; Carroll and Harrison, 1994). During the last seventy years organizational theories have, however, continuously drifted away from “one best way” principles. In the 1950s and 1960s empirical research showed organizational performance and organizational “laws” advocated by classical theorists not necessarily to be correlated. On the contrary, differing organizational forms were found to be equally successful. The view emerged that innovative organizational design solutions must be contingent upon the circumstances influential at a certain point in time (contingency approach) and must hence be tailored to the specific needs of a firm (Buchanan and Huczynski, 1997; Gooderham et al. 1999).

The contingency approach first evolved focusing on organizational strategies and structures. Initially two sub schools developed, namely “environmental determinism” and “strategic choice”. Environmental determinists underline a company’s high dependency on its environment: in response to changes of the environment organizations are continuously forced to adapt their strategies (Buchanan and Huczynski, 1997; Iles, 2005). The strategic direction adopted then determines the degree of universality or diversity the organization may adopt in its structure (Iles, 2005). Strategic choice authors, on the contrary, argue that different organizations may also perceive their environment differently. Organizations’ strategies and structures are hence not merely reactions to changing environmental influences: managers’ viewpoints become of key importance for decisions regarding appropriate organizational strategies and structures. Managers create and influence the environments to which organizations adapt. Despite the above differences, the environmental determinism and the strategic choice school are part of the same

contingency approach, as they both agree that there exists a link between environmental circumstances and organization's strategies or structures (Buchanan and Huczynski,1997). According to Gruen (2001) and Peters and Waterman (2000) contingency theories' initial concentration on strategies and structures was mainly due to the historical analysis by Alfred Chandler. His thesis that "structure follows strategy" had a most important impact on two decades of organizational management. During the sixties and seventies of the last century firms that failed to adapt their structure to new strategies were believed to be prone to ineffectiveness. In the late seventies it became, however, clear that significant difference in performance might exist even in organizations with very similar structures and strategies. Increasingly thus also issues of strategy implementation have been taken into consideration (Kaplan and Norton, 2001;2001b). The importance of alternative managerial tools facilitating the implementation of a strategy such as HRM systems began to be acknowledged. Devenna (1984) and Kaplan and Norton (2001) for example pointed out:

"To accomplish its mission or objectives, the firm must decide what optimal structure is needed to carry out its objectives. Once the nature of the structure is decided upon, it must attract and retain sufficient numbers of people to carry out the task needed to see that its objectives or strategies are effectively implemented.... Mission and strategy, formal structure, and human resource management are interrelated systems embedded in a turbulent environment."
(Devenna,1984 p.35)

"....just as firms will be faced with inefficiencies when they try to implement new strategies with outmoded structures, so they will also face problems of implementation when they attempt to effect new strategies with inappropriate human resource management systems."
(Devenna,1984 p.37)

"...ability to execute strategy can become more important than the strategy itself."
(Kaplan and Norton,2001 p.1)

Organizational performance can hence also partly be seen as a function of the contents of an HRM system. During the last decade international research literature has universally reported a significant relationship between core HRM practices and organizational success (Becker and Gerhart, 1996; Green et al. 2004; Guthrie and Datta, 2004; Wright et al.2005). Similarly also more recent theoretical work does highlight the crucial role HRM might play in augmenting organizational performance: according to the resource-based view, firms can only build up and maintain competitive advantage when they are able to create it in a

way which is demanding for competitors to imitate. Compared to traditional sources of competitive advantage like, for example, natural resources, technology or economies of scale, complex social structures such as an employment system are more difficult to imitate and might hence be a key source for creating competitive advantage (Becker and Gerhart, 1996; Miner and Mezias, 1996; Kaplan and Norton, 2001; Meneguzzo, 2000).

4.2. The Performance Appraisal – Organizational Performance Relationship

4.2.1. The best practice – fit debate

According to numerous experts in the field, there exists an identifiable set of best HRM practices which have an additional enhancing effect on firm performance and which can be generalized (best practice approach). This view is, however, inconsistent with the one of resource-based view authors' (internal fit approach). They highlight instead that a sum of individual HRM activities may only have a limited potential to effect firm performance significantly. Only in combination, by creating firm-specific and hence not generalizable synergies, may HRM activities fully enhance competitive advantage (Becker and Gerhart, 1996). Nevertheless, Becker and Gerhart (1996) do not consider the best practice approach and the internal fit approach as being contrary to each other. They highlight that the two perspectives do merely operate at diverse levels of analysis. There may exist, for example, a best practice in the "architecture" (guiding principles) of an HRM system. An architectural element might for example be that employee performance is valued and rewarded or sanctioned. This specific architectural element would hence be expected to have a generalizable best practice effect on firm success. Although there may exist a best HRM system architecture, however, the individual HRM activities implemented in a particular organization (e.g. a mix of review sessions, incentive pay and promotions) have to be aligned with each other and have to be in accordance with the HRM architecture in order to have an effect on firm performance (Becker and Gerhart, 1996).

The ideas of Becker and Gerhard (1996) regarding different levels of analysis have been used as a basis to develop this project's framework. The HRM architectural element that employee performance is evaluated and good performance is rewarded whereas unsatisfactory performance is sanctioned, was expected to have a generalizable best practice effect on firm success in the profit sector as well as in the public sector.

Architectural options where evaluation of employee performance was lacking or remained without consequences were not taken into consideration in this project.

As mentioned above, in order to achieve a significant effect on firm performance, however, also a firm specific mix of HRM activities, consistent with this best HRM system architecture has to be chosen. These activities must be aligned with each other. In an initial step, this project aimed to identify and represent such activities-combinations specific to the public sector. The following sections of this chapter describe in detail how the single building blocks for the framework as well as propositions describing relationships between them were derived from the international research literature.

4.2.2. Influencing organizational performance through performance appraisal activities

Empirical tests of basic causal models showed performance evaluation practices may impact positively on individual as well as group work motivation. This in turn can lead to higher levels of individual and group performance and hence improved levels of organizational performance (ERC, 2006; Green et al. 2004; Wright et al. 2005; Stanton, 2000). Performance evaluation may enhance individual and group performance in two ways: through developmental review sessions and through administrative decisions. Administrative decisions work as motivators by providing extrinsic rewards/sanctions, for example, in the form of performance-related pay, promotion or discharge. Developmental review sessions effect on motivation by supplying intrinsic rewards like the recognition of achievement and effort (OECD, 2005; Rynes et al. 2005). Some authors argued that a positive influence on firm performance can only be achieved if these two performance appraisal activities are separated in time from each other (Meyer et al. 1965) cited by (Rynes et al. 2005). Although the publication by Meyer et al. (1965) had a major impact on practice, empirical studies which aimed to test the assertion, have failed until now to find supportive evidence (Rynes et al. 2005). Firm performance seems hence to be improved most when employees receive both information enabling them to perform better and incentives when reacting adequately on that information (Rynes et al. 2005). With a view to the above, the first propositions for this project may be formulated as follows:

Proposition 1

Employee performance evaluation practices may impact positively on individual as well as on group work motivation.

Proposition 2

Improved individual and/or group work motivation enhances individual and/or group performance.

Proposition 3

Higher levels of individual and/or group performance enhance organizational performance.

Proposition 4

Organizational performance may be improved most when performance evaluation practices do include both administrative activities and developmental review sessions and when these two activities are not separated in time from each other.

The successive paragraphs [4.2.3. a) and b)] include a more comprehensive description of how organizational performance may be influenced by administrative activities. In **section 4.2.4.**, the relationship between organizational performance and developmental review sessions will be outlined in more detail.

4.2.3. Influencing organizational performance through administrative performance appraisal activities

a) Linking pay and performance (performance-related pay systems/performance based rewards)

If an organization introduces a performance-related pay system, a variable part of the pay is attributed on a periodic basis depending on performance. Usually performance-based reward systems are applied at the individual employee level; they can, however, also be applied at the team or unit level (OECD, 2003). Linking pay to performance is not a very recent invention. The idea of using performance-related pay systems to boost performance can be traced back to Taylor's scientific management approach developed in the 19th century (OECD, 2003). However, during a great part of the 20th century three motivational theories, namely, Maslow's need hierarchy theory, Herzberg's motivation-hygiene theory, as well as Deci and Ryan's cognitive evaluation theory, have dampened the interest of examining closer the links between performance, performance evaluation and performance-pay. All three theories considered monetary incentives as not being a major motivational technique (Rynes et al. 2005). These predictions could, however, not be

sustained by empirical evidence: more recent extensive reviews as well as meta-analytical evidence come to the conclusion that in the private sector monetary rewards (such as merit pay, gain sharing, profit sharing and stock plans) must be a key motivational factor or probably even the most crucial motivational factor (Locke et al.1980; Cameron et al.2001; Gerhard and Rynes, 2003) cited by (Rynes et al. 2005). It is hence not astonishing that performance-pay approaches have become one of the most frequently introduced policies aiming at augmenting motivation and performance in the private sector during and after the economic crisis of the mid-1970s (Landel, 2004; OECD, 2003; Rynes et al. 2005). The diffusion of performance-related pay schemes in private firms had a strong influence on public sector organizations. During the mid-1970s also the public sectors started to come under pressure. Economic and budgetary difficulties in the OECD member countries led to socio-economic pressures to improve performance management. Performance-pay approaches (merit increments and bonuses³) have hence increasingly been extended also to public sector organizations. As in the private sector, the main reason for introducing performance-related pay systems was the improvement of motivation and performance of employees and managers (OECD, 2003;2003b;2005; Varone and Giauque, 2001). At present two thirds of all OECD countries have implemented or are about to implement a performance-related pay scheme (Landel, 2004; OECD, 2005;2005b). Experts in the field assume that its use will continue to grow in the future, as currently there is widespread support among public sector managers for the principle performance based reward systems (OECD, 2004;2003).

In the light of the above, the introduction of performance-related pay systems in the public sector seems to be an appealing idea. Recent empirical studies do, however, reveal such schemes to be much less effective in terms of motivation and performance improvement than generally assumed (Forest, 2006; Landel, 2004; OECD, 2003;2005). Several large-scale surveys among public sector employees in OECD countries (OECD, 2001;2003;2005) have shown performance based monetary rewards ranking low as motivational factors. Compared to the private sector, the design and implementation of performance-related pay systems in the public sector appears to be more problematic, for various reasons. Often it proved, for example, to be most difficult to find suitable quantitative indicators, especially at the individual level, for an accurate measurement of

³ such performance-related pay elements (relying on ex post evaluation) should not be confused with other elements of variable pay like for example remuneration (based on ex ante evaluation of likely job demands) linked to the nature of duties associated with a position (OECD,2005)

performance (Landel, 2004; OECD, 2002c;2002d;2005; Rynes et al. 2005). Furthermore supplementary pay increases for performance appear to act rather as second-rank incentives as they generally seem to be too low in order really to be motivating (OECD, 2003;2005). Additionally, the costs for running a performance-related pay system were frequently underestimated by public managers. As a consequence, budgeted funding was often insufficient from the onset to run the system properly (Landel, 2004; OECD,2003;2005).

In the light of the above, we can conclude that also in the public sector, performance-pay systems may have a positive influence on individual and/or group work motivation. Unlike in the private sector, performance-related pay is, however, only of secondary importance as a managerial tool for improving motivation. Moreover, in order to successfully implement and operate performance-related pay schemes in the public sector, certain preconditions have to be fulfilled (see OECD, 2005 guidelines **table 4.2.3.** below).

Table 4.2.3. adapted from Landel (2004) and OECD (2005)

Preconditions for a successful implementation of performance-pay schemes:

- *Involvement of employees in the preparation and implementation of the performance-related pay scheme.*
- *Solid objective setting process: objectives must be realistic and measurable ⁴*
- *Devotion of sufficient extra resources (financial and management) to planning, implementing and running the system*

⁴ Goal-setting is regarded as an extremely powerful management tool to improve performance. Organizational goal setting was found to have a positive impact on employee motivation and thus improve both employee and organizational performance (Green et al.2004; Michie and West,2004). The most extreme proponents of goal setting theory even highlight that goal setting alone will suffice to raise performance (OECD,2003b)

With a view to the above, a second set of propositions for this project may be formulated as follows:

Proposition 5

In the public sector, administrative performance appraisal practices/activities like performance-related pay schemes may impact positively on individual as well as on group work motivation.

Proposition 6

In order to lead to improved motivation, performance-related pay schemes must be properly designed and implemented. For this to occur, the following preconditions have to be fulfilled:

- Employee-participation*
- Quantitative performance measures*
- Devotion of sufficient resources to plan, implement and run the system*

Proposition 7

Performance-related pay is of secondary importance as a managerial tool for improving motivation.

b) Linking promotion and performance

Another well-known performance incentive is promotion. Around twenty years ago, it was the main incentive for public sector employees in OECD countries. As outlined in the previous chapter, only more recently performance-related pay schemes have been introduced in the public sector as substitutes or complementary incentives to promotion (OECD 2003;2005). Promotion possibilities seem, however, to have remained a most influential factor to enhance employee motivation and hence performance (De Pietro,2005; Michie and West, 2004; OECD, 2001). According to a large-scale survey among public sector employees in OECD countries (OECD, 2001), career opportunities (vertical promotion possibilities) rank among the higher prioritized motivational factors. Interesting job content has even been stated as the most important motivational element. Lateral promotion possibilities towards more stimulating jobs might thus even be regarded as the most important single motivational factor for public sector employees (De Pietro, 2005; OECD, 2001).

In the light of the above, the following set of propositions can be developed:

Proposition 8

In the public sector, administrative performance appraisal practices/activities such as promotion incentives may impact positively on individual as well as on group work motivation.

Proposition 9

Vertical and lateral career development possibilities are of primary importance as a managerial tool for improving motivation.

4.2.4. Influencing organizational performance through developmental review sessions

Regarding the developmental review sessions practice, again the theories by Meyer et al. (1965) have had a major impact over the last few decades: according to Meyer, review sessions where employees are praised have merely a small positive effect (if any) on performance improvements (Meyer et al. 1965) cited by (Rynes et al. 2005). These assertions could, however, not be supported by more recent meta-analytical empirical studies. On the contrary, it has been suggested that generally individual or group performance does improve after receipt of review sessions in the laboratory as well as in work settings, independently of whether the review session did contain praise or criticism (Tziner and Kopelman, 2002; Rynes et al. 2005). The work environment, the recognition of one's achievements seem to have a high impact as a motivational tool (Perrin, 2003). According to the large-scale OECD survey among public sector employees (OECD, 2001), such factors rank among the higher prioritized ones. In order to assure that review sessions will be effective, however, certain preconditions have to be fulfilled. First, development reviews should be held on a regular basis, ideally every six months (ERC,2006). Too frequent review sessions (> 4 sessions per year) should be avoided (Iles, 2005; Salvati et al. 2004; Stanton, 2000). Secondly, review sessions must never be demoralizing (e.g. criticise the person instead of his/her work). It has to be clearly communicated in an open, respectful way. For this to occur it is necessary to devote extra resources to train evaluators on a regular basis (Iles, 2005; Landel, 2004; Stanton, 2000). Last review sessions should be based on specific quantitative measures of performance (Iles, 2005; Landel, 2004; OECD, 2005; Rynes et al. 2005; Stanton, 2000). For this purpose, one of the two major types of performance rating tools currently used in the field [BOS(behaviour-based) rating formats)] seems to be more adequate than the other [GRS(graphic rating scales)-based rating formats]. Behaviour-based rating formats do define job performance in terms of specific, "pinpointed", observable actions. Raters are, for example, asked to record the frequency with which specific critical behaviour occur. This procedure increases the likelihood that goals will be framed in terms of specific, observable behaviour. Because of its preciseness, and its clearer format, BOS seems to reduce communication barriers, to increase employee-perceived justice with the performance appraisal tool, to lead to clearer and more observable goals and consequent increased motivation to carry them through (Tziner and Kopelman, 2002). Graphic rating

scales, on the contrary, do typically identify relatively broad and vague dimensions of performance-specific areas (e.g. “employee pays increased attention to details”). The review process with GRS is generally less focused and produces less specific, measurable job-related goals. As a consequence, GRS-based rating formats risk increasing communication barriers and reducing employee motivation to achieve set goals (Tziner and Kopelman, 2002). At present GRS-based performance appraisal sessions are widespread. This might explain why the performance appraisal process is frequently regarded by supervisors as an unpleasant task and is often avoided or postponed, especially if the motivational level of employees is a low one (Tziner and Kopelman, 2002; Iles, 2005).

With a view to the above, a further set of propositions for this project may be formulated as follows:

Proposition 10

In the public sector, developmental review sessions may impact positively on individual as well as on group work motivation.

Proposition 11

In order to lead to improved motivation, developmental review sessions must be properly planned for and implemented. For this to occur, the following preconditions have to be fulfilled:

- The review sessions should be effectuated by trained reviewers, to guarantee adequate frequency, transparency and respectfulness*
- Sufficient resources should be devoted to train reviewers*
- The review sessions should be based on quantitative performance measures, such as BOS (behaviour-based) rating formats*

Proposition 12

The performance appraisal process is frequently regarded by supervisors as an unpleasant task and often avoided or postponed, especially if the motivational level of employees is a low one and if no BOS (behaviour-based) rating formats are used.

Proposition 13

Developmental review sessions are of primary importance as a managerial tool for improving motivation.

4.3. Reverse or Reciprocal Causation

In a most robust recent literature review, Wright et al. (2005) examined the relationship between HRM staff motivation practices and various measures of firm performance. They found support for the basic causal model, stating that the adoption of HRM practices may indeed impact positively on employee motivation and organizational performance. However, only few of the reviewed studies did also test for a possible reverse causal order. As Beckert and Gerhart (1996) did a decade before, also Wright et al. (2005) do hence conclude that causal inferences on the HRM practices – firm performance relationship should be drawn with caution: the causal order might also be reversed. In other words: Wright et al. (2005) do not suggest that HRM practices may not have a positive impact on motivation and performance. But they dare to question the true causal relationship between these variables. A possible explanation might also be that organizations that perform well tend to invest more in HRM practices, which in turn pays off in increased motivation and performance (Wright et al. 2005).

In the light of the above, several new propositions might be added:

Proposition 14

High levels of organizational performance enhance investments in HRM practices.

Proposition 15

High levels of organizational performance enhance individual and/or group work motivation.

4.4. Model Boundary

As outlined earlier in the text, simulation models are simplified representations of the world including some, but not all characteristics of it (Davis et al. 2005; Levinthal, 2001). Sterman (2000) thus highlights the importance of not limiting the description of a constructed model merely to the variables included. Variables which the researchers have decided to exclude should also be reported (model boundary). The following paragraphs thus aim to delineate the model boundary of this project.

4.4.1. Factors other than HRM systems influencing organizational performance

In **section 4.1.** several management activities supposed to have a key influence on organizational performance were outlined:

- Managing organizational structure
- Managing organizational strategy
- Managing HRM systems

In international literature organizational performance is, however, not merely described as a function of the above three management activities. When properly instituted, besides HRM systems, several other instruments, such as financial management, communication management and IT-management systems may contribute to enhancing organizational performance (OECD, 2001;2001b; Peters and Waterman, 2000). Besides structure, strategy and systems, also leadership style and organizational culture are frequently cited as having a most positive impact on organizational performance (Forest, 2006; OECD,2001;2001b; Peters and Waterman, 2000; Plamper, 2007; Wright et al. 2005).

This project aims to explore further the relation between HRM decisions and organizational performance in the public sector. The focus of the developed computer model is hence limited to the HRM system – organizational performance relationship. Other possible management systems, as well as activities to manage organizational strategy and structure, are deliberately excluded from the model.

4.4.2. HRM activities other than performance appraisal influencing organizational performance

Numerous experts in the field (Devenna, 1984; Gruen, 2001; Michie and West, 2004; Wright et al. 2005) see HRM management as consisting of a set of core components, namely, HRM planning, job description, recruitment, performance appraisal, pay management and training. In order to explore the relation between HRM decisions and organizational performance this project focused on one particular HRM activity, namely, performance appraisal. Activities like HRM planning, job description, recruitment, and training were not included in the computer model developed for this project.

Besides the above-cited core activities, some authors do also integrate broader formal management practices into their HRM framework definition (De Pietro, 2005; Gruen, 2001). These might for example comprise:

- Managing employment relations (e.g. collaboration with trade-unions, job security issues)
- Managing employment reform (e.g. redundancy planning)

For the purpose of this project these management activities were attributed to the formal organizational strategy domain (Michie and West, 2004), which was, as outlined in **paragraph 4.4.1.** above, excluded from the framework developed in this study.

4.4.3. Factors moderating or increasing responses to review sessions: self-efficacy and optimism

Robust empirical research generally reports an improvement of performance following individual or group review sessions (see **paragraph 4.2.4.** above). At the same time several studies do also point out significant differences in improvement for individuals or groups after review sessions (Rynes et al. 2005). Therefore possible factors that may moderate or increase responses to review sessions should also be taken into account (Rynes et al. 2005). An important construct identified in the international literature in this context is self-efficacy (Green et al. 2004; Karl et al. 1993). Self-efficacy may be defined as an employee's belief about how successfully he/she may carry out a task. A closely related construct to self-efficacy is the one of optimism. Compared to persons with low self-efficacy (or optimism) levels, individuals with high self-efficacy tend to show superior work motivation and performance after review sessions (Green et al. 2004; Karl et al. 1993). Nevertheless the concept of self-efficacy has not been integrated into this project's model. The models' focus was on exploring how organizations may influence employees' motivation through one particular HRM activity (performance appraisal) in the public sector. The self-efficacy level was assumed to be a given constant among public sector employees at the point of performance appraisal. This constant might be influenced by increasingly recruiting personnel with a high level of self-efficacy. However, the HRM activity "recruitment" was, as outlined in **section 4.4.2.** above, not an integral part of the computer model developed for this project.

4.5. Representing the Evidence-Based Framework by Using a SD Modelling Approach

In the prior sections of this report the empirical evidence from the international literature on the performance appraisal – organizational performance relationship was summarized and propositions were formulated to describe effects between key variables. A synopsis of all developed propositions can be found in the **table 4.5.** (pages 40-41). This table also includes information on the evidence-level⁵ of the public sector studies upon which each proposition was based.

System Dynamics Modelling (SD-programme Vensim®) was employed to represent graphically the causal structure of the framework by means of causal loop diagrams and stock and flow maps. As recommended by Sterman (2000), the construction of the graphical representation will be explained stepwise and in detail. An illustration of the complete graphical model can be found in **figure 4.5.2d** (page 62).

⁵ see UWM, 2006 **Appendix IV**

Table 4.5.

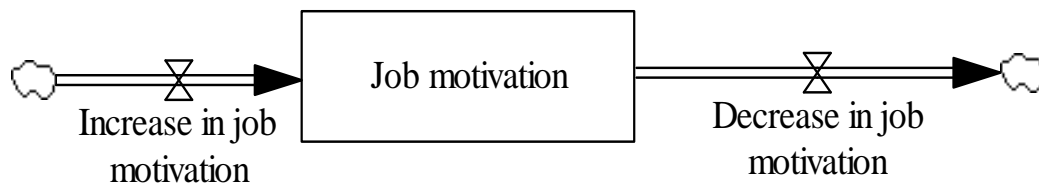
Proposition Number	Proposition	Evidence-Level
1	<i>Employee performance evaluation practices may impact positively on individual as well as on group work motivation</i>	1A Wright et al. (2005)
2	<i>Improved individual and/or group work motivation enhances individual and/or group performance</i>	1A Wright et al. (2005)
3	<i>Higher levels of individual and/or group performance enhance organizational performance</i>	1A Wright et al. (2005)
4	<i>Organizational performance may be improved most when performance evaluation practices do include both administrative activities and developmental review sessions and when these two activities are not separated in time from each other</i>	1A Rynes et al. (2005)
5	<i>In the public sector, administrative performance appraisal practices/activities like performance-related pay schemes may impact positively on individual as well as on group work motivation</i>	1A OECD (2005)
6	<i>In order to lead to improved motivation, performance-related pay schemes must be properly designed and implemented. For this to occur, the following preconditions have to be fulfilled:</i> <ul style="list-style-type: none"> • <i>Employee-participation</i> • <i>Quantitative performance measures</i> • <i>Devotion of sufficient resources to plan, implement and run the system</i> 	1A OECD (2005)
7	<i>Performance-related pay is of secondary importance as a managerial tool for improving motivation</i>	3A OECD (2003)
8	<i>In the public sector, administrative performance appraisal practices/activities such as promotion incentives may impact positively on individual as well as on group work motivation</i>	1A OECD (2005)
9	<i>Vertical and lateral career development possibilities are of primary importance as a managerial tool for improving motivation</i>	3C OECD (2001)
10	<i>In the public sector, developmental review sessions may impact positively on individual as well as on group work motivation</i>	1A Rynes et al. (2005)

Table 4.5.

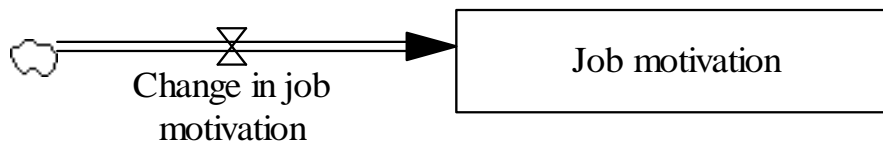
Proposition Number	Proposition	Evidence-Level
11	<p><i>In order to lead to improved motivation, developmental review sessions must be properly planned for and implemented. For this to occur, the following preconditions have to be fulfilled:</i></p> <ul style="list-style-type: none"> <i>• The review sessions should be effectuated by trained reviewers, to guarantee adequate frequency, transparency and respectfulness</i> <i>• Sufficient resources should be devoted to train reviewers</i> <i>• The review sessions should be based on quantitative performance measures, such as BOS (behaviour-based) rating formats</i> 	1A OECD (2005)
12	<i>The performance appraisal process is frequently regarded by supervisors as an unpleasant task and often avoided or postponed, especially if the motivational level of employees is a low one and if no BOS (behaviour-based) rating formats are used</i>	3B Iles (2005)
13	<i>Developmental review sessions are of primary importance as a managerial tool for improving motivation</i>	3C OECD (2001)
14	<i>High levels of organizational performance enhance investments in HRM practices</i>	1A Wright et al. (2005)
15	<i>High levels of organizational performance enhance individual and/or group work motivation</i>	1A Wright et al. (2005)

4.5.1. Representing effects of performance appraisal activities on job motivation

In order to represent “job motivation” in the SD-model a stock variable has been created. Stock variables are displayed as a box by the Vensim programme. A stock variable may increase or diminish over time, depending on the strength of inflows and outflows. Inflows (see “increase in job motivation”) and outflows (see “outflows in job motivation”) can be created with Vensim as “pipe” sections with sources and sinks (cloud symbols):



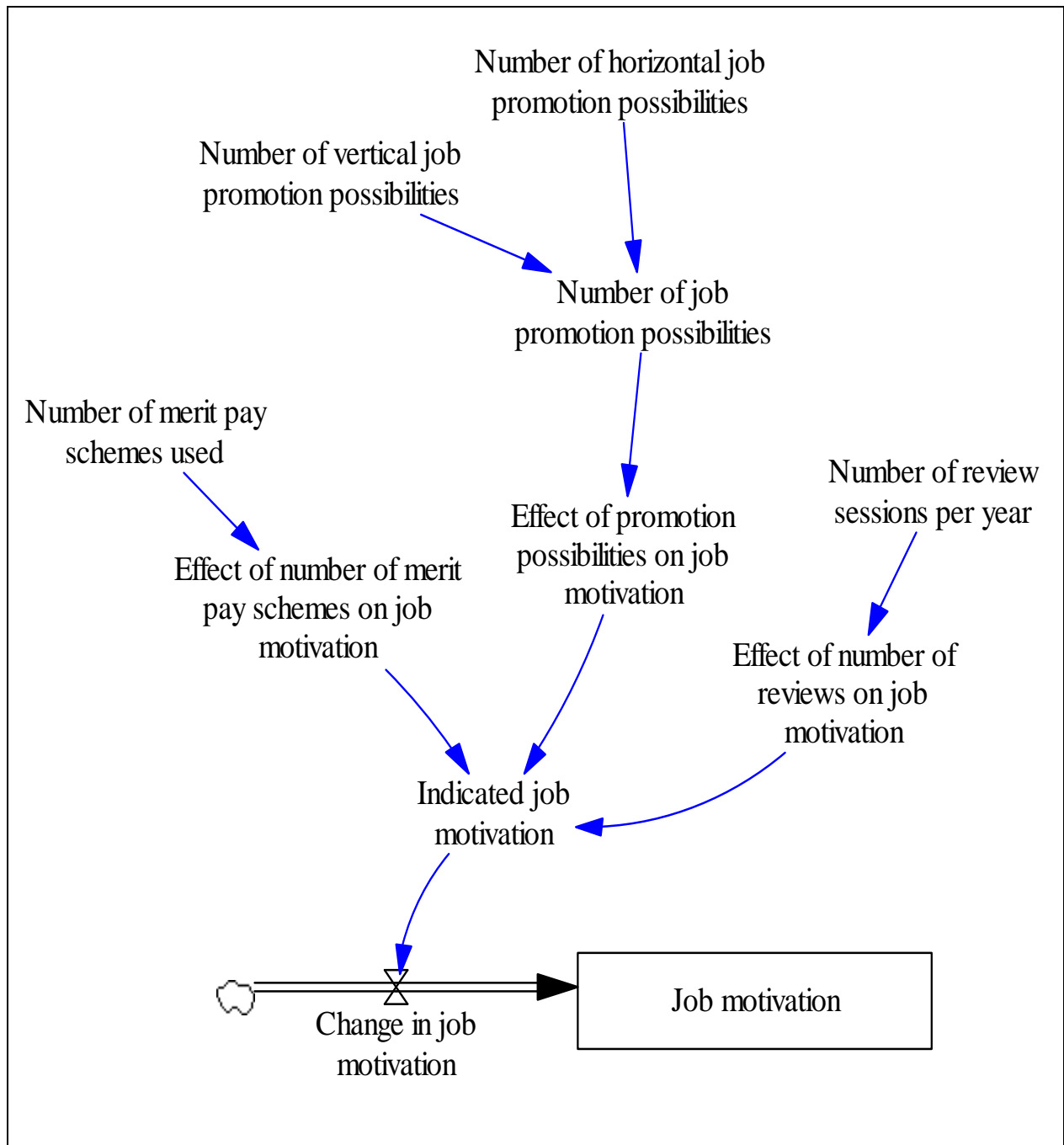
In this project inflows and outflows were, however, united in one single “pipe” representation named “change in job motivation”:



This option can be used, to facilitate graphical representation (Larsen, E.R. 2006 personal communication). “Change in job motivation” includes both possibilities: a change of job motivation in a positive direction (inflow, increase) as well as a change in a negative direction (outflow, decrease) depending on the mathematical input (positive or negative values respectively).

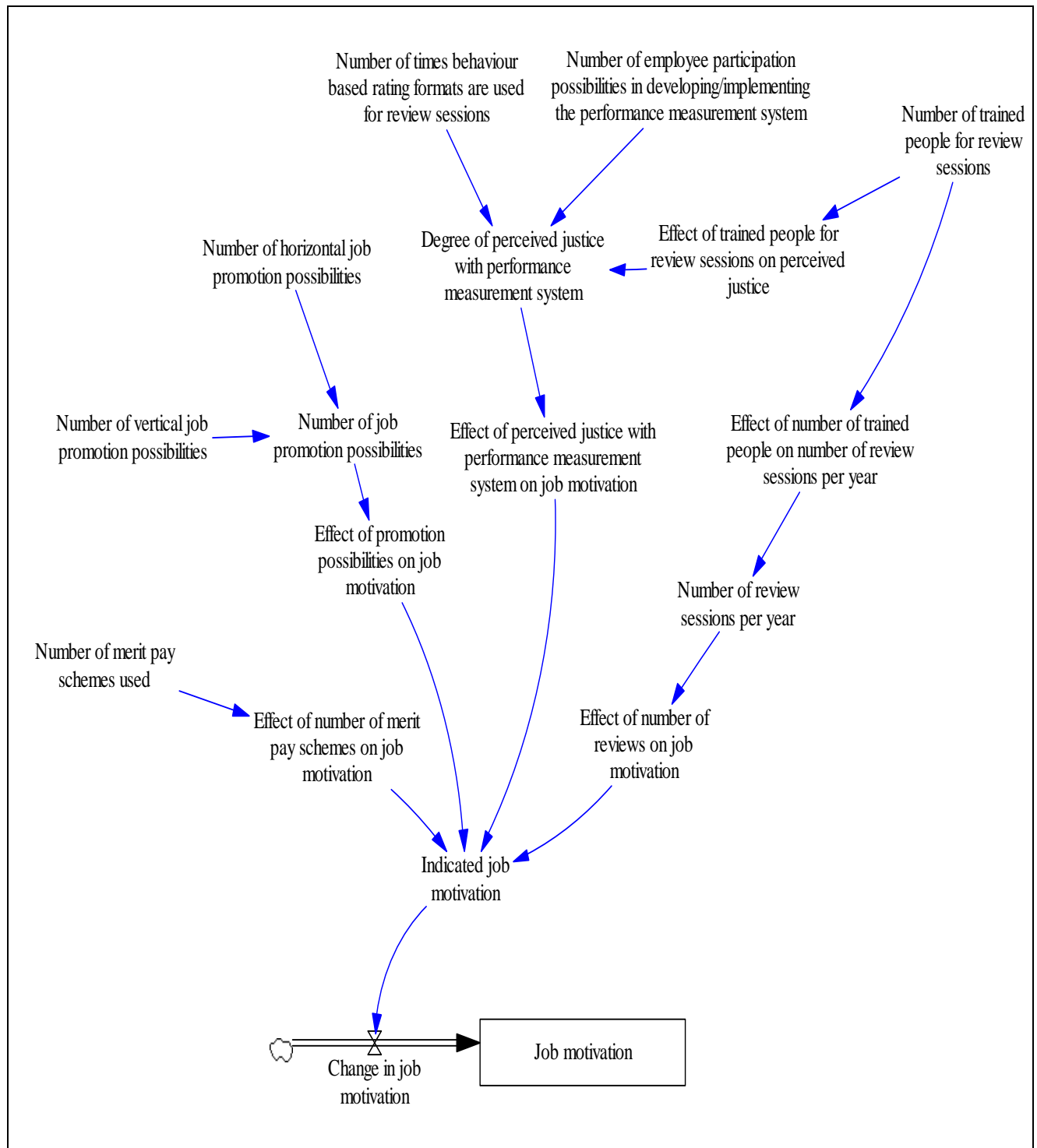
In the next step, the variables supposed to cause a change in job motivation (employee performance appraisal practices) were included in the model based on the propositions made previously (see **table 4.5.** pages 40-41). *Proposition 1-3* suggest performance appraisal practices do influence employee/job motivation and hence organizational performance. Such an effect is supposed to be maximized when both administrative performance appraisal practices/activities and developmental review sessions are conducted contemporaneously (see *propositions 4 and 10*). Administrative performance appraisal activities may include performance-related pay schemes (see *proposition 5*) as well as promotion incentives, which might include horizontal and vertical job promotion possibilities (see *propositions 8 and 9*). The number of merit pay schemes used, the number of horizontal and vertical job promotion possibilities as well as the number of review sessions conducted per year were thus represented in the model as effecting on job motivation. This was done by creating corresponding auxiliary variables with the Vensim programme. Auxiliary variables as well as stock variables were then linked by means of arrows in order to represent the causal processes (see **figure 4.5.1a** page 44).

Figure 4.5.1a



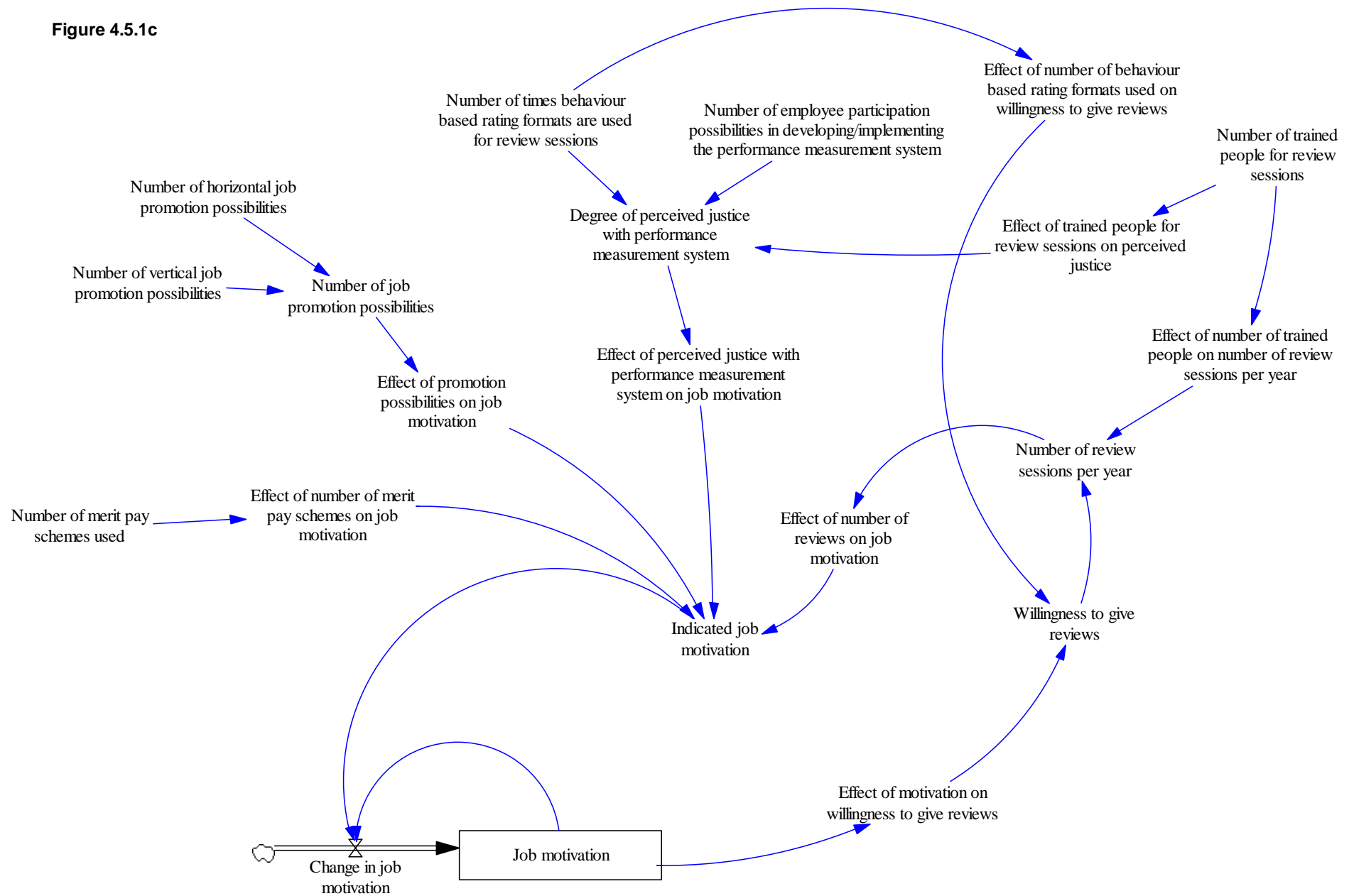
Subsequently, other influencing variables identified in the scientific literature were also added to the model (see **figure 4.5.1b** page 46). The use of behaviour based rating formats (and hence of objective performance measures), the number of employee-participation possibilities to develop the system, as well as the number of people trained for review sessions may all (see *proposition 6 and 11*) have a key influence on the degree of employees' perceived justice with the performance measurement tool and hence on job motivation. The number of people trained for review sessions is also known to have an impact on the frequency of review sessions conducted per year (see *proposition 11*).

Figure 4.5.1b



Furthermore from empirical work we know that the motivational level of personnel itself may enhance or inhibit supervisors' willingness to give reviews (*see proposition 12*). Therefore a link between "job motivation" and "number of review sessions per year" was also created by introducing the variables "effect on motivation on willingness to give reviews" and "willingness to give reviews". The first series of processes with circular causality (feedback loop number 1) was thus integrated into the model: the number of review sessions per year may influence job motivation and vice versa. The same is true for the "change in job motivation" and "job motivation" relationship (feedback loop number 2). The newly created variable "willingness to give reviews" might be influenced by the use or non-use of quantitative performance measures such as BOS (behaviour-based) rating formats (*see proposition 12*). A corresponding link between the "number of times behaviour based rating formats are used for review sessions" and the variable "willingness to give reviews" was hence introduced in the model. Two further links were added between the "number of trained people for review sessions" and "the number of review sessions per year" as well as between "the number of trained people for review sessions" and the "degree of perceived justice with the performance measurement system" respectively. These latter links were based on *proposition 11*. The model constructed so far (**figure 4.5.1c**) is represented on the next page.

Figure 4.5.1c



With Vensim the causal structure of a model can be constructed graphically with relatively ease by linking icons of auxiliary/constant variables as well as stock and flow maps by means of arrows. Mathematical links between stocks and flows may then be created. A stock can be represented as an integration of a flow by clicking on the stock variable and subsequently by choosing the initial variable from the “editing equation” pop-up window. Similarly, flows can be described as the derivatives of a stock by defining mathematical relationships in the ad-hoc “editing equation” pop-up window.

In the model developed so far, the stock variable “job motivation” was hence represented mathematically as an integration of the flow “change in job motivation”:

$$\text{Job motivation} = \text{INTEG} (\text{Change in job motivation})$$

It was, however, known not only that the stock variable “job motivation” may be influenced by the flow “change in job motivation”, but that the stock variable “job motivation” may also enhance or inhibit the flow “change in job motivation” (see feedback loop number 2 above). Hence it became necessary to represent mathematically the flow “change in job motivation” as the derivate of the stock “job motivation”:

$$\text{Change in job motivation} = (\text{Indicated job motivation} - \text{Job motivation})$$

Possible interactions between these variables may, however, never take place instantaneously. Also the factor time had thus to be considered in the model. Time delays of a non-physical nature may be represented with the aid of the smooth function of the Vensim programme (Stermann, 2000). For the purpose of this project, time delays were, however, not described by using this function. In order to achieve the same effect the variable “time to change job motivation” was integrated directly into mathematical functions (Larsen, E.R. 2006 personal communication) as follows:

$$\text{Change in job motivation} = (\text{Indicated job motivation} - \text{Job motivation}) / \text{Time to change job motivation}$$

Besides time delays, the construct “base motivation” had also to be taken into consideration. Employee job motivation may not start from “scratch”. A start level of base

motivation was hence assumed to exist and was introduced by means of the constant (“normal motivation”) into the model.

The insertion of time delays, as well as base values for certain variables, was not merely restricted to “change in job motivation” and “indicated job motivation”: also when modelling possible effects of review sessions a corresponding variable (see “time to train people for review sessions”) was introduced.

A subsequent challenge in the modelling process was the mathematical representation of effects between certain auxiliary variables. As described above, a mathematical link between variables may be created by means of writing a formula directly in the ad-hoc editing equation pop-up window of the programme. This is, however, only feasible if the units of measurement for the two connected variables are the same. If this is not the case, one risks mixing “apples” with “oranges” (Sterman, 2000). In order to resolve this problem, numerous mathematical relationships between variables had to be specified with the help of the lookup function of the Vensim programme. Lookups allow the definition of customized (also non linear) relationships between a variable and its causes. They can be constructed as a table of numbers or as a graph (see graph lookup editor of the Vensim programme). In order to develop the lookup functions in this study, several experts in the field had to be consulted, namely, two human resource managers from private firms, three human resource managers from public organizations, as well as two professors from the University of Lugano. To enhance further the internal validity of the model, the functions developed had also been reviewed by an expert in the field at the annual conference (2006) of the System Dynamics Society in Nijmegen, Netherlands.

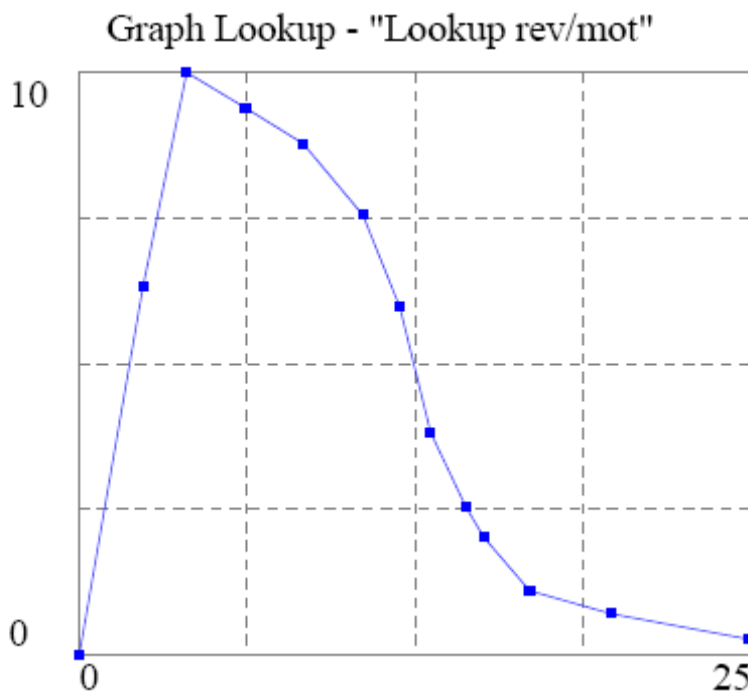
In the following paragraphs, the construction and the use of graphical lookup functions in this project will be illustrated by means of several examples.

In order to create the graphical lookup function for the effect of number of review sessions (x-axis) on job motivation (y-axis), information from different sources was integrated. From the scientific literature, we know that up to four review sessions per year might help to ameliorate employees’ motivational level. If this number of review sessions per year is

exceeded, supervisors risk triggering a contrary effect. From 0 to 4 review sessions per year thus the motivational level was supposed to increase rapidly (see steep slope **figure 4.5.1d** below). If more than four review sessions per year are held the motivational level may start to diminish. According to two human resource managers interviewed during this project, this decrease will, however, not be linear. Once a certain motivational level has been built up, it is initially hard to “destroy”. This fact was represented graphically by a less marked initial decrease of the curve.

Figure 4.5.1d

Graphical lookup function: effect of number of review sessions on job motivation



Another key example for the use of a graphical lookup function in this project was the representation of the effect of the number of job promotion possibilities (x-axis) on job motivation (y-axis). If there are no horizontal or vertical job promotion possibilities in an organization, an effect from the variable “number of job promotion possibilities” on “job motivation” is inexistent. An increase in job motivation becomes only possible if the x-axis value exceeds $n=1$. From this point “job motivation” was hence supposed to increase rapidly, as in a first phase any additional vertical or horizontal job-promotion possibilities will boost job motivation significantly. According to all human resource experts interviewed

during this project this effect will, however, “wear off” as successive additions to the quantity of job promotion possibilities will result in smaller improvements in “job motivation”. After an initial sharp increase, the curve of this lookup function thus grew at a reduced rate (see **figure 4.5.1e** below).

Similar considerations were made when constructing other graphical lookup functions. From empirical research we know, for example, supervisors’ willingness to give reviews to be dependent on the degree of employee job motivation: it is easier to hold review sessions with more motivated employees. With a rising degree of employee job motivation, there must hence initially be a dramatic increase in supervisors’ willingness to give review sessions. Successive increases in employee job motivation will, however, produce a less marked effect. This fact was represented graphically again by means of a gradual decrease in the growth of “willingness to give reviews” curve (see **figure 4.5.1f** page 53).

Figure 4.5.1e

Graphical lookup function: effect of number of job promotion possibilities on job motivation

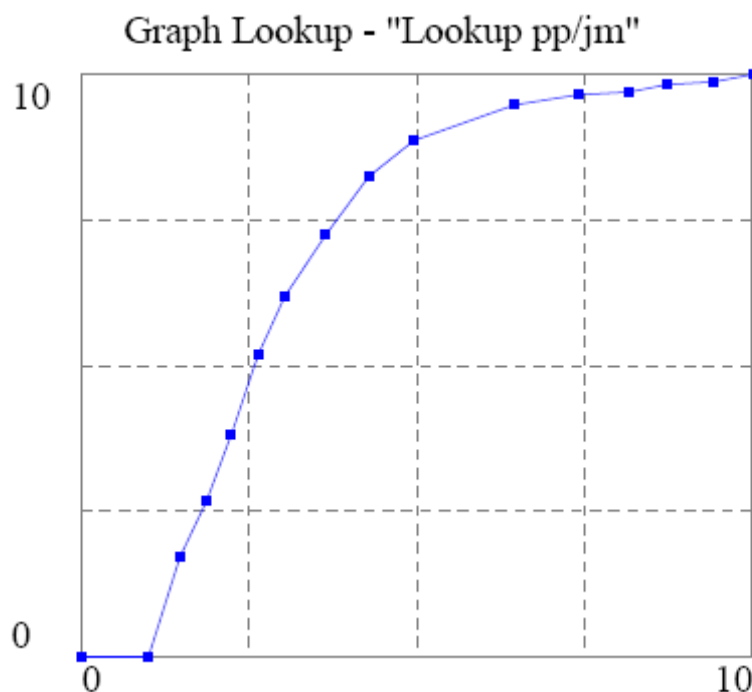
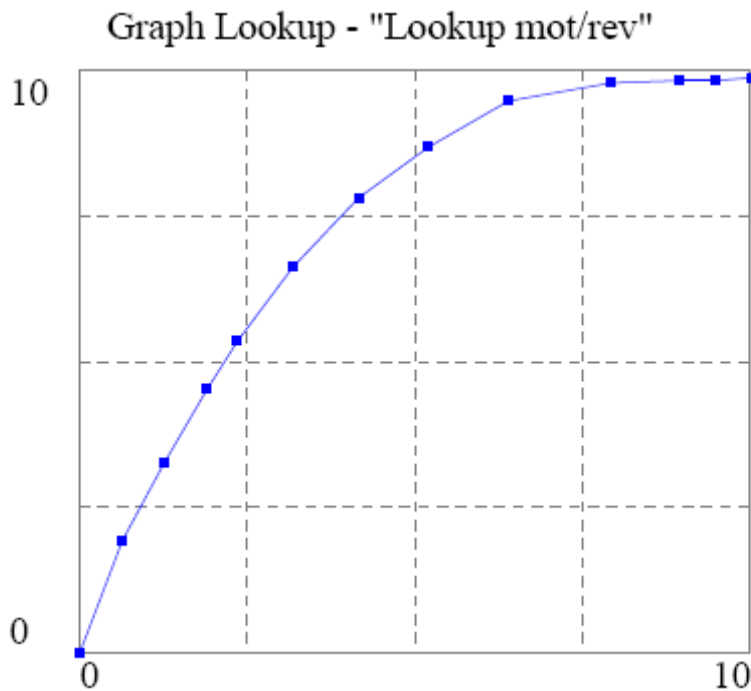


Figure 4.5.1f

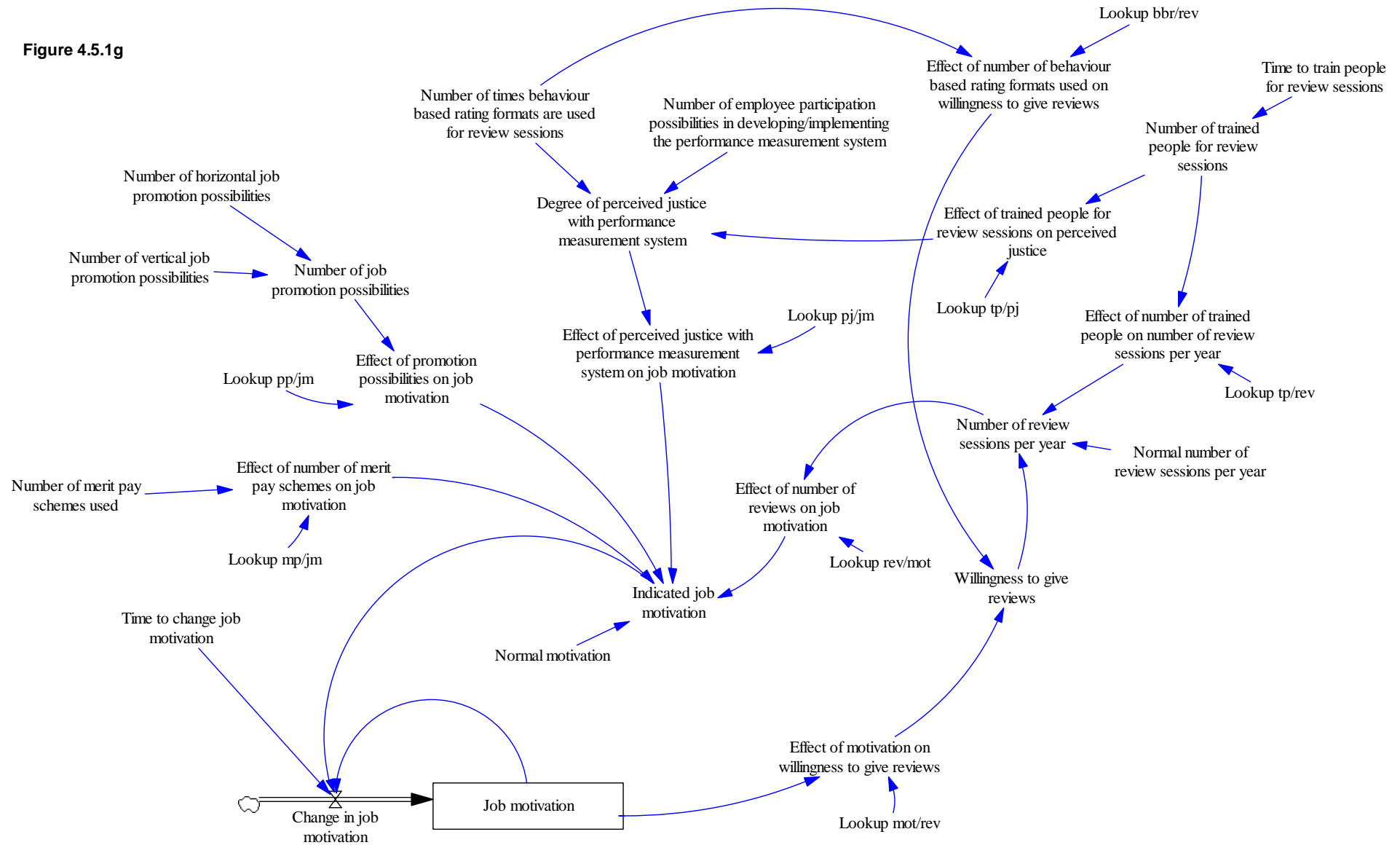
Graphical lookup function: effect of job motivation on willingness to give reviews



In this section the System Dynamics Modelling programme Vensim was used to represent the effects of performance appraisal activities on job motivation graphically and mathematically. In an initial step the causal structure of the framework was constructed by means of causal loop diagrams and stock and flow maps (see **figure 4.5.1c**). Secondly the constructs “time delays”, “base values for variables” as well as “lookup functions” were integrated into the model. A graphical representation taking these latest additions into consideration can be found on the following page (**figure 4.5.1g**).

In the next section the model will be expanded in order to include also interactions between organizational performance and job motivation, as well as performance appraisal activities. Again each construction step of the model will be outlined as recommended by Sterman (2000).

Figure 4.5.1g

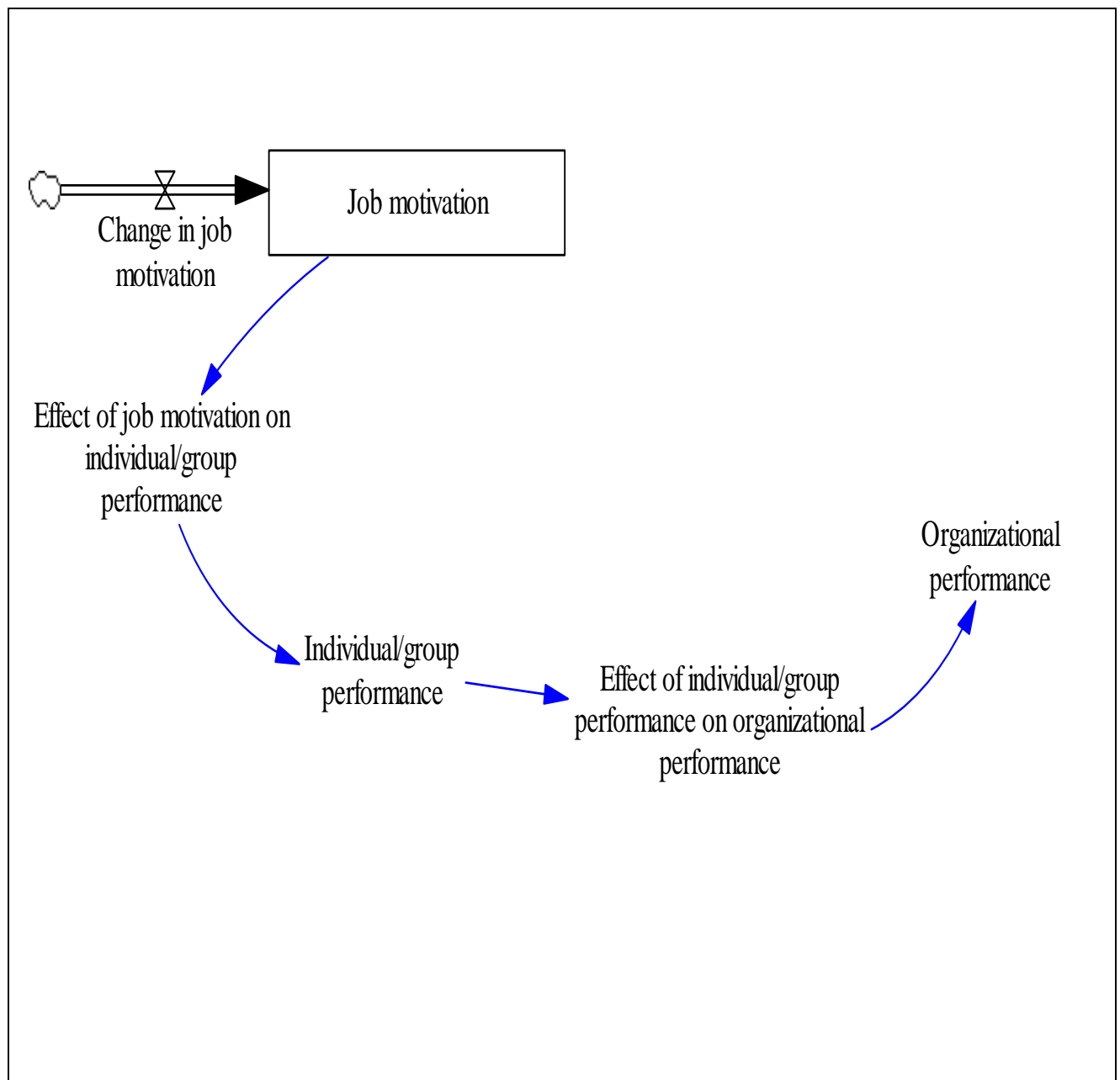


4.5.2. Representing interactions between organizational performance, job motivation and performance appraisal activities

From *proposition 3 and 4* (see **table 4.5.** page 40-41) we can deduce that an increase⁶ in individual or group work motivation may augment individual and/or group performance, which in turn can enhance organizational performance. In order to integrate these relationships in the SD model also “Individual/group performance” as well as “Organizational performance” were represented as variables. With the help of arrows and auxiliary variables (“Effect of job motivation on individual/group performance”), the variables “Job motivation” and “Individual/group performance” were then linked. In a next step the same procedure was used to link the variables “Individual/group performance” and “Organizational performance (see **figure 4.5.2a** page 56).

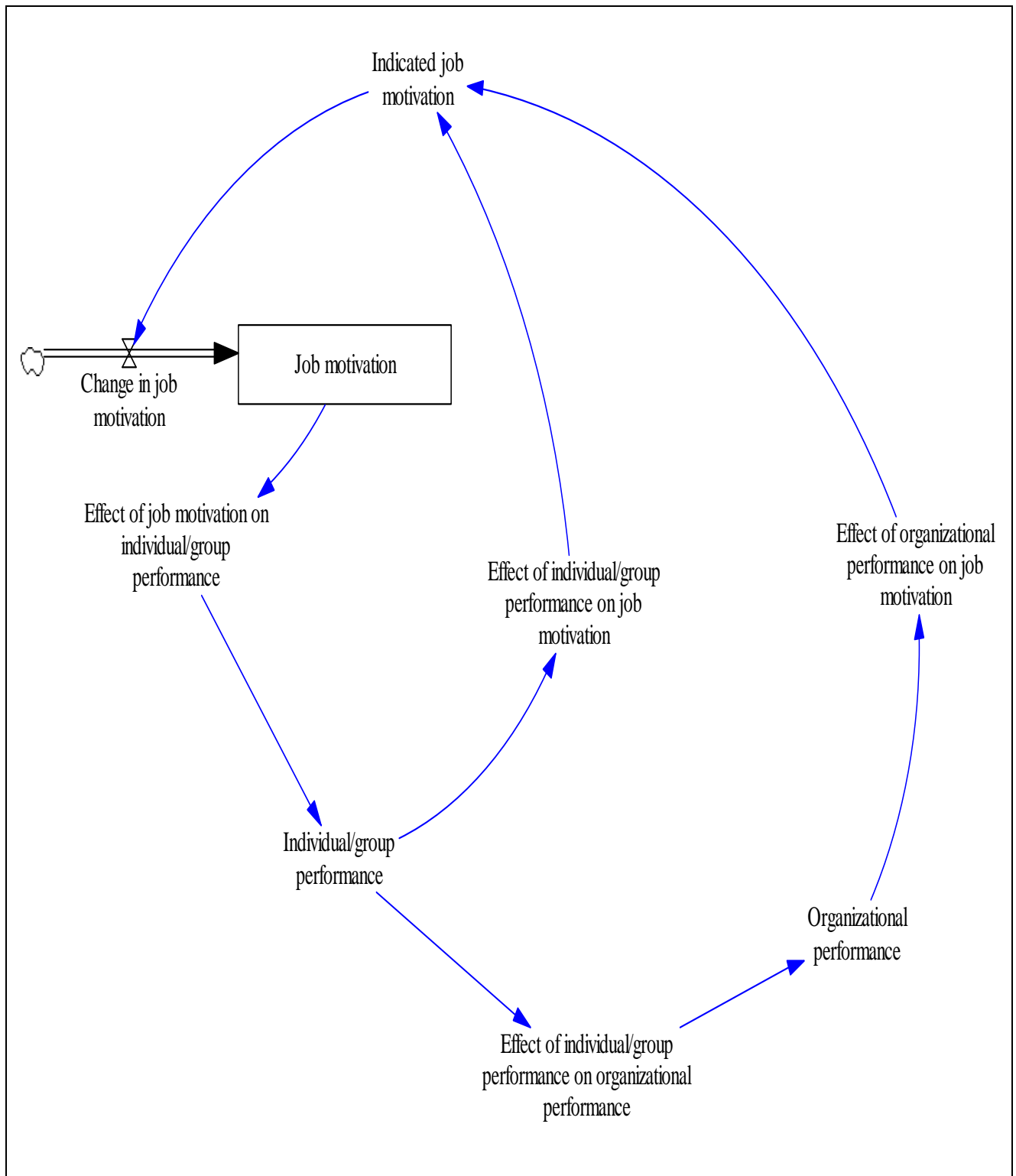
⁶ For reasons of simplicity, propositions were formulated in the text merely in a positive direction. However, also the contrary effect may exist (a decrease in individual or group work motivation may diminish individual and/or group performance, which in turn will trigger a reduction in organizational performance) and has been considered as an option when building the model.

Figure 4.5.2a



From empirical studies we know that employee job motivation may have a key impact on individual or group performance within an organization and hence on organizational performance. At the same time we do, however, also know that this causal order might equally well be reversed (see *proposition 15*): a high individual/group performance itself may act as a promoter for staff motivation and low levels of individual/group performance may have a contrary effect. The same mechanisms come into play in case of high or low levels of organizational performance. To represent such self-reinforcing (or balancing) effects, two further feedback loops have had to be integrated into the model (see added arrows in **figure 4.5.2b** (page 58)).

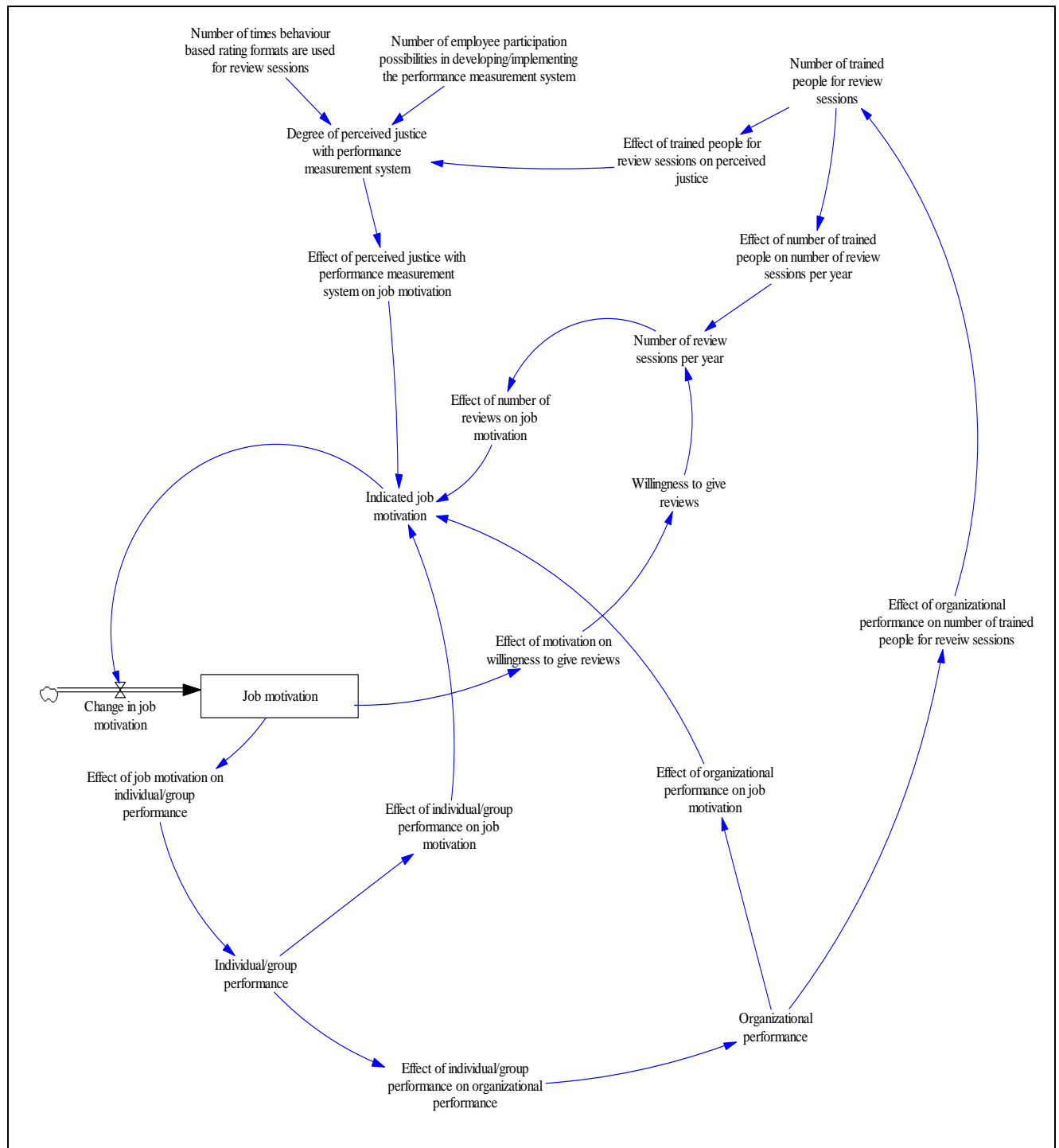
Figure 4.5.2b



The third series of processes with circular causality (feedback loop number 3) thus regarded the employee performance – job motivation relationship: a given level of employee (individual or group) performance may impact on employee job motivation, which in turn can trigger a change in employee performance. Similarly the level of organizational performance might effect employee job motivation, which again is known to influence organizational performance through employee performance (feedback loop number 4).

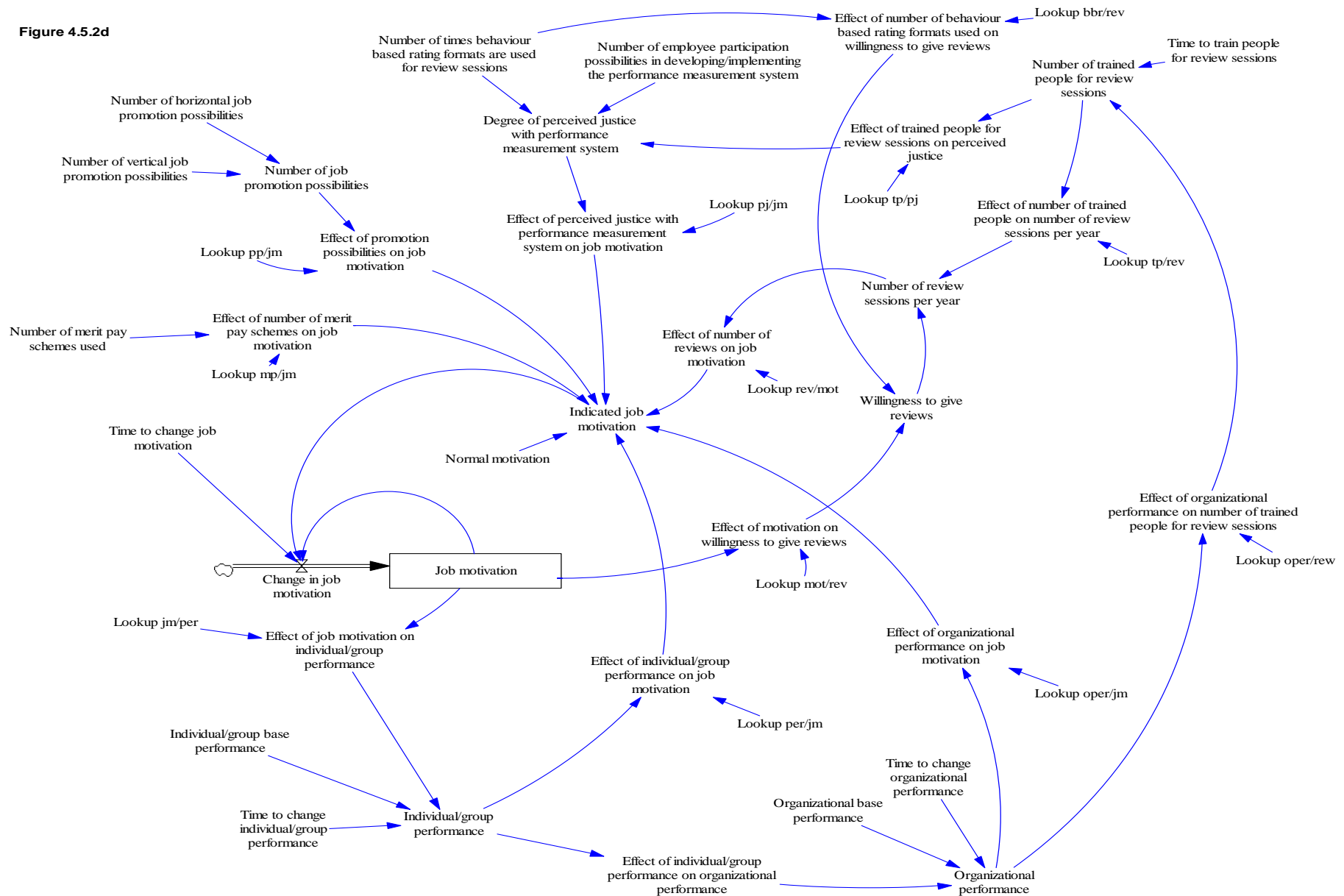
According to the international literature, organizational performance might, however, also impact on HRM practices: organizations that perform well are supposed to invest more in HRM practices, which may pay off in increased motivation and performance (see *proposition 14*). Another last feedback loop (feedback loop number 5) has had therefore to be taken into account when constructing the model. In **figure 4.5.2c** on the next page, feedback loop number 5 has been represented in addition to feedback loop number 3 and 4. Feedback loop number 5 was integrated into the model by simulating the effect of “organizational performance” on the number of supervisor-trainings that might be financed. The “number of trained people for review sessions” was supposed to influence employees’ “degree of perceived justice with the performance measurement system” as well as the “number of review sessions” held by supervisors per year. Both the degree of justice perceived by employees and the number of review sessions held per year are known to impact on job motivation and hence on employee and organizational performance.

Figure 4.5.2c



In this section the model was expanded to represent also possible interactions between performance appraisal activities, job motivation and organizational performance. Again, firstly the causal structure of the framework was constructed by means of causal loop diagrams. As in the previous section, “time delays”, “base values for variables” as well as “lookup functions” were then also included. A graphical representation integrating also these last additions to the model (**figure 4.5.2d**) can be found on the next page.

Figure 4.5.2d



5. Framework Analysis and Preliminary Propositions for Variable Operationalisation

In **Chapter 4. Developing the Evidence - Based Framework** the evidence from the international literature regarding the performance appraisal – organizational performance relationship in the public sector was summarized and propositions to describe effects between interacting variables were formulated. System Dynamics Modelling was then used to represent the causal structures within the developed framework. Next a more detailed analysis of the framework was performed in order to delineate possible key effects of various performance appraisal practices.

5.1. Delineating Possible Key Effects

In the model represented by **graphic 4.5.2d** various performance appraisal practices were identified as having a key influence on employee motivation. These practices are:

- The use of merit pay schemes
- The offering of vertical and horizontal job promotion possibilities
- The use of behaviour based rating formats (see “effect of perceived justice”)
- The encouragement of employee-participation opportunities in developing the performance measurement system (see “effect of perceived justice”), and
- The use of review sessions

The data collected by the OECD, large-scale surveys on motivational factors among public sector employees (OECD, 2001), allows for the estimation of the approximate strength of these effects (see **Appendix III** for a more detailed description of formula details). Horizontal and lateral career development possibilities seem to have the biggest impact: these practices are found to be approximately 350% stronger than the effect of each behavior based rating formats, employee-participation opportunities and review sessions, and 500% stronger than the effect of merit pay schemes. In the model developed in this project, employee motivation was linked with individual/group performance, which was further linked with organizational performance. As a consequence it can be deduced that the most significant increase in organizational performance might be produced by promoting career-path planning schemes, namely opportunities for vertical and horizontal job promotion possibilities. Also the implementation of regular review sessions using behaviour-based rating formats, as well as the encouragement of employee-participation opportunities when developing and implementing performance measurement criteria,

seem to have a significant influence on performance, whereas the impact of performance-pay schemes appears to be minor.

Within this context, it is important to emphasize that the impact of HRM-activities delineated above might well be understood singularly. More valid statements could, however, be made by also considering the impact of variables outside the HRM domain, as well as potential effects due to processes with circular causality. This would only be possible by running the model by means of the SD simulation programme. While the SD simulation was not the objective of this project, it may be interesting and valuable to address these issues in future studies. In the subsequent sections therefore some preliminary propositions were made for variable operationalisation with a view to running the simulation. A more exhaustive list regarding the definition and operationalisation of variables can be found in **Appendix VI**.

5.2. Preliminary Propositions for Simulating HRM Effects on Organizational Performance by Varying the HRM Inputs

5.2.1. Propositions for simulation run 1 - basic performance appraisal conditions

A first run might be performed where the HRM practices “merit pay schemes used”, “vertical and horizontal job promotion possibilities”, “use of behaviour based rating formats” as well as “employee-participation possibilities in developing the performance measurement system” are all supposed in existence. The value one could thus be preset for each of these variables prior to run the model. With several performance-enhancing appraisal practices in place, the model is expected to produce increasingly positive effects on job motivation, individual/group performance, and organizational performance.

5.2.2. Propositions for simulation run 2 - optimized performance appraisal conditions

In order to further explore and compare the effects of different performance appraisal approaches, in a subsequent phase the model could be run under optimal rather than under basic performance appraisal conditions. For this purpose HRM practices⁷ values might be adapted as follows:

- Merit pay schemes used = 2
- Vertical job promotion possibilities = 5
- Horizontal job promotion possibilities = 5
- Use of behaviour based rating formats = 4 (once per trimester)
- Employee-participation possibilities = 12 (once per month)

Under such optimal conditions the model is expected to show an increase in job motivation and in individual/group performance as well as in organizational performance when compared to the run 1.

In the next step, simulation runs under suboptimal performance appraisal conditions might be performed (see propositions in paragraphs 5.2.3. - 5.2.5. below). In each run the value

⁷ Except the value for „number of trained people for review sessions“ : this variable was represented within the model as depending on “organizational performance” and may hence not be manipulated independently.

of a key HRM practice variable could be reduced to zero, in order to compare the output with the run under optimal HRM practices conditions.

5.2.3. Propositions for simulation run 3 - promotion possibilities limited

In this simulation run the value zero might be attributed to the two variables (“vertical” and “horizontal job promotion possibilities”). Under such suboptimal conditions job motivation, individual/group performance as well as organizational performance are expected to decrease when compared to the run under optimal HRM practices conditions.

5.2.4. Propositions for simulation run 4 - behaviour based rating formats and employee-participation limited

For this simulation, the value zero could be attributed to the two variables, namely, “number of times behaviour based rating formats are used for review sessions” and “number of employee-participation possibilities in developing/implementing the performance measurement system”, directly impacting on the degree of perceived justice with the performance measurement system. Under these suboptimal conditions the model is again expected to produce a less positive effect on job motivation, individual/group performance and organizational performance when compared to the run under optimal HRM practices conditions. The decrease should, however, in this case be less marked than in run number 3 where promotion possibilities have been limited.

5.2.5. Propositions for simulation run 5 - number of merit pay schemes limited

In this run the value 0 might be attributed to the variable “number of merit pay schemes used”. Again conditions for this run could be preset at a suboptimal level and job motivation, individual/group performance and organizational performance would hence be expected to decrease in respect to the “optimized HRM practices” run. The decrease should, however, be even lower than in run number 3 and 4 where promotion possibilities and behaviour based rating formats/participation possibilities have been reduced respectively.

In order to further explore and compare possible effects on employee motivation, individual/group performance, and organizational performance initial propositions were made regarding how the model can run under basic and optimal performance appraisal conditions. Subsequently, suggestions for simulation runs with suboptimal performance appraisal variable settings were also made. In a final step (see **section 5.3.**) the study determined how the model might be tested under extreme simulation conditions.

5.3. Preliminary Propositions for Simulating HRM Effects on Organizational Performance: Sensitivity Analysis

In order to validate further a developed model, Sterman (2000) highlights the need to test it also under extreme conditions (sensitivity analysis). The effects on job motivation, individual/group performance and organizational performance under such extreme performance appraisal circumstances may then again be compared with the run under optimized HRM conditions. To purpose, three further simulation runs might be performed (sensitivity analyses run 1-3), where the HRM practices values could be adapted as follows:

5.3.1. Propositions for sensitivity analysis run 1 - HRM practices input equal zero

Operationalisation of variables sensitivity analysis run 1

- Merit pay schemes used = 0
- Vertical job promotion possibilities = 0
- Horizontal job promotion possibilities = 0
- Use of behaviour based rating formats = 0
- Employee-participation possibilities = 0

Without an input form key HRM practices variables, job motivation are expected to remain at the basic “normal motivation” level preset for the model.

5.3.2. Propositions for sensitivity analysis run 2 - underestimation of HRM practices input

Operationalisation of variables sensitivity analysis run 2

- Merit pay schemes used = -100
- Vertical job promotion possibilities = -100
- Horizontal job promotion possibilities = -100
- Use of behaviour based rating formats = -100
- Employee-participation possibilities = -100

Unlike in the first-run sensitivity analysis, this run includes the expectation that job motivation would not only “freeze” at a basic level, but would in fact diminish due to extremely negative values preset for key HRM practices variables.

5.3.3. Propositions for sensitivity analysis run 3 - overestimation of HRM practices input

Operationalisation of variables sensitivity analysis run 3

- Merit pay schemes used = 100
- Vertical job promotion possibilities = 100
- Horizontal job promotion possibilities = 100
- Use of behaviour based rating formats = 100
- Employee-participation possibilities = 100

As this time extremely positive HRM practices values were preset, it might be supposed that job motivation would reach a higher level than in the “optimized HRM practices” run.

In order to explore and compare possible effects on employee motivation and organizational performance **section 5.2.** presents propositions made regarding how the developed model could be run under basic, optimal, and suboptimal performance appraisal conditions. To further validate the model this section also includes suggestions formulated for performing simulation runs under extreme conditions. In the following section the information obtained from this project will be discussed further and its limitations outlined.

6. Discussion

6.1. Interpreting the Framework

The overall aim of this project was to explore further the relationship between various performance appraisal practices and organizational performance in the public sector. In an initial step, the evidence from international research literature regarding the performance appraisal – organizational performance relationship in the public sector was summarized and propositions to describe effects between interacting variables were formulated. Subsequently, System Dynamics Modelling was employed to represent the causal structures within the developed evidence-based framework. An analysis of the framework allowed for the identification of several performance appraisal practices that seem to have a key influence on employee motivation, individual/group performance and organizational performance namely:

- Implementation of regular review sessions using behaviour-based rating formats (BOS-format)
- Encouragement of employee-participation opportunities when developing and implementing performance measurement criteria
- Career-path planning: opportunities for vertical and horizontal job promotion possibilities

This observation is much in line with the view of De Pietro (2005), who proposed regular evaluation of competences/performance, together with career-path planning, to be key HRM tools to promote employee motivation and hence organizational performance in the public sector. Interestingly, exactly these HRM activities seem at present to be underdeveloped, whereas much emphasis has been put on the development of performance-pay schemes (De Pietro, 2005; OECD, 2005). Regular review sessions based on objective goal setting procedures (BOS-format) linked with career planning interventions, rather than the implementation of performance-pay schemes, appear to have the most positive impact on employee motivation and public sector performance. This effect might be reinforced by allowing employees to participate in the development and implementing process of the performance measurement system.

In conclusion it is of great importance to remember that factors other than HRM practices may also have a key influence in this process: leadership and organizational culture, for example, have been identified in more recent studies as being crucial in stimulating employee and organizational performance. Several authors even hypothesize that precisely these factors so difficult of measurement might have the biggest impact on employee motivation and public sector performance (Forest, 2006; Plamper, 2007; OECD, 2004b;2003c; Wright et al. 2005). As mentioned in section **4.4. Model Boundary**, the focus of the computer model developed in this project was, however, limited to the HRM system – organizational performance relationship and hence did not integrate the above elements.

6.2. Limitations

The framework for the SD-model was developed using as its basis theoretical suggestions from international research literature. Data was collected only from reliable sources (professional peer reviewed journals). The use of computer databases which is generally recommended as an effective way to search journal literature was adopted as the main method⁸ of identifying original research. The sampling procedure to select professional publications was not omitted, but described in detail in **Appendix I**. Based on the empirical evidence, propositions were formulated to describe effects between key variables and System Dynamics Modelling was used to represent the causal structure of the framework. During the model constructing phase several experts (University of Lugano; annual conference of the System Dynamics Society) were consulted.

Various safeguards had thus been introduced in order to enhance the objectivity and hence the validity of the model construction process. The literature review conducted, for example, can be regarded as quite thorough. As the data was collected exclusively by one researcher, it is however possible that some studies had been overlooked and that the reviewed studies do not represent all relevant research on this topic. A further threat to validity in this context is that the literature review brought up surprisingly few studies

⁸ In addition to the electronical literature search, experts in the field were consulted to retrieve relevant unpublished studies and books

evaluating the cause-effect relationship between HRM practices and organizational performance. As a consequence, it was not possible to build the evidence framework merely based on the outcomes of the strongest known study designs, such as meta-analyses and systematic literature reviews of experimental studies. Relevant studies at a lower level of the hierarchy of research evidence (see UWM, 2006 **Appendix IV**) had also to be taken into account. In addition, it is important to highlight that this project focused on the public sector in industrialized countries. Results of this study might hence be regarded as adequate for this specific context but should not be generalized to all public services or private organizations.

6.3. Communication of Results

A copy of this project will be available in the library of the University of Lugano. Study results will also be disseminated by means of presentations at congresses as well as in lectures given by the author. First presentations will be held in:

- March 2007 at the University Hospital Zürich (continuous education workshop for personnel)
- May 2007 at the University of Lugano (PhD module in Public Policy and Management)
- June 2007 at the EFMD (European Foundation for Management Development) conference on Public Sector Management Development in Madrid
- September 2007 at the Haute Ecole de Santé Fribourg (forum de recherche)
- September 2007 at the EGPA (European Group of Public Administration) conference in Madrid (seminar for doctoral students)

In a second phase, study results will be summarized (articles) and submitted to peer-reviewed journals for publication.

7. Conclusion

This research project aims to explore further the relationship between HRM decisions and organizational performance in the public sector. In order to meet this objective, first the evidence from international research literature regarding the performance appraisal – organizational performance relationship was summarized and propositions to describe effects between interacting variables were formulated. System Dynamics Modelling was then used to represent the causal structures within the evidence-based framework. Finally, propositions were made on how the developed model could be run under varying “performance appraisal conditions” in order to simulate possible influences on organizational performance. The analysis of the framework suggested a specific combination of performance appraisal practices which has the most positive impact on organizational performance in the public sector. These practices include the implementation of regular review sessions, the use of behaviour-based rating, the introduction of career-path planning procedures, and the encouragement of employee-participation opportunities in the development and implementation of a performance measurement system. At present, however, there seems to be a widespread reluctance to develop precisely these HRM activities. Influenced by practices of private firms, the public sector too often focuses only on performance-related pay schemes. Within this context, it is important to note that this study is not intended to promote the above-cited combination of performance appraisal activities as the over-arching solution to enhancing organizational performance in the public sector. This project aims to offer insights on prioritizing performance appraisal practices. However, elements outside HRM may have an equal or superior impact upon organizational performance in the public sector. In fact in recent years experts in the field have suggested that “software” elements of organizational management, such as leadership and organizational culture, most influence performance. Unfortunately, to this day there exist only a few well-designed empirical studies on the leadership/culture – organizational performance relationship. As further research data on the issue becomes available, the author plans to expand the SD-model presented herein. Two institutions have already expressed their intention to commission a model integrating these latter components.

Overall, it has been extremely motivating for the author to sense a growing interest in SD modelling in his direct work environment, as well as among the international research community (see **Appendix V** for relevant recently published studies/information in journals as well as on online platforms). In the public health sector, for example, SD modelling is currently used to optimize service provision and the British National Health Service has integrated SD modelling as a strategic planning tool.

Computer modelling might not have developed to the “wave of the future” as it was hoped during the 1950s and 1960s, but more recently, the interest in computer simulations has indeed been revived, and the future of SD modelling is most promising.

References

- AXELROD, R.** (1997) The dissemination of culture: a model with local convergence and global polarization. The Journal of Conflict Resolution **41**(2) 203-226
- BECKER, B. and GERHART, B.** (1996) The impact of human resource management on organizational performance: progress and prospects. Academy of Management Journal **39**(4) 779-801
- BREWSTER, C.** (1995) Towards a "European" Model of Human Resource Management. Journal of International Business Studies **26**(1) 1-21
- BUCHANAN, D. and HUCZYNSKI, A.** (1997) Organizational Behaviour. 3rd ed. Milan: Prentice Hall Europe
- CAMERON, J., BANKO, K.M., PIERCE, W.D.** (2001) Pervasive negative effects of rewards on intrinsic motivation: the myth continues. The Behavior Analyst **24**(1): 1-44
- CARROLL, G.R. and HARRISON, J.R.** (1994) On the Historical Efficiency of Competition between Organizational Populations. American Journal of Sociology **100**(3) 720-749
- DAVIS, J.P., BINGHAM, C.B., EISENHARDT, K.M.** (2005) Developing theory through simulation methods. Working Paper Stanford University
- DE PIETRO, C.** (2005) Gestire il personale nelle aziende sanitarie italiane: contesto, politiche, strumenti. Milano: McGraw-Hill
- DEMMKE, C., HAMMERSCHMID, G., MEYER, R.** (2006) Decentralisation of HR practices – a European comparative perspective. Paper presented at the EGPA Annual Conference, Milan
- DEVENNA, M.A., FOMBRUN, C.J., TICHY, N.M.** (1984) Strategic Human Resource Management. New York: John Wiley Press
- DEVORAKOVA, Z.** (2005) HR Practices in the Czech Public Administration. Paper presented at the EGPA Annual Conference, Berne
- EGPA** (2007) www.iiasiisa.be/egpa/agacc.htm
- ERC-THE MANAGER'S ELECTRONIC RESOURCE CENTER** (2006) <http://erc.msh.org>
- FOREST, V.** (2006) Work motivation and performance-related pay in the French Civil Service. Paper presented at the EGPA Annual Conference, Milan

GAVETTI, G. and LEVINTHAL, D. (2000). Looking Forward and Looking Backward: Cognitive and Experiential Search. Administrative Science Quarterly **45** 113-137

GERHART, B. and RYNES, S.L. (2003) Compensation: Theory, Evidence, and Strategic Implication. Thousand Oaks, California: Sage

GOODERHAM, P.N., NORDHAUG, O., RINGDAL, K. (1999) Institutional and rational determinants of organizational practices: human resource management in European firms. Administrative Science Quarterly **44**(3) 507-531

GREEN, K.W., MEDLIN, B., WHITTEN, D. (2004) Developing optimism to improve performance: an approach for the manufacturing sector. Industrial Management & Data Systems **104**(2) 106-114

GRUEN, R. (2001) Organisational Management Subject Guide Folder – HSM 202. London: University of London, London School of Hygiene and Tropical Medicine

GUENOUN, M. and GOUDARZI, K. (2006) L'utilisation de l'outil marketing SERVQUAL pour mesurer la qualité dans les services publics municipaux. Extrait des actes du 15^{ème} Colloque international de la revue Politiques et Management Public 1-28

GUTHRIE, J.P. and DATTA D.K. (2004) HRM and firm performance: peeling back the onion. Academy of Management 2004 – Human Resources Conference Paper Abstracts p.37

HAATAINEN, J. and SIHVONEN, M. (2006) Competition in public services and its effects on employees. Paper presented at the EGPA Annual Conference, Milan

HARRIS, L. (2005) The changing nature of the HR function in UK local Government and its role as "employee champion". Paper presented at the EGPA Annual Conference, Berne

HELMREICH, S. (1998) Recombination, Rationality, Reductionism and Romantic Reactions: Culture, Computers, and the Genetic Algorithm. Social Studies of Science **28**(1) 39-71

HIRSCH, G., HOMER, J., McDONNELL, G., MILSTEIN, B. (2005) Achieving health care reform in the United States: towards a whole system understanding: Paper presented at the 2005 System Dynamics Conference, Boston, USA

HPSIG - HEALTH POLICY SPECIAL INTEREST GROUP (2006) <http://www.hpsig.com>

ILES, V. (2005) Really Managing Health Care. 2nd ed. Buckingham: Open University Press

KAPLAN, R. S. and NORTON, D. P. (2001) Strategy-Focused Organization. How balanced scorecard companies thrive in the new business environment. Harvard Business School Press

KAPLAN, R. S. and NORTON, D. P. (2001b) Transforming the Balanced Scorecard from Performance Measurement to Strategic Management: Part I. Accounting Horizons **15** (1) 87-104

KARL, K.A., O'LEARY-KELLY, A.M., MARTOCCHIO, J.J. (1993) The impact of feedback and self-efficacy on performance in training. Journal of Organizational Behavior **14**(4) 379-394

LÄHDESMÄKI, K. (2006) The new pay system requires encouraging and performance-oriented leaders: The case of several Finnish State Government Organizations. Paper presented at the EGPA Annual Conference, Milano

LANDEL, D. (2004) Performance-related pay policies for government employees: main trends in OECD member countries. Ppt-presentation HRM Working Party Meeting 7 October 2004 p. 1-18

LEISINK, P. (2006) Public Identity and Human Resource Practices. The case of age-related personnel policies in the Netherlands. Paper presented at the EGPA Annual Conference, Milan

LEVINTHAL, D.A. in LOMI, A. and LARSEN, E.R. eds. (2001) Dynamics of Organizations – Computational Modeling and Organization Theories. Cambridge, Massachusetts: MIT Press

LOCKE, E.A., FEREN, D.B., McCALEB, V.M., SHAW, K.N., DENNY, A.T. in DUNCAN, K.D., GRUENBERG, M.M., WALLIS, D. eds. (1980) Changes in Working Life - The relative effectiveness of four ways of motivating employee performance. New York: Wiley

LOMI, A. and LARSEN, E.R. eds. (2001) Dynamics of Organizations – Computational Modeling and Organization Theories. Cambridge, Massachusetts: MIT Press

LOMI, A. and LARSEN, E.R. (1996) Interacting locally and evolving globally: a computational approach to the dynamics of organizational populations. The Academy of Management Journal **39**(5) 1287-1321

MACKAY, K. (2007) How to build M&E systems to support better government. World Bank Independent Evaluation Group Report. Washington: The World Bank

MARCH, J. ed. (1965) Handbook of Organizations. Chicago: Rand McNally

MARCH, J. in LOMI, A. and LARSEN, E.R. eds. (2001) Dynamics of Organizations – Computational Modeling and Organization Theories. Cambridge, Massachusetts: MIT Press

MENEGUZZO, M. in BERGAMASCHI, M. ed. (2000) L'organizzazione nelle aziende sanitarie. Milano: McGraw-Hill

MEYER, H.H., KAY, E., FRENCH, J. (1965) Split roles in performance appraisal. Harvard Business Review **43**(1) 123-129

MEYER, J.P. and SMITH, C.A. (2000) HRM Practices and Organizational Commitment: Test of a Mediation Model. Canadian Journal of Administrative Sciences **17**(4) 319-331

MICHIE, S. and WEST, M.A. (2004) Managing people and performance: an evidence based framework applied to health service organizations. International Journal of Management Reviews **5/6**(2) 91-111

MINER, A.S. and MEZIAS, S.J. (1996) Ugly duckling no more: pasts and futures of organizational learning research. Organization Science **7**(1) 88-99

MOLLONA, E. (2000) Analisi Dinamica dei Sistemi Aziendali. Milano: EGEA

MONK, D. (2005) Whole Systems in Health and Social Care – Introducing a commissioning template. Working Paper Symmetric SD 1-12

MORECROFT, J.D.W. (1983) System Dynamics: Portraying bounded rationality. The International Journal of Management Science **11**(2) 131-142

MORECROFT, J.D.W. (1985) Rationality in the Analysis of Behavioural Simulation Models. Management Science **31**(7) 900-916

NHS – NATIONAL HEALTH SERVICE CENTRE FOR REVIEWS AND DISSEMINATION (2001) CRD's Guidance for those Carrying out or Commissioning Reviews - CRD Report number 4 (2nd Edition). York: Publication Office University of York

NICE – NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE (2004) Depression: management of depression in primary and secondary care. NICE guidance, National Clinical Practice Guideline Number 23

OECD (2007) Towards better measurement of government. OECD Working Papers on Public Governance. OECD Publishing

OECD (2005) Performance-related pay of government employees. OECD Publishing

OECD (2005b) Annex A – Performance-related policies across 12 OECD countries: brief overview. Performance-related pay policies for government employees. OECD Publishing

OECD (2004) Trends in human resources management policies in OECD countries. An analysis of the results of the OECD Survey on strategic human resources. Unclassified paper of the Human Resources Management Working Party p.1-25

OECD (2004b) Public sector modernisation: governing for performance. OECD Observer October 2004 p. 1-7

OECD (2003) Performance-related pay of government employees: assessing reforms across OECD member countries. Background Paper – Experts Meeting 7 October 2003 p.1-8

OECD (2003b) Performance-related pay of government employees: assessing reforms across OECD member countries. Introductory Paper – Experts Meeting 7 October 2003 p.1-10

OECD (2003c) Managing senior management: senior civil service reform in the OECD member countries. Unclassified paper of the Public Governance and Territorial Development Directorate Public Management Committee p.1-46

OECD (2002) OECD survey on strategic human resources management. Unclassified Paper of the Human Resources Management (HRM) Working Party p.1-46

OECD (2002b) Working Definitions. OECD Publishing

OECD (2002c) Annual Report on OECD's work on HRM. Summary Record of the meeting of the Human Resources Management Working Party p. 1-11

OECD (2002d) Improving the performance of health care systems: from measures to action (a review of experiences in four OECD countries). Unclassified Paper of the Directorate for Education, Employment, Labour and Social Affairs Employment, Labour and Social Affairs Committee p. 1-87

OECD (2001) Annual Report on OECD's work on HRM. Summary Record of the meeting of the Human Resources Management Working Party p. 1-10

OECD (2001b) Recent developments on human resources management in OECD member countries. Unclassified Paper of the Human Resources Management Working Party p. 1-14

PICHAULT, F. (2006) The problem of coherence in HRM-based modernisation projects. Paper presented at the EGPA Annual Conference, Milan

PETERS, T.J. and WATERMAN, R.H. (2000) Auf der Suche nach Spitzenleistungen. 8. Aufl. Landsberg am Lech: mvg-verlag

PERRIN, B. (2003) Implementing the vision: addressing challenges to result-focused management and budgeting. Paris: OECD Publishing

PLAMPER, H. (2007) Leadership in Regional Governance. Plenary Session Paper presented at the EFMD Annual Conference, Madrid

POLITT, C. (2005) Hospital performance indicators: how and why neighbours facing similar problems go different ways. Plenary Session Paper presented at the EGPA Annual Conference, Berne

PUBMED MESH-TERM (2006) <http://www.ncbi.nlm.nih.gov/entrez>

RIVKIN, J.W. and SIGGELKOW N. (2002) Organizational sticking points on NK landscapes. Wiley Periodicals 7(5) 31-43

RYNES, S.L., BARRY, G., PARKS, L. (2005) Personnel Psychology: Performance evaluation and pay for performance. The Annual Review of Psychology **56** 571-600

SALVATI, N., GOSSELIN, A., MORIN, D., MORIN, L. (2004) Performance feedback overload: an exploratory field study of its antecedents and consequences. Academy of Management 2004 – Human Resources Conference Paper Abstracts p.7

SASTRY, M.A. in LOMI, A. and LARSEN, E.R. eds. (2001) Dynamics of Organizations – Computational Modeling and Organization Theories. Cambridge, Massachusetts: MIT Press

SD – SYSTEM DYNAMICS SOCIETY (2006) <http://www.systemdynamics.org/>

SENGE, P. (1990) The Fifth Discipline. New York: Doubleday

STANTON, J.M. (2000) Reactions to employee performance monitoring: framework, review, and research directions. Human Performance **13**(1) 85-113

STEEN, T. (2005) Public sector motivation: is there something to learn from the study of volunteerism? Paper presented at the EGPA Annual Conference, Berne

STERMAN, J.D. (1987) Testing behavioural simulation models by direct experiments. Management Science **33**(12) 1572-1592

STERMAN, J.D. (1989) Modeling managerial behaviour: misperceptions of feedback in a dynamic decision making experiment. Management Science **35**(3) 321-339

STERMAN, J.D. (1992) System Dynamics Modeling for Project Management. Cambridge, Massachusetts: MIT Press

STERMAN, J.D. (2000) Business Dynamics – Systems Thinking and Modeling for a Complex World. Boston: McGraw-Hill

TZINER, A. and KOPELMAN, R.E. (2002) Is there a preferred performance rating format? A non-psychometric perspective. Applied Psychology: An International Review **51**(3) 479-503

UWM - UNIVERSITY OF WESTMINSTER (2006) <http://www.wmin.ac.uk/sih/page-484>

VARONE, F. and GIAUQUE, D. (2001) Policy management and performance-related pay: comparative analysis of service contracts in Switzerland. International Review of Administrative Sciences **67**(3) 543-565

WILLEMS, I., JANVIER, R., HENDERICKX, E. (2005) Central government pay systems in Europe. Pre- or post-NPM? Paper presented at the EGPA Annual Conference, Berne

WOLSTENHOLME, E., MONK, D., McKELVIE, D., SMITH, G. (2006) Influencing and Interpreting Health and Social Care Policy in the UK. Working Paper Symmetric SD 1-22

WOLSTENHOLME, E., REPPER, D., TODD, D., MONK, D. McKELVIE, D. (2006b) Implementation of a Stepped Care approach to Depression Services in North West England. Paper presented at the 2006 System Dynamics Conference, Nijmegen, NL

WOLSTENHOLME, E. (2005) The potential of system dynamics. A new area of strategic planning? Leading Edge Series NHS Confederation **10** 1-8

WRIGHT, P.M., GARDNER, T.M., MOYNIHAN, L.M., ALLEN, M.R. (2005) The relationship between HR practices and firm performance: examining causal order. Personnel Psychology **58**(2) 409-446

Appendix I

- To search the online database for OECD publications (www.oecd.org→ More Search Options Exact Match): the following subject search terms were used:

→ Human resource management
→ Performance evaluation
→ Performance feedback

The searches produced between 17 and 211 matches (see below for example “human resource management”). The abstracts of all matching texts were examined in order to identify the texts relevant for this project.

Searched for the text: **Human resource management**

Found **172** result(s)

Documents

[Assessment Report: Bosnia and Herzegovina - Public Service and Administrative Framework \(2006\)](#) (pdf, 182Kb,English)

14-Nov-2006

The 2006 Assessment Report on Bosnia and Herzegovina's Public Service and Administrative Framework is available here.

[View long abstract](#)

[Survey on Strategic Human Resources Management](#) (doc, 736Kb,English)

26-Aug-2004

The survey on Strategic Human Resources Management was completed in 2003 by all 30 OECD member countries.

Also available: [Enquête sur la gestion des ressources humaines](#) (doc, 839Kb,French)

[View long abstract](#)

Appendix I

- *To search the ISI Web of Knowledge the following subject search terms were linked:*

((motivation) AND (computer modelling OR computer simulation))

((human resource management) AND (computer modelling OR computer simulation))*

((performance feedback OR performance appraisal OR performance evaluation OR performance management) AND (human resource management) AND (organi*ational success OR organi*ational performance OR organi*ational efficiency OR firm success OR firm performance OR firm efficiency) AND (motivation OR commitment))*

*((performance feedback OR performance appraisal OR performance evaluation OR performance management) AND (organi*ational success OR organi*ational performance OR organi*ational efficiency OR firm success OR firm performance OR firm efficiency) AND (motivation OR commitment))*

The searches produced between 1 and 10 matches. The abstracts of all matching texts were examined in order to identify the texts relevant for this project. All reference lists of all studies retained relevant were examined in order to identify other important texts. For this purpose the “times cited” tool of the ISI Web of knowledge database proved to be most helpful.

Appendix II

Genetic Algorithms - GA (adapted from Helmreich, 1998)

“For many GA researchers, nature can itself be considered as a computational system that finds solutions to physical and biological design problems. And nature is understood on the model of the best sort of computer available nowadays – a computer that does massively parallel processing, searching from a population of points simultaneously.” (Helmreich, 1998 p.47)

The genetic algorithm (GA) is a computer modelling approach relying partly on neo-Darwinian ideas of natural selection. It has been developed by drawing on the knowledge of behaviour of genes in populations of sexually reproducing organisms. In a GA model first a population of possible solutions to a given problem is generated on a random basis. The solutions are encoded as bit-strings:

A(1) 10101100

A(2) 00110110

Each randomly created bit-string population includes numerous individuals. Some individuals can be regarded as “fitter” than others in terms of ability to perform a given task. In computer simulation runs individuals can then “mate”, “reproduce” and “compete” to “survive” and may thus “evolve” solutions to optimization problems.

The expansion of GA has recently been boosted significantly by the development of parallel computer systems, which allow the running of a vast number of calculations simultaneously.

Appendix II

Cellular Automata (adapted from Davis, 2005; Axelrod, 1997; Lomi and Larsen, 1996)

Cellular automata models aim at exploring macro-level consequences of micro-level interactions among spatially related agents, for example, competing firms/ organizations or cities in a country. All agents included in a model are programmed to follow the same (few) simple rules. These rules (e.g. regarding competition approaches) usually apply to spatial processes: nearby agents are hypothesized to be influenced more than distant ones. An important concept is thus the one of “neighbourhood”: it defines which agents are local (and hence neighbours) and which are not. Cellular models normally consist of a two dimensional regular lattice (size $n \times n$), where each agent is represented by a cell.

Cellular automata are pioneered in the physical sciences. In the paragraphs below, the problem definitions of two researchers who applied cellular automata modelling to social and organizational sciences are cited:

“If people tend to become more alike in their beliefs, attitudes, and behaviour when they interact, why do not all such differences eventually disappear? Social scientists have proposed many mechanisms to answer this question. The purpose of this article is to explore one more mechanism. The mechanism proposed here deals with how people do indeed become more similar as they interact, but also provides an explanation of why the tendency to converge stops before it reaches completion.” (Axelrod, 1997 p. 203)

“Empirical studies have demonstrated that competitive and institutional processes are localized; not all organizations in a population compete for the same scarce resources, nor do they benefit equally from the presence (or absence) of other, similar organizations. These studies show that processes of resource partitioning, strategic differentiation and disruptive selection work to reduce the number of competitors that each organization faces in a population. In the light of this ecological evidence, we claimed that understanding the population-level consequences of local interaction among individual organizations is crucial to the progress of ecological theories of organizations... we proposed a computational model of organizational evolution according to which the global dynamics of organizational populations emerge from simple rules of local interaction among individual organizations.” (Lomi and Larsen, 1996 p.1313)

Appendix II

NK Landscapes (adapted from Davis et al. 2005; Rivkin and Siggelkow, 2002)

NK landscape simulation approaches aim at exploring how rapidly and effectively a system is able to adapt to change. An organizational system, for example, may be represented as a model with N nodes and K interactions among the nodes. IT search strategies (“moves” and “jumps”) allow the system to “adapt” and find an optimal point (e.g. the best organization). To every possible interaction a performance or fitness value is attributed. This allows the construction of a three dimensional grid (fitness landscape): If K (and hence interaction) is low, only a few ideal combinations, ore even only one, become possible. The fitness landscape is hence “smooth”, presenting only a few peaks and the optimal point may be localized easily. If interactions do, however, augment, more optimal combinations become possible, the landscape gets increasingly “rugged” and it is harder to spot the optimal combination in the landscape “map”.

NK landscapes are widely used in the biological and physical sciences. In the paragraph below, the work of two researchers who applied the NK modelling approach to organizational sciences is cited:

“Gavetti and Levinthal (2000) examined how experiential learning (alone and with cognition) affected the time to find an optimal policy for an organization. They represented organizational policy as N policy elements and K interactions among them. They then compared the time to find an optimal policy (and its performance) using only experiential learning (i.e. incremental moves) with using both experiential learning and cognition (i.e., a basic “map” of the landscape that enabled long jumps) under varying levels of coupling (K) among elements”. (Gavetti and Levinthal, 2000) cited by (Davis et al. 2005) p.10- 11

Appendix III

Most important motivational factors for public sector employees

Motivational factor	Prioritization of motivational factor by employees	Strength (Tot=161%)
Satisfying Job content Promotion opportunities	75% Effect of promotion possibilities (horizontal) 28 % Effect of promotion possibilities (vertical)	103→ 0.64
Work environment (recognition of one's achievements; fair treatment)	30% Effect of number of reviews plus effect of perceived justice	30→ 0.18 (0.09each)
Special payments	19% Effect of number of merit pay schemes	19→ 0.12
Image	9% Effect of individual/group performance plus effect of organizational performance plus effect of normal motivation	9→ 0.06 (0.02each)

OECD (2001) survey with 14'000 respondents

Appendix IV

Research evidence can be arranged as a hierarchy: there are grades of evidence and levels of complexity to research methods.

The hierarchy of levels of evidence is briefly:

- | | | |
|----|---|---|
| | A | Systematic reviews/ meta-analyses |
| 1. | B | RCTs (Randomized Controlled Trials) |
| | C | Experimental designs |
| | A | Cohort control studies |
| 2. | B | Case-control studies |
| | A | Consensus conference |
| | B | Expert opinion |
| 3. | C | Observational study |
| | D | Other types of study eg. Interview based, local audit |
| | E | Quasi-experimental, qualitative design |
| 4. | | Personal communication |

UWM - University of Westminster (2006)

Appendix V

Current use of System Dynamics in the National Health Service (NHS)

Increasing knowledge on health treatment and illness prevention processes

In a recent issue of the leading edge briefing paper of the British National Health Service (NHS) Professor Eric Wolstenholme⁹ outlines the potential of system dynamics to promote effective management solutions within complex adaptive organizations, such as the NHS. According to Wolstenholme, System Dynamics Modelling may prove, for example, particularly useful for increasing knowledge on health treatment and illness prevention processes within a health care system (Wolstenholme,2005). Wolstenholme thus proposes to represent the whole health well-being process as a stock and flow map:

See figure **“The health and well-being process”**: Hirsch et al. (2005) cited by Wolstenholme (2005) p.5

⁹ Winner of the 2004 J.W. Forrester International Award for the best contribution to system dynamics in the last five years

Appendix V

Current use of System Dynamics in the National Health Service (NHS)

Relieve capacity problems in the acute sector

Over the past three years Wolstenholme (2006;2005) and Monk (2005) have used System Dynamics Modelling to influence health and social care policy in the United Kingdom. The iThink system dynamics software was used to simulate pressures (using national data) in a sample health economy regarding primary, acute and post-acute care. The developed model helped to promote rethinking of intended “fix that fails” to relieve capacity problems in the acute sector: increasing post-acute capacity, rather than introducing greater capacity in the acute sector, was proposed as a win-win solution:

See figure “**National Delayed Discharge Model**” for a simplified version of the model:

Wolstenholme et al. (2006) p.5

Appendix V

Current use of System Dynamics in the National Health Service (NHS)

Implementing a stepped care approach to depression services

The National Institute for Clinical Excellence in Great Britain recommends in its guidelines a stepped care approach to depression services (NICE,2004)¹⁰. Up to the present, however, the guidelines have not been endorsed by effective implementation strategies. Wolstenholme et al. (2006b) are thus currently collaborating with NHS service providers to develop a whole system simulation model. The model aims at combining the NICE guidelines with resource allocation factors, in order to allow the appropriate treatment of more patients, without any additional financial resources.

See figure **“The structure of stepped care services for depression”**: Wolstenholme et al. (2006b) p.8

¹⁰ Clinically-proven, best-practice pathways to care via a series of steps, namely, watchful waiting, followed by primary care interventions (guided self help and other brief therapies), which only then lead to psychological interventions or medication and perhaps longer-term specialist treatment.

Appendix V

System Dynamics and Health Policy

On the world wide web the Health Policy Special Interest Group of the International System Dynamics Society (SD,2006) currently operates the health system dynamics wikipedia (HPSIG,2006):

<http://www.systemdynamics.org/>

<http://www.hpsig.com>

The HPSIG consists of a library (HSD library) as well as a model repository (HSD models). The library contains the majority of the information that can be found on the site.

HSD library

The main sections of the Library are:

- Disease (epidemiology, natural progression of illness, illness burden, etc.)
- Healthcare Delivery
- Genetics
- Individual Behavior
- Individual Biology
- Physical Environment
- Social Environment
- Health and Function (Societal implications, etc.)
- Prosperity
- Well-Being
- System Dynamics (General Section)
- Generic Structures
- Puzzling Health Dynamics
- Whole system dynamics (and interactions that cross two or more sections)

Further information on the HSD models section of the health system dynamics wikipedia can be found on the following pages.

Appendix V

System Dynamics and Health Policy

HSD Models

This part of the health system dynamics wikipedia site contains actual models in the health policy domain, which have been constructed so far. The HSD models section is subdivided into the subsequent categories:

- Disease Based Models
- Healthcare Design & Delivery Based Models
- Genetics Based Models
- Individual Behavior Based Models
- Individual Biology Based Models
- Physical Environment Based Models
- Social Environment Based Models
- Health and Function Based Models
- Prosperity Based Models
- Well-Being Based Models
- Public Policy and Politics Based Models
- Public Health Based Models
- Health Economics Based Models
- System Dynamics (General Section) Models
- Generic Structure Based Models
- Puzzling Health Dynamics Based Models
- Whole System Based Models
- Stone Soup Models
- Data Time/Trend Sets

In this section of the site it is possible to collaborate with other researchers to construct models, to share existing models, as well as to upload new models. The long term aim is to share and re-use executable Health Simulation models and components that are transparent, maintained, annotated, well-referenced and documented, with a particular initial emphasis on their use in Health Policy.

Appendix V

System Dynamics and Health Policy

HSD Models

At present the health system dynamics wikipedia prescribes no “standard” for uploaded models. System Dynamic Models may be included in any software package that produces models (e.g. Vensim, iThink, Powersim etc.). Within the HSD models section, categories (see previous page) are, however, organized according to a model proposed by Evans, Barer, and Marmor. In the following paragraphs three HSD-categories’ relations with the model proposed by Evans, Bear, and Marmor will be described in more detail.

Healthcare Design & Delivery Based Models (text and model **cited from HPSIG,2006**):

For models that explore the design and delivery of care.

Evans, Barer, and Marmor described disease/illness (and injury) and its interaction with healthcare as a dynamic in which various factors influenced the incidence of disease, to which the primary response is the mobilization of healthcare resources. As the "outside" factors caused more disease, more healthcare resources were sought, and the pressure on technology and capacity increased.



Generally speaking, use this section to upload models that describe the dynamics of disease and the design and utilization of healthcare resources as a response to disease/illness and injury.

Appendix V

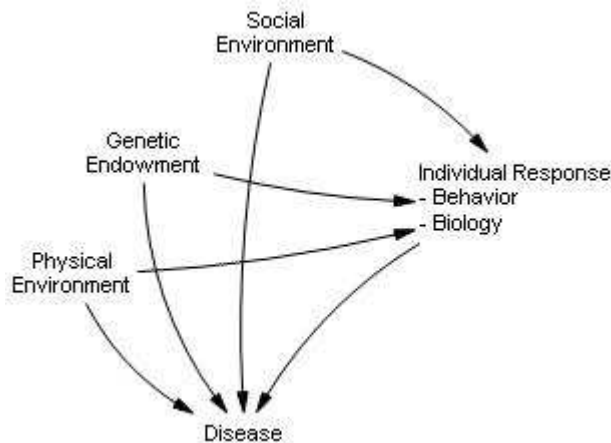
System Dynamics and Health Policy

HSD Models

Social Environment Based Models (text and model **cited from HPSIG,2006**):

For models that explore the dynamics of the influences on social environments.

Evans, Barer, and Marmor go on to develop a set of relationships that more robustly explore the influences on the overall illness burden of a population. This part of their model acknowledges that there are factors over which individuals (and/or populations) have no control and factors over which they have some degree of control, ranging from low to high.



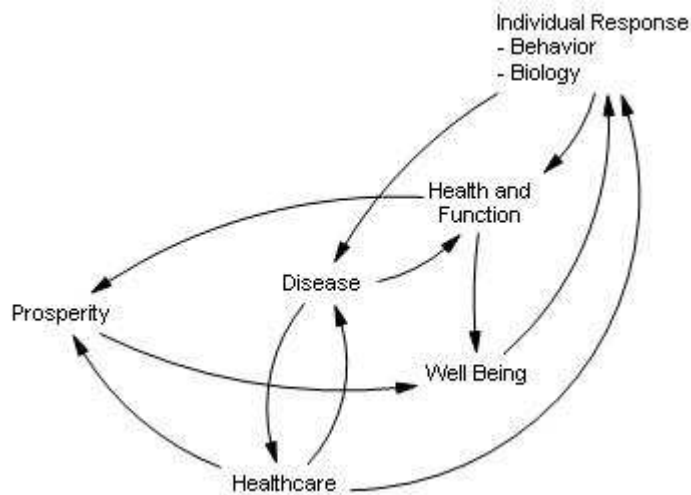
Appendix V

System Dynamics and Health Policy

HSD Models

Well-Being Based Models (text and model **cited from HPSIG,2006**):

For models that explore the influence that psychological and sociological factors have on a general sense of well-being.

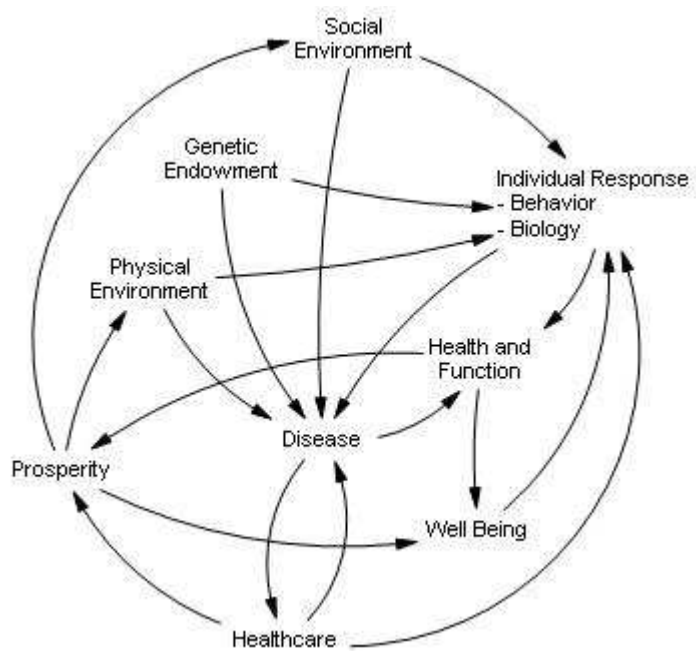


Appendix V

System Dynamics and Health Policy

HSD Models (text and model **cited from HPSIG,2006**):

The entire Evans, Barer, Marmor model looks like this:



Appendix VI

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Change in job motivation	Change in the direction, intensity or persistence of behaviour, such as acting as an employee in a goal-seeking or satisfying manner	Flow	Change in job motivation = (Indicated job motivation - Job motivation) / Time to change job motivation	Range: scale from 0 to 4	Calculation	
Degree of perceived justice with performance measurement system	Degree to which employees view the performance measurement system put in place as being fair/objective	Auxiliary	Number of times behaviour based rating formats are used for review sessions + "Number of employee-participation possibilities in developing/implementing the performance measurement system" + Effect of trained people for review sessions on perceived justice	Range: scale from 0 to 40	Calculation	
Effect of individual/group performance on job motivation	Degree of impact of individual/group performance on job motivation	Auxiliary	"Lookup per/jm" ("Individual/group performance")	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of individual/group performance on organizational performance	Degree of impact of individual/group performance on organizational performance	Auxiliary	"Individual/group performance"*0.3	Range: scale from 0 to 6	Calculation	
Effect of job motivation on individual/group performance	Degree of impact of employee job motivation on individual/group performance	Auxiliary	"Lookup jm/per"(Job motivation)	Range: scale from 0 to 1	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Effect of motivation on willingness to give reviews	Degree of impact of employee motivation on supervisors' willingness to give reviews	Auxiliary	"Lookup mot/rev" (Job motivation)	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of number of behaviour based rating formats used on willingness to give reviews	Degree of impact of number of behaviour based rating formats used on supervisors' willingness to give review sessions	Auxiliary	"Lookup bbr/rev" (Number of times behaviour based rating formats are used for review sessions)	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of number of merit pay schemes on job motivation	Degree of impact of performance-pay approaches (merit increments and bonuses) available on employee job motivation	Auxiliary	"Lookup mp/jm" (Number of merit pay schemes used)	Range: scale from 0 to 1	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of number of reviews on job motivation	Degree of impact of number of review sessions held per year on employees' job motivation	Auxiliary	"Lookup rev/mot" (Number of review sessions per year)	Range: scale from 0 to 2	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of number of trained people on number of review sessions per year	Degree of impact of number of supervisors trained for review sessions on number of review sessions given per year	Auxiliary	"Lookup tp/rev" (Number of trained people for review sessions)	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of organizational performance on job motivation	Degree of impact of organizational performance on job motivation	Auxiliary	"Lookup oper/jm" (Organizational performance)	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Effect of organizational performance on number of trained people for review sessions	Degree of impact of organizational performance on number of trained people for review sessions	Auxiliary	"Lookup oper/rew" (Organizational performance)	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of perceived justice with performance measurement system on job motivation	Degree of impact of employees' perceived justice with performance measurement system on employee job motivation	Auxiliary	"Lookup pj/jm" (Degree of perceived justice with performance measurement system)	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of promotion possibilities on job motivation	Degree of impact of the number of job promotion possibilities available on employee job motivation	Auxiliary	"Lookup pp/jm" (Number of job promotion possibilities)	Range: scale from 0 and 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme
Effect of trained people for review sessions on perceived justice	Degree of impact of number of supervisors trained to give review sessions on employees' perceived justice with performance measurement system	Auxiliary	"Lookup tp/pj" (Number of trained people for review sessions)	Range: scale from 0 to 10	Delphi-type expert survey	Mathematical relationship between variables was derived from interview data with experts in the field and with the help of the graph lookup editor of the Vensim programme

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Indicated job motivation	Degree of impact of performance appraisal activities on change in job motivation	Auxiliary	0.1*Normal motivation+0.3*Effect of promotion possibilities on job motivation+0.2*Effect of perceived justice with performance measurement system on job motivation+0.1*Effect of organizational performance on job motivation+0.1*Effect of number of reviews on job motivation+0.1*Effect of number of merit pay schemes on job motivation+0.1*"Effect of individual/group performance on job motivation"	Range: scale from 0 to 8	Calculation	Due to the quantity of data collected in OECD, large-scale surveys on motivational factors among public sector employees (OECD,2001), it became possible to express the strength of impacts in percentages in the formula (see Appendix III for a more detailed description of the process)
Individual/group base performance	Start level of base individual/group performance	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Individual/group performance	Quantity of activities produced by employee(s) per month	Auxiliary	(("Individual/group base performance"+"Effect of job motivation on individual/group performance")/"Time to change individual/group performance")	Range: scale from 0-20	Calculation	

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Job motivation	Direction, intensity, and persistence of behaviour, such as acting as an employee in a goal-seeking or satisfying manner	Stock	Job motivation = INTEG (Change in job motivation)	Initial value: 1 Range: scale from 0 to 8	Calculation	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Normal motivation	Start level of base employee motivation	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Number of employee-participation possibilities in developing/ implementing the performance measurement system	Number of times per year each employee is allowed to participate in the development and implementing process of the performance measurement system	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Number of horizontal job promotion possibilities	Number of lateral promotion possibilities (towards more stimulating jobs) available per employee	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Number of job promotion possibilities	Number of vertical and/or horizontal job promotion possibilities available per employee	Auxiliary	Number of vertical job promotion possibilities+Number of horizontal job promotion possibilities	Range: scale from 0 to 10	Calculation	

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Number of merit pay schemes used	Number of performance-pay approaches (merit increments and bonuses) available	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Number of review sessions per year	Number of review sessions given by supervisors to employees per year	Auxiliary	Effect of number of trained people on number of review sessions per year+Willingness to give reviews	Range: scale from 0 to 40	Calculation	
Number of times behaviour based rating formats are used for review sessions	Number of times supervisors' use behaviour based rating formats when giving review sessions	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Number of trained people for review sessions	Number of supervisors trained per year to give review sessions to employees	Auxiliary	Effect of organizational performance on number of trained people for review sessions/Time to train people for review sessions	Range: scale from 0 to 10	Calculation	
Number of vertical job promotion possibilities	Number of career opportunities available per employee	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Organizational base performance	Start level of base organizational performance	Constant	Constant	Range: initial value chosen between 1 and 4	Delphi-type expert survey	Initial value chosen between 1 and 4 in order to avoid too marked variances and to allow the model to balance out differences during the simulation process (choice based on personal communication with an expert in the field)
Organizational performance	Quantity of services produced by an organization per month	Auxiliary	((Organizational base performance+"Effect of individual/group performance on organizational performance")/Time to change organizational performance)	Range: scale from 0-20	Calculation	
Time to change individual/group performance	Time delay between impact of job motivation on individual/group performance and change in individual/group performance	Constant	Constant	0.1 month	Delphi-type expert survey	
Time to change job motivation	Time delay between implementation of performance appraisal activities and change in job motivation	Constant	Constant	3 months	Delphi-type expert survey	
Time to change organizational performance	Time delay between impact of individual/group performance on organizational performance and change in organizational performance	Constant	Constant	0.25 month	Delphi-type expert survey	

<i>Variable name</i>	<i>Variable definition</i>	<i>Variable type</i>	<i>Formula</i>	<i>Initial value/range</i>	<i>Origin</i>	<i>Comments</i>
Time to train people for review sessions	Time necessary to train supervisors to give review sessions to employees	Constant	Constant	1 month	Delphi-type expert survey	
Willingness to give reviews	Degree of supervisors' willingness to give review sessions to employees	Auxiliary	Effect of motivation on willingness to give reviews+Effect of number of behaviour based rating formats used on willingness to give reviews	Range: scale from 0 to 20	Calculation	