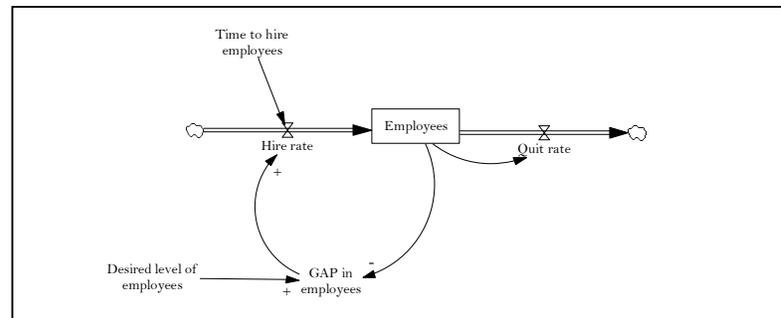


WHAT WE DON'T MEASURE ABOUT HUMAN RESOURCES:
Towards a conceptual framework for analysing the role of soft variables
in human resources management modelling



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Abstract

Low retention of valuable employees and difficulties in finding qualified candidates for recruitment are two issues managers face in Romania, but are a growing concern around the world (Deloitte, 2004; Holton & Naquin, 2004). High turnover of specialists disrupts organizational continuity (Lum, et al,1998) and the current policies don't seem to have the expected results, according to the field study of the author. We suspect that the cause of inefficient policies lies in a misperception of dynamics, ignorance of feedback loops and of intangible stocks, like the job satisfaction of employees. Although well documented in psychology literature (Lichenstein, 1998), the influence of job satisfaction on turnover seems to be ignored by the policy makers. We test policies that account for the determinants of job satisfaction and show that the outcome of such policies is better than the current ones. Implications for HR policy design and directions for future research are indicated.

KEY WORDS: Human resources; Job satisfaction; Intangible variables; Misperception; Policy design; Attitudes

1. INTRODUCTION

Low retention of valuable employees and difficulties in finding qualified candidates for recruitment are two issues managers face in the high growth markets, like the banking and telecom industries, in Romania today. While this thesis addresses issues in the Romanian human resources (HR) market, it also reflects a growing concern among consultants around the world about retention of talents in companies (Deloitte, 2004; Holton & Naquin, 2004).

External HR consultants and managers in Romania are complaining about the difficulties of making long term plans for their firms because of the high turnover of specialists. Literature indicates that functional turnover, that separates the poor performers in the company, is efficient for the companies (Hollenbeck & Williams, 1986; Dalton, Krackhardt & Porter, 1981). Yet consultants are complaining that the best, not the poorest performers are leaving. Thus turnover represents a problem because it entails greater costs than benefits and it disrupts organizational continuity (Lum et al, 1998).

The turnover is just a symptom, and the problem, in the eye of the managers and policy makers, is that employees are not motivated enough and that they need higher salaries or training in order to stay (Tabacaru, unpublished field study; unreferenced, 2005). The current solutions to the problem are the “buy” strategy, in which companies are attracting highly qualified employees by setting high salaries, even higher than those of the people currently employed on the same position, and the “train” strategy, meant to both increase the quality of the employees and increase their job satisfaction. Yet the policies are not yielding the expected results, and our aim is to show why.

We suspect that the current Romanian HR policies are inefficient because of the misperception of employee work related attitudes when designing policies addressing retention. Although literature shows the training does not directly influence job satisfaction, the current policies falsely assume a causal link between the two. Furthermore, we give evidence that the policy makers focus mainly on hiring policies to replace the loss of specialists, but they ignore, or they don't measure, the real causes behind the turnover. Literature (Serman, 2004; Moxnes, 2004) shows that people stop searching when they have found one possible cause for the behaviour they observe, and that they misperceive even the simplest dynamic systems. The policy makers' focus is on the easy-to-measure

data, like turnover and number of employees, thus misperceiving “soft” variables like the work attitudes. The intention to quit, job satisfaction and organizational commitment are three key employee attitudes that influence the turnover. (Ostroff et al, 2003; O'Reilly, Chatman, & Caldwell, 1991; Carmeli, 2005). Commitment should be built by improving these attitudes.

Even though work related attitudes are not easily measured, that does not mean that they are not quantifiable. The so called “soft”, or difficult-to-measure, factors are powerful drivers of growth and decline in the tangible resources that determine performance (Warren, 2000; Sveiby, 1997; Sveiby, Linard & Dvorsky, 2002). Thus understanding performance and evaluating the impact of policies over time requires that these soft factors too be evaluated and dealt with rigorously.

The present paper is based on both a fieldwork carried out by the author in 2005 in Romania, and on the experience the author has in working in HR departments in Romanian based multinational companies. Starting from the realities of the Romanian market and building on the psychology literature related to work attitudes like job satisfaction, we construct a model that explicitly shows the influence of these attitudes in the HR policy design and we test policies addressing the improvement of job satisfaction. We show that the policies that account for the real determinants of job satisfaction yield better results than the current policies.

The thesis is organized as follows. The second chapter presents an overview of the methodology used to investigate the turnover phenomenon in Romania, the structure of the interviews and the subjects of the fieldwork, and it introduces the system dynamics method and its contribution to understanding complex systems and policy design. Chapter 3 is a literature review about current and normative policies and about the misperception of dynamics and feedback in complex systems. The fourth and fifth chapter represent the modelling part. Chapter 4 presents the model we build and the psychology literature its variables are based on, assessing the validity of the model by direct comparison with knowledge and information about the real system (Forrester and Senge, 1980). The following chapter, the fifth, presents the validation process and its results. Chapter 6 represents the main contribution of the thesis, the policy analysis, where different policies are tested and their results and impacts on the main indicators of the firm are discussed. Finally, in the last chapter, implications for policy making are discussed and directions are given for future research.

2.METHOD

This chapter presents an overview of the method used to investigate the specialists' turnover phenomenon in Romania. It presents the structure of the interviews, the subjects and the procedure of the fieldwork and it goes on by presenting the system dynamics method and its contribution to understanding complex systems and policy design in these systems.

Fieldwork

The research this thesis is based on is a fieldwork carried out by the author in the period June - August 2005, in two cities in Romania, Bucharest and Cluj-Napoca. The choice of the interview as an investigation method was motivated by the need to gather qualitative data and its importance in developing system dynamics models (Forrester, 1992).

Subjects

The participants were, on the one hand, managers in multinational companies (mostly banking and telecom), and on the other hand, external HR consultants that had more than 7 years experience on the Romanian job market. The reason for choosing to interview both managers and consultants was to have a broader view and to confirm, partially, that what the consultants were saying is what actually happens in the companies. The age range of the subjects was between 25 and 45 years old.

All the subjects were very cooperative. The author's 6 years experience as an HR consultant in different companies in Romania was a mediating factor in the access to the pool of subjects. Most subjects were known to the author from before hand; however the same set of questions was applied to all of them.

Procedure

The interviews were semi-structured and contained a set of questions that were asked to all participants, as a basis for discussion. The "semi structured" interview is somewhat in the middle of a continuum that has on one end the "structured" interview, in which the interviewer determines the precise form and direction of questions in advance, and at the other end the "unstructured" interview, with no line of question prepared, but in which the interviewer decides what questions to

ask from moment to moment depending on the information given by the respondent (Dyer, 1995). The questions were aimed at discovering the set of policies most commonly used in companies and the indicators used in making the decisions. As Hauge (2004) suggests, the policy analysis investigation should concentrate on the operational goals decision makers have, on the rules guiding decisions (standard operating procedures), on the structural maps and on the control structures for choosing the policy type.

The language used was Romanian. All interviews were recorded and are available upon request in “.wma” format. All interviews were carried out at the premises of the interviewee. This practice facilitates the remembering of items and decisions made because of the similarity of the context in which the events actually take place (Smith, Osherson, Rips & Keane, 1988, *cited in* Miclea, 1999).

The following questions were asked to all managers from companies. The same kind of questions, but asking subjects to relate in general to the clients they have, were asked to the external HR consultants:

1. How much of your time would you say you spend on HR related activities? What are those activities? Give me an example from the past month.
2. Describe the HR processes in your department/company, what do you do. Report a success case and a failure of an HR policy.
3. What do you say best describes the end result of HR policies?
4. What do you report about HR to your superiors? What is the data you measure? How do you measure HR policies effectiveness?
5. How do you decide when a person needs training or receives coaching?
6. Try to sketch, in a graphical form, the relation between training and employee retention or commitment.
7. What are other policies that the company has adopted in order to ensure that people stay within the firm; give specific examples.

The drawbacks of interviewing, as pointed out in the literature (Dyer, 1995) and that we tried to counteract throughout the process, were the social desirability effect, very frequent in interviewing; general statements rather than specific examples; mistrusting the interviewer; and the “confidentiality” clause for not giving specific information from the firm.

Results

The results of the study can be categorized as follows:

- instances of decision rules
- instances of the representations or mental models of the usefulness of HR policies
- examples of data used in the decision making process

Due to the fact that all interviews were carried out in Romanian, and their exact transcription would take too much of the reader's attention, we chose to quote the interviewees whenever we make a statement about one of the above mentioned categories. We will refer to the field study as "Tabacaru, unpublished field study; unreferenced, 2005" when making the citations or refer to the study.

Publications survey

In addition to the field study, Romanian's main financial newspaper, *Ziarul Financiar* (The Financial Newspaper) was reviewed for articles describing the job market and specific HR issues for a period starting with 1999 until the present day. Other Romanian publications that deal with HR related problems, like *Capital* and *Cariere* (Careers), and several internet sites for HR professionals (e.g. www.HR-romania.ro), were also consulted on a regular basis between 2004 - 2006 to get a broader view of the issues discussed in this thesis.

The system dynamics method

The choice of system dynamics (SD) as a method is given by the description of the problem itself. As mentioned before, we hypothesize that a major cause of inefficient policies in the HR management in Romania is misperception of dynamics, of feedback and of intangible variables that are part of the HR system.

System dynamics is a method developed primarily to improve policy design in social systems. In system dynamics it is assumed that if we correctly and explicitly represent the various elements and relationships within a system, we can calculate the general dynamic behaviour for the system (Hauge, 2004). One of the main contributions of SD to understanding complex systems is the building of explicit models that account for misperceptions such the ones described above. Sterman

(2000) sees system dynamics as a method to enhance learning in complex systems. As an interdisciplinary method, SD is concerned with the behaviour of complex systems, and even if it is grounded in the theory of nonlinear dynamics and feedback control developed in mathematics, physics and engineering, it applies these tools to the behaviour of humans, drawing on cognitive and social psychology, economics and other social sciences.

The building blocks of system dynamics are the following concepts:

- *Stock and flow*

Stocks, as accumulations, represent the state of the system and generate the information upon which the decisions and actions are based. Stocks accumulate the difference between the inflow to a process and its outflow (Sterman, 2000, p.192). According to Mass (1980, *cited in* Sterman 2000), stock are also critical in generating the dynamics of systems because they provide systems with inertia and memory, being the source of delays and creating disequilibrium dynamics by decoupling rates of flow. Examples of such structures are ubiquitous in our lives: the bank account is a stock and the deposits and withdrawals from that account represent inflows and outflows, respectively; the stock of employees in a company increases with the inflow of hiring and decreases with the outflow of quitting or firing; a company's stock of customers increases with new acquisitions (inflow) and decreases with churn (outflow).

- *Feedback*

Feedback is a pervasive component in learning about complex systems. We gather information feedback about the world around us, and then use this information in altering the world through the decisions we are making. However, feedback is often difficult to see and, as Sterman (2000, p.12) says, "...much of the art of system dynamics modelling is discovering and representing feedback processes". Moxnes (2004) has shown that we have problems managing the simplest feedback systems even when we have the complete information about the variables. Other experiments show that the misperceptions of feedback are robust to experience, financial incentives, and the presence of market institutions (Diehl and Sterman, 1993; Paich and Sterman, 1993; Kampmann and Sterman, 1998). An example of misperceived feedback in our problem system is the influence of the "buy" hiring policies (paying very high salaries for newly acquired employees), designed for fighting against the loss of specialists: the difference in salaries influences the distributive justice perception of current employees, which decreases the employees' job satisfaction, which in turn, increases the specialists' turnover, thus rendering the policy inefficient.

- *Delay*

A delay is a process whose output, or result, falls behind its input in some way. A good example of delay is hiring people in a company. The input to the delay is the rate at which vacancies or positions are created. The result, or output, is the rate at which people are being hired. In between these two delays is the stock of vacancies that need to be filled in the recruitment process. Other examples are alcohol in taking, CO₂ absorption in the atmosphere, and the supply or distribution chain. Delays may seem easy to understand, but they are very frequently ignored in making decisions, often leading to oscillations (see, for example, the Beer Distribution Game, Sterman, 1989). The delay in training new employees until they become fully productive or the delay involved in the set up of a promotion system in the company are other instances of delays in the system we are describing.

- *Nonlinear relationship*

It is very rare that effects are proportional to the cause (linear relationship), and what characterizes a relationship at the beginning may not characterize it towards the end of the time frame. For example, working overtime may be efficient for increasing the productivity in the beginning, but, as tiredness accumulates, the worker becomes less productive (the worker burnout model by Homer, 1985, gives a good example of the effects of this nonlinearity). Similarly, when investing in training, there is no direct increase in quality, unless coaching is provided, and the effect of coaching saturates after a while, meaning that the relationship levels off after the maximum absorption threshold is reached, showing a diminishing marginal return behaviour.

The building of explicit models and the use of simulations are very useful when solving policy issues. The purpose of modelling is to gain insight into the problem, because, as Simon (1977) demonstrates, people are not rational beings, weighing all possible outcomes of decisions and analyzing all probabilities. Often the policies decision makers are choosing give counterintuitive results (Sterman, 2000). This ability to explicitly simulate decisions and learn from this process is a very good argument in favour of choosing system dynamics as a tool for investigating our problem.

3.LITERATURE REVIEW

This literature review is about the human resources (HR) department as a strategic department, and about the misperception of intangible variables and the psychology concepts they are based on. It also includes a section about current and normative policies applied to turnover issues. It finally reviews previous literature about HR issues modelling and draws attention to the attitude concept in psychology and why we think it is important for our problem description.

The HR department - a strategic partner?

The purpose of the HR department has always been to improve the performance of the system in which it is embedded and which provides the resources to support it (Swanson and Arnold, 1997). This statement points to the dynamics of the HR subsystem: investment in HR increases performance, yields growth, which in turn gives more resources to other investment initiatives. More specific to the training process, Hinrichs (1976) comments:

"The nature of the training process, when reviewed as a series of procedures to foster skill acquisition, immediately suggests an open system model of what's involved. Components of the model should be readily apparent to those with even a brushing acquaintance with the systems theory: inputs (trainees, organizational resources), some type of system operator (individual learning process, the 'training program'), and outputs (skilled personnel, organizational success). Systems feedback occurs through the training evaluation procedures, either research based or informal" (page 834)

However, many organizations, especially small businesses, fail to take the HR strategies into account when planning the firm activity. Their 'do-nothing' policies often result in a permanent crisis management producing lay-offs and early retirement incentives that produce long-term problems, such as shortages of high-qualified personnel (London, 1985). Too often the HR subsystem operates in isolation from other subsystem of the firm in reactive functions.

Employee retention is an important issue, particularly in high growth markets, yet the companies don't seem to always make the right steps towards achieving a high retention goal. Deloitte consulting, in a report (2004) about the acquisition and retention strategies affecting corporations around the world in the next 4 years, show that the typical US company spends fifty times more on recruitment of a 100.000 \$ professional than it invests in his annual training after he has been

hired. The average cost to replace an employee is one and half times one average yearly salary. New employees can take a year or more to master their jobs. Moreover, a company that focuses on external talent, but does not breed from within, can erode the commitment of internal candidates.

Employee retention is a complex construct, not just one variable (Lynard & Dvorsky, 2003) and it is affected by several factors, among which are: work overload, role ambiguity and job satisfaction (the overall degree in which a person likes his job). It would seem obvious that these intangible factors are the ones companies need to manipulate and integrate into their long term strategies if they want to keep their valuable employees. Yet too few companies even consider such issues.

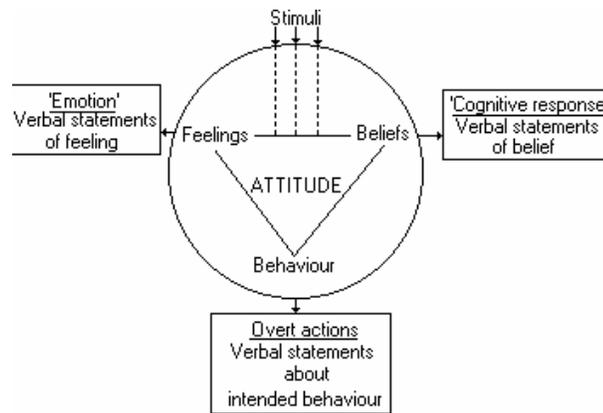
Intangible variables often create measurement difficulties, but that does not mean they are not quantifiable. We believe it would be very useful to make managers see the impact of these intangibles on the turnover, on the quality of employees and on the profits of the company. We will review, in what follows, why we believe the attitudes are central to our problem and some of the reasons for the difficulty of grasping intangibles.

Work related attitudes and “soft” variables in HR management

Attitudes as stocks

Why talk about attitudes in relation to human resources problems and to their system dynamics modelling? The majority of organizational scientists would agree that attitudes play the central role in their discipline. Attitude is defined as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour” (Eagly & Chaiken, 1993). Olson and Zanna (1993, p.119) note that most attitude theorists would agree that :

“...(a) evaluation constitutes a central, perhaps predominant, aspect of attitudes; (b) attitudes are represented in the memory; and (c) affective cognitive and behavioural antecedents of attitudes can be distinguished, as can affective, cognitive, and behavioural consequences of attitudes”



After Spooncer(1982)

There are many different definitions of ‘attitude’; however, we believe that the one advanced by Schiffman and Kanuk (1996) contains most of the major concepts: “a learned predisposition to behave in a consistently favourable or unfavourable way with respect to a given object “. The three component model of attitudes emphasizes that attitudes persist across time and situations, that are limited to socially significant events or objects (like the work environment) and that they involve at least some degree of abstraction, meaning that it will take a while or an important event to change an attitude (Hogg& Vaughan, 2002).

According to Anderson’s (1971, 1980) information integration theory, most of our attitudes are constructed in response to information we receive about our attitude objects. People function as complex problem solvers and as vigilant evaluators of new information, and how we receive and combine this information provides the basis for attitude structure. From all the attributes of the information, the salience, for example, and the order in which the information is received become important determinants in the ways they are processed. As new information arrives, people evaluate it and combine it with existing information stored in memory. In Anderson’s approach, people acquire and re-evaluate attitudes by a type of cognitive algebra, which involves ‘mentally’ averaging the values attached to discrete bits of information that are collated and stored in memory about an attitude object.

This description of the information integration process is similar to the stock definition in the system dynamics methodology. The similarity is relevant in what Anderson describes as memory and the difference between what is already stored and the new information. In the SD words, Sterman (2000, p.192) describes stocks as:

“Stocks are accumulations. They characterize the state of the system and generate the information upon which decisions and actions are based. Stocks give systems inertia and provide them with memory”.

We believe that attitudes are a very good indicator of the state of the system. The goal of the attitude, that of maximum value, against which actions are weighed, is constantly re-evaluated in the light of the information regarding the work environment changes.

One might very well ask: why show the variables that represent people's attitudes, since they are so hard to measure? And since the instances preceding them have, in the end, an influence on turnover, why not link the precedents directly to turnover and show a mathematical formula of the relation that will encompass the mediating factors (that is the attitudes) in its formulation?

When people ignore accumulations in their structural maps, they reduce the time span of their thinking (Hauge, 2004; Sterman, 2000). Many actions have consequences that materialize after a long time. The Beer-game is a well-known management example of what happens when people ignore the orders that they have sent, but where they not yet have received the goods ordered. The goods on order can be represented as a stock, and when people order more goods because they only ordered an amount of goods last time period, and not look at their total amount of orders, they experience systems that have tendencies to overshoot and collapse (Sterman, 2000).

The purpose of this thesis is to show the managers what are the things that they are excluding from their decisions. This can only be done by explicitly showing the delays and the stocks they are ignoring, because SD research has been striving to show that explicit representations of the instances we consider when making decisions, are powerful instruments in improving decision making. As Sveiby, Linard and Dvorsky state (2005):

“To the extent that qualitative variables are perceived to be relevant to the problem under review, and would otherwise implicitly be factors into managerial decision making, it is far better to confront the choice values openly and explicitly rather than allow them to be hidden. In this way, decision makers and stakeholders are better able to identify the implications of the qualitative assumptions and to challenge their usage or valuation if this seems desirable.”

The relation between attitudes and behaviour

The relation between attitudes and behaviour has been long studied in social psychology (for a comprehensive review on the attitudes' research see Azjen, 1991; Azjen and Fishbein, 1980). Current research views attitudes as a construct that precedes behaviour and guides our choices and decisions for action, even though it is not something directly observable (Hogg& Vaughan, 2002). The word "attitude" comes from the Latin word *aptus* which means "fit and ready for action". Describing the relation, Azjen (1991) notes that:

"Intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control, account for considerable variance in actual behaviour."

The literature shows that attitudes are *predictors* of what people will do, so it is worth measuring them from that perspective. In the broadest sense of functionality, attitudes facilitate adaptation to the environment (Eagly & Chaiken 1993). A word of caution, however: establishing a correlation does not establish causation, though it often provides *evidence* about causation. To establish causation, other reasons must be ruled out. For example, sending people to training and increasing retention may *correlate*, but it is not necessarily true that one *causes* the other. In other words, caution is required if we want to demonstrate a relation between attitude and behaviour, both have to be measured appropriately and for a longer period of time to avoid confounding factors (Furnham, 1997). This is exactly what the organizations are not doing: they are measuring behaviour, but not attitude. Why is it so hard to take into account such intangible variables as the attitudes, although there it least some recognition of their importance?

Measuring intangibles: the accessibility of data bias

The importance of these "soft" indicators that we are stressing is not obvious to the decision makers, even though literature, especially the industrial and organizational psychology literature, has a long history of research on how satisfaction influences turnover and productivity. What we have here is a problem of VISIBILITY. We will try to build on psychology literature to support the inclusion of the "soft" variables in our model.

Causal search and attribution

Many of our beliefs concern the relation between one quantity and another and we are concerned with such relationships because we want to decide whether to manipulate one thing in order to affect another (Barron, 1995). What is the relation between the amount of money I invest in training and the performance improvements I get? How about the job satisfaction and the training opportunities? Over the long term, how do my recruiting efforts reflect the quality of the people I have in the firm? The normative theory points towards statistical correlation, but people systematically violate this normative view.

Correlations are very often confused, in everyday reasoning, with *causal* relationships (Barron, 1995). Research about the probability heuristics shows that people have a bias towards correlating two instances simply by associating the presence of two, and ignore the combination of probabilities of one or both being absent (Smedslund, 1963). Subjects typically attend to the probability of the outcome given the “present” cue only. In a case of associating the probability of a disease with the presence of one symptom for example, Smedslund shows that 85% of the nurses investigated stated there is relation between the two, even though the number of times when the symptom was absent and the disease present was almost as high as when both are present. This is very relevant in organizations, when associating instances in the surrounding environment and picking up the present cues helps develop very simple cause and effect relationships, which lead to the misperception of dynamics.

Documentation of attributional activity is, from an experimenter's point of view, a difficult task to explore. However, there is reasonable consensus (Weiner, 1985) that search for a cause is elicited by either an unexpected event or by a failure in an otherwise familiar and successful task. In other words, policy designers will only look for a cause if something goes wrong or unexpected, and then stop looking when they will have found a first possible cause to explain that. Vandenbosch & Higgins (1996) found that as long as companies were doing satisfactorily, they made little effort to improve their decision rules. As Hauge (2004) reports, a search activity's success or failure is evaluated based on short-term feedback, and an activity's past record of accomplishment determines its likelihood to be used the next time the search procedure is implemented. The search procedure, therefore, controls the adaptation of the policies, the learning techniques, and the key organizational goals. Vandenbosch & Higgins (1996) found that scanning behaviour, more often than other types of information acquisition, led the policy designer to find new and challenging information that contributed to mental model building. Sometimes, however, policy designers are

not able to perceive new and unusual information, and in such cases, scanning behaviour will result in mental model maintenance. This may very well be the case of the ignored soft variables.

Saliency of quantitative data

An important factor that influences the choice of policies is the saliency and relative easiness of collecting quantitative data, versus the more unquantifiable variables. In an experiment by Feldman (2004) about the culture of objectivity at NASA, it is shown that misunderstanding leading to the explosion of Challenger and Columbia spaceships resulted from two general aspects of NASA's culture: (i) an over-confidence in quantitative data went hand-in-hand with a marginalization of no quantifiable data, leading to an insensitivity to uncertainty and a loss of organizational memory; and (ii) problem definition and solution creation were constructed as if they were independent of organizational goals, resulting in an inaccurate estimation of risk.

This over-confidence in quantitative data is specific to a broader context: accessibility of information—the ease (or effort) with which particular mental contents come to mind. This is a well documented phenomenon (Tversky & Kahneman, 1974; Kahneman, 2003). Kahneman is arguing that the accessibility of a thought is determined jointly by the characteristics of the cognitive mechanisms that produce it and by the characteristics of the stimuli and events that evoke it. Among others, the determinants of accessibility subsume the notions of stimulus saliency, selective attention, specific training, associative activation, and priming. Because quantitative data is more salient than qualitative data, it is highly likely to observe a bias towards the first type. Muller (2001) also shows that more complex decision tasks lead to a higher deviation rate and that in the presence of differences between the numbers of outcomes, subjects prefer the simpler alternatives.

The bias towards salient data needs to be documented in the case of complex decision making in HR policies. We believe that the process of building up positive work related attitudes, like job satisfaction, is one that is limitedly transparent. We define “limitedly transparent” as containing “variables that cannot be observed directly, either because we are only capable of observing the symptoms, or because the system contains so many variables that we have to concentrate on the few that we regard as the key ones in the system” (Hauge, 2004, p 29). Career opportunities, distributive justice and job satisfaction are just some examples where only their *effects* on productivity are easily observable. The way in which they influence, however, are most often not

measured or unclear, and thus unattended to. We will show, in what follows, the current policies used in Romania, and why we believe they are inefficient.

Current policies description

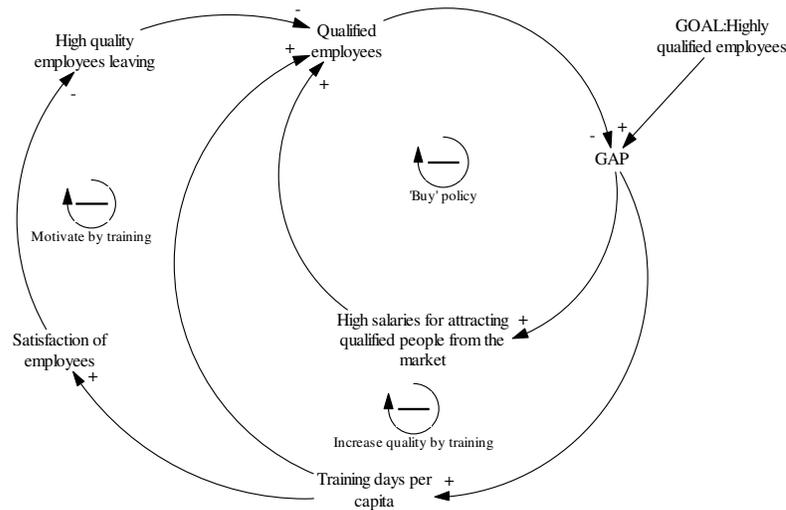
Companies have a clear and growing bias to build human capital through organization-sponsored, formal training (Davenport, 1999). The main solution to a wide range of problems is training: expensive training, team buildings outside the company, in mountain or seaside resorts, training that enchants the eye and makes the employees believe that the company cares for them. Companies spend small fortunes on training, but fail to measure their impact. As a leading company in training and consulting in Romania says, “there are extremely few clients that are interested in the impact of their training session on anything: employee morale, turnover, retention” (Tabacaru, unpublished field study; unreferenced, 2005). As long as it is done, they have a load off their back, they have done something. If it doesn't work, it must be the external conditions of the market that are to blame. But if training is done isolated from the real problem, what good will this do?

Holton and Naquin (2004) show that human resources development (HRD) initiatives are often too expensive or too difficult to measure and that has led to a credibility and accountability gap with regard to development. The investment in training, only one of the activities aimed at improving the employees' job performance, represents a huge financial expenditure, as high as the hiring costs. As Baldwin and Ford (1988) point out, only as little as 10% of all expenditure is projected to pay off in performance improvements resulting from the transfer of knowledge to the job, mainly because people do not transfer their knowledge in the real work situations. Training represents the HRD activity with the smallest chance of the person actually learning the point, compared to other activities, such as group learning through joint task assignment, doing your own research or even asking a colleague for help (Deloitte, 2004).

The current policies to address the specialists' turnover in Romania are two: the “buy” and the “train” strategy or policy. The “buy” strategy means that companies are attracting highly qualified employees by setting high salaries, even higher than those of the people currently employed on the same position. The “train” strategy is meant to increase the quality of the employees and give them an impression that the company cares for them, but it also acts as a motivation tool per se, as often it is done without any relation to the training need (Tabacaru, unpublished field study; unreferenced, 2005): “If employees ask for training, the managers give them training because otherwise they will leave. It is fashionable to give training these days, but managers don't care

what type of training they give”, says one external HR consultant (Tabacaru, unpublished field study; unreferenced, 2005).

The expected outcomes of the current policies are as follows:



Current polices and their **assumed** effect

This causal loop diagram¹ shows that the policy makers (righteously) believe that by setting high salaries, they will attract high quality employees, thus solving the problem they got by losing good quality employees in the first place. What policy makers fail to see is that setting high salaries for the incoming employees affects the current employees in the long run. Also, it transmits an implicit signal that the company is not looking to promote, but rather the only chance for the employees to promote or get a raise is to be “bought” by another company themselves.

The “train” policy also raises some questions. As literature shows (Holton & Naquin, 2004), one of the problems with analyzing the output of the training process is that the utility and value of training are too often taken for granted. Education in our society has mainly a positive value associated to it: proposals for training rarely have a negative reception by business executives who in other decision may be more harsh and analytical (Hinrichs, 1976). Very frequently the training is accepted as an end in itself, without careful analysis of how it contributes to the broader business objectives. It seems that this non-discriminative acceptance of training is also widely spread in the Romanian market.

¹ For a description of the causal loop diagramming notation, see chapter 4, Model building

Another problem is that policy makers seem to expect training to give results immediately. However, from the moment you send people to training, until they actually apply what they have learned, there is a big delay. Transfer to workplace conditions of the knowledge acquired in class doesn't just happen; employees need support from both their manager and their peers. It is clear that organizational support for transfer is essential, and that is one factor that Romanian companies seem to fail to take into account.

To account for transfer of knowledge from training, Holton & at (2000) developed an instrument addressing the conditions that need to be met in order that the transfer happens. The most important factors accounted for in the learning transfer indicator are the following:

- Content validity : how valid is the design of the training program so that it is relevant to the topic discussed
- Transfer design: how does the firm plan that the knowledge be transferred to workplace situations, does it give or not any indication of this during the training program
- Personal capacity to transfer: does the individual know how to transfer the information learned
- Opportunity to use: is the employee given the opportunity to use the new information at work
- Peer support: do the peers help the newly trained make use of his/her new knowledge

To sum up, we have two issues here: on one hand, we have an ill defined problem, and on the other hand we have ineffective policies to address that problem. Let' take a closer look at the basis for designing such policies.

The key motivators behind HR policies in Romania, as the field study (Tabacaru, unpublished field study; unreferenced, 2005) revealed, are the following indicators (the list provided is an exhaustive one and it includes all the decision variables the subjects mentioned):

- Turnover
- Performance indicators (in very few cases, when performance appraisal systems are in place)
- Headcount (the number of people approved by the management to be recruited - could be approximated as "approved vacancies")
- Number of training days per capita
- Training budget that needs to be spent by the end of the year
- Job descriptions and level of education reached before coming to the company.

A quick evaluation of these indicators shows that they are based on quantitative measures, which say very little about *why* people are not motivated. In SD terms, the companies are treating the lack of motivation as an exogenous influence that is not affected by conditions internal to the companies. Perhaps, then, they are measuring the wrong indicators, and adopting the wrong policies in response to those measured.

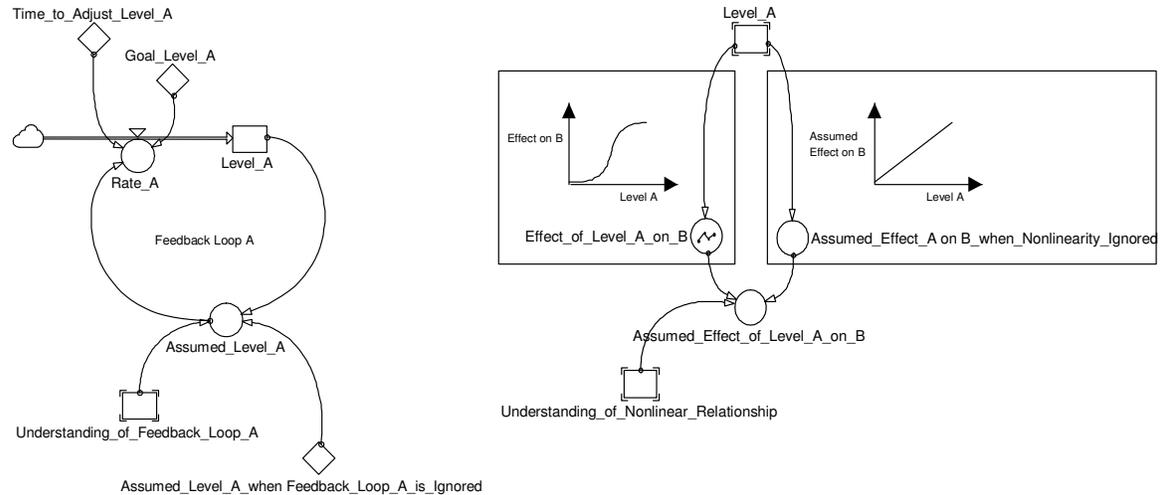
By building a model to explicitly address the understanding of work related attitudes and their determinants, and designing policies taking into consideration the above described variables, we believe we will obtain better results for three indicators: turnover, profits and quality of employees.

Normative policies

The literature shows that decision makers often oversimplify complex dynamic problems in the direction of static systems, with the result that chosen policies are not only inaccurate but also systematically biased. Misperception of dynamics and a faulty mental model can prevent the managers from seeing the real problems (Sterman, 2004; Moxnes, 2000, 2004). If people do not have the correct representation of stock and flow, it's very likely that they will either ignore one flow (Warren, 2002), or they underestimate the value of a stock (Hauge, 2004). As Warren (2002, p.32) shows, "(...) having the right information is vital for understanding what is happening through time. A regular report on staff members is useful, but a report separating gains and losses (*meaning separating inflows and outflows, n.a.*) is much more valuable, in the sense of indicating where action is needed".

The lack of measurement of the HR contribution to the system makes the investment in this area chaotic and short term oriented. We believe this might probably be leading to some sort of over- or under-evaluation of key stocks. As Hauge (2004) suggests it, this can be modelled as a misperception of accumulation of stocks, because if you can't manage what you can't measure, you surely can't measure what you can't describe (Norton, 2001 *cited in* Linard & Dvorsky, 2003). Hauge made an analysis and tested different (hypothetical) outcomes from policies that were ignoring the feedback loops, the accumulations, the delays in the system and the non-linear relationships. A representation of her assumptions is given in the next figures. ²

² For an explanation of the stock and flow diagramming notation, see Chapter 4, Model Building



Suggested stock-and-flow representation of misperception of feedback loops and non-linear relationships (Hauge,2004)

Hauge asserts that when a loop is broken, or partly broken, a gap between the true value of a variable (“Level A”) and the assumed value of this variable may develop (“Assumed Level A”). Similarly, by totally misperceiving a non-linear relationship, a policy designer views this relationship as a pure, linear relationship.

In a study about the consequences of turnover, Staw (1980, p217) says “we need to know more about the attributions and lay theories of administrators in regard to turnover”, further noting “If we understand why administrators react to turnover the way they presently do...it may be easier to change these behaviours in the future”.

If we consider the above statements regarding the normative way of building efficient policies, it is clear that the current policies probably don't yield the expected results because the managers:

- ignore or misperceive the existence of job satisfaction as mediating stock variable
- ignore other variables and feedback loops that affect the evolution of this stock, like the importance of coaching in transferring the knowledge from training sessions.
- focus on inflow of employees and design attractive hiring policies, but disregard the outflow form that stock: why they are leaving.

We will come back to and develop more on the current policies when describing the model in chapter 4.

The real problem is the high cost of inefficient policies directed at reducing the turnover. As the managers claim, it is easier to take a man that is already a specialist than to invest in a rookie and grow him yourself over the years, pointing to the fact that they may not invest much in developing employees in the company. If managers are misperceiving the real causes of turnover, and direct their spending in the wrong direction, the policies are not yielding the expected results. We challenge the current policies because we believe they are mostly a fire fighting solution. We assert that taking into consideration employee attitudes would help improve the policy design by making it more effective in terms of both results of and costs associated with the policy implementation.

Previous modelling of HR processes

Psychology literature

Turnover has been a highly researched issue in Industrial/Organisational (I/O) psychology and it has not lacked controversy. Although it is generally agreed that high turnover is detrimental for the organisation, Dalton, Todor and Krackhardt (1982) have highlighted the need to distinguish between turnover frequencies (i.e. the number of separations) and turnover functionality (i.e. the nature of separations). The authors found that 42% of the voluntary turnover among bank teller was actually functional, as poorer performers were leaving the bank. Boudreau (1983) and Boudreau and Berger (1985) have argued that utility models, which emphasize the retention, should focus on the flow of employees who enter and leave the organisations.

The need to separate between the poor and good performers is essential, as the quitting of 10 good performers is more damaging to the organizations than of the poor performers. In our situation however, it seems that the problem is that the good performers leave, and that the companies are worried both by turnover frequency and by losing key employees, even if they don't measure functional turnover properly. Dalton, Todor and Krackhardt (1982) believe that future research on turnover needs to identify variables that are associated to turnover functionality. Factors believed to affect motivation, such as contingent reward structures, goal setting and feedback and training need to be examined with respect to functional turnover. To respond to these issues, our model addresses the goal setting & communication and training in the broader context of turnover determinants.

When it comes to explicit modelling of turnover, and we mean modelling as in mathematical causal (theory like) models that base their mathematical expressions on postulated causal relations within the modelled system (Barlas & Carpenter, 1990), there is relatively little research in I/O psychology. The models we could find (e.g. Boudreau & Berger, 1985; Boudreau, 1983; Sturman, Trevor, Boudreau & Gerhart, 2003) were mostly utility analysis models that dealt with the profitability of a certain policy versus another, yet few attempted to make claims about the results of the interaction of the variables in the real system by simulating such a system. Nevertheless, these articles hold important contributions to the field on modelling HR issues and deserve our attention for the future research directions they give.

A reference article is Boudreau & Berger's (1985) algebraic model for utility analysis of acquisitions and separations (hiring and quitting decisions) in a HR system, reflecting three basic types of variables for each of the movements: (a) the quantity of the movers (e.g. the number of the employees selected); (b) the quality of the movers (e.g. the expected increase in productivity produced by the employees), and (c) the costs incurred to produce the movement (e.g. the cost of developing and applying the predictor that leads to productivity increase)

As the authors identified, at the time the article was written there was an obvious void in current utility models regarding their ability to account for the effect of employee separations (layoff, retirement, and turnover) on the HR system. The important contribution of this model was the focus on the outflow of employees. The models until that point had been mainly concentrating on the inflow of employees and the hiring processes. Boudreau & Berger's focus was the retention utility or impact of retention on productivity, showing that there is substantial positive utility in retaining the employees.

The directions of research given by Boudreau & Berger's study indicate very useful paths in defining our contribution to the problem of modelling turnover & retention. Firstly, Boudreau & Berger's model does not show specific policies to retain employees and these policies' impact on the profits of the firm. Secondly, it ignores the delay in making these policies work in the systems. Thirdly, the time frame is limited to 10 years. Fourthly, the simulated analysis considers only employee selection and hiring, and the authors suggest that other factors, such as training, could be included. There are several measurement challenges, and finally, the model only addresses external employee movement, saying nothing about what happens inside the company. We will add to these the limitations the fact that the model is not transparent and can be very hard to grasp for people with little mathematical background. In our model, we discuss specific policies to address turnover

and simulate their result, we incorporate delays, we expand the simulation over a period of 15 years, we include training in the process, and we show what is going on inside the company when each of the policies are tested. Finally, by using system dynamics as a modelling methodology, we show all of the above in a transparent and easy to understand modelling language.

In a recent article on utility analysis, Sturman, Trevor, Boudreau & Gerhart (2003) demonstrate how, through integrating turnover and compensation research, the Boudreau and Berger (1985) staffing utility framework can be used to address the retention issue of key employees. They estimate the effects of incentive pay on employee separation patterns at various performance levels, and then use the utility framework to evaluate the financial consequences of incentive pay as an employee retention vehicle. However, they do not discuss the impact of job satisfaction or other work related attitudes that influence the turnover. Rosenblatt & Sheaffer(2001) suggest that the organizational and environmental predecessors in the “brain drain” phenomenon, or the loss of specialists, are the labour market opportunities, internal career opportunities, unbalanced workload, and undifferentiated retention strategies, thus pointing to more “soft” variables .Even though Rosenblatt & Sheaffer (2001) base their case on literature describing the turnover of specialists, they do not provide any implantable model to test its hypothesis.

Finally, Maertz and Campion (2004) distinguish between *process* models of turnover, which have a focus on how people quit; and *content* models, which focus on why people leave. Their results suggest that process-content integration is a fruitful direction for turnover research. We will model explicitly how each variable influences the turnover, pointing both to the process and to the content of this phenomenon.

System dynamics literature

There is very little SD modelling on the HR subsystem and its link with the endogenous structural conditions of a business, although the labour is an important part of most SD models. As Sveiby, Linard and Dvorsky (2002, p.1) show in their comprehensive review of HR related literature in the SD field:

“Despite the fact that simple human resources (HR) capacity models have been stock-in trade for system dynamics software manuals and training courses for over a decade (...) there are surprisingly few published papers that focus specifically on the personnel or workforce dimensions of the system dynamics of organisational value creation”.

Most SD models show the processes in the HR subsystem just as the transition from one stock of rookies to the stock of experienced, and more often the level of skills or quality that needs to be attained. There are several exceptions that we will draw our research upon: Achi & Mott (1982), Hirsch (1965), Sveiby, Linard and Dvorsky(2005).

In the model developed by Achi & Mott (1982), the authors investigate the performance dynamics in a consulting firm, dynamics created by the interaction between the expectation and perceptions of the professional staff, the planning and control policies of the firm and the market place. They define job satisfaction as depending on overload assessment, work mix (repetitive, basic work versus project, creative work) and fraction of manager allocated time for staff development. Another important soft variable they consider is perceived career opportunities, depending on the promotion rate and the career opportunities from growth in client attractiveness. We will also consider the perceived career opportunities from the market.

The average staff quality in Achi & Mott's view is exogenous. In the words of the authors:

"[...] the firm may attempt to improve the performance of its professionals by means of training programs designed to increase professional competence, but its key leverage point is its ability to recruit the highest quality individuals in the system".

Thus, by increasing the manager allocated time to recruitment, the firm automatically increases the new recruit quality, finally increasing the quality of its employees. We believe that the training variable is endogenously determined in our case, since it is often a policy undertaken as a result of the turnover crisis.

Finally, management time allocation is set in order of priorities as time for engagements, time for recruiting, time for staff development, time for selling/ specific job tasks. The managers' time is also dependant on perceived partnership attractiveness on time. An interesting point is that Achi & Mott see the time allocated to development of employees a *result* of the employees' satisfaction, and not its determinant. The explanation is that the satisfied employees take the proactive stance necessary to gain the full benefit of the managers' time. This may as well be the case of the specific company that the authors are modelling; however, we think this formulation needs to be restated for a more general analysis, as the one we are attempting and in line with the psychology literature on job satisfaction (Agho, Price & Mueller, 1993)

In a paper describing a system dynamics model of professional performance, Hirsch (1965) defines motivation as the central drive to work:

“Motivation to work refers to the professional’s desire to perform work in the interests of the [...] company.”(p. 22)

He believes that people are motivated to stay in a company not directly due to the performance, but because incentives influence their motivation to work. There are different other influences: motivation from pressure, motivation from group cohesion, motivation from position increase, motivation from salary increase. These are all predecessors of motivation and contribute to its variation over time. Hirsch approximates motivation to job satisfaction, but does not present convincing literature supporting his claim.

A major drawback of the two models discussed, Achi& Mott (1982) and Hirsch (1965), is that they are built in Dynamo, one of the first SD software for simulation. We could not reproduce the models and run them in order to test other policies than the ones suggested by the authors, even though the formulations of soft variables are interesting and useful to our problem description.

More recent modelling efforts are concentrated on other aspects that deal with the HR subsystem, like the intellectual capital (Bianchi & Bivona, 2005), the group learning processes going on in a company (Lizeo 2005), the broader unemployment problem (Nanda, Rao and Vizayakumar, 2005), the retirement plan (Labeledz and Stalker, 2005) or the training (Bajracharya et al 2000). These models do not tackle the endogenous aspects of retention or turnover and most of them do not quantify intangible variables like work related attitudes, though they mention their importance. Furthermore, Sveiby, Linard and Dvorsky (2002) argue that in the papers presented until that moment in the most representative instance of the SD society, the annual System Dynamics conference, the definition of the “soft” variables in HR was vague and unclear. In response to these critiques, we intend to clearly define our “soft” or intangible variables basing our case on psychology literature about work related attitudes, and attempt to represent the structure behind the behaviour of turnover.

The interest towards SD modelling of human resources problems is increasingly relevant these days since more and more firms are now employing human resources information systems (HRIS) to help decision making and policy enforcement. A HRIS is defined as “a system used to acquire, store, manipulate, analyze, retrieve, and distribute pertinent information about an organization’s human resources” (Tannenbaum, 1990). As useful as a HRIS can be, the results it yields are mainly descriptive, in the form of reports. Examples of data that a HRIS report contains are number of

employees, days or hours worked, holidays taken, number of people hired or quitting, days of training per capita, etc. As Haines and Petit (1997) show, “The ideal assessment of HRIS success would probably include data from a return on investment or utility analysis.” We believe that a system dynamics model could provide simulations to show the effectiveness of certain policies and help decision making.

Summary

In this chapter we reviewed literature showing the importance of the human resources system in the strategic view of a firm, and we argued the contribution of attitudes into the broader perspective of our problem definition. The misperceptions of intangible variables in dealing with HR issues were discussed and the current and normative policies employed in order to fight turnover reviewed. We tried to build on previous attempts, both in I/O psychology and system dynamics literature, which modelled HR policy making decisions.

Some of the directions for research we identified were:

- a) policy makers seem to ignore the importance of work related attitudes in solving the turnover problem, thus a solution for a better understanding of the problem is required;
- b) there is a need for formal, transparent and user-friendly models and analysis for the turnover problem in order to show managers the impact of their policies and help them design better ones;
- c) in the SD community, there is a need to show the interaction of “soft” variables in the HR system.

In the next chapter we present our model and explicitly show how we believe its components influence each other.

4. MODEL BUILDING

In the previous chapters we have presented the motivation for this study, the method we employed in our research and we have reviewed literature helping us to build our case. This chapter presents an important part of our contribution: the model and the psychology literature the model's variables are based on, thus assessing the validity of the model through direct comparison with knowledge and information about the real system (Forrester and Senge, 1980). First, we present the reference mode and the assumptions it is based on. We continue with a model overview meant to help the reader grasp the basic dynamics involved in the retention problem. The main variables of the model are then presented and the assumptions behind each relation made explicit.

Reference mode

We chose to model a single company, and not the aggregated economy, since it will have more impact on the individual client we will (hopefully) be using this model for. We will refer to the company throughout the modelling chapter in singular, as "the company". This company reflects the banking and telecom businesses, which experience the highest problem in retaining valuable employees (Ziarul Financiar, March 24th 2006). As the system dynamics practice imposes, we had to find a relevant stock and observe its behaviour over time; this procedure gives us the reference mode and the dynamic hypothesis that encompasses it.

Since there is no available historical data for our problem, we have developed a number of hypothetical reference modes, the validity of which we will now seek to establish (Randers, 1976).

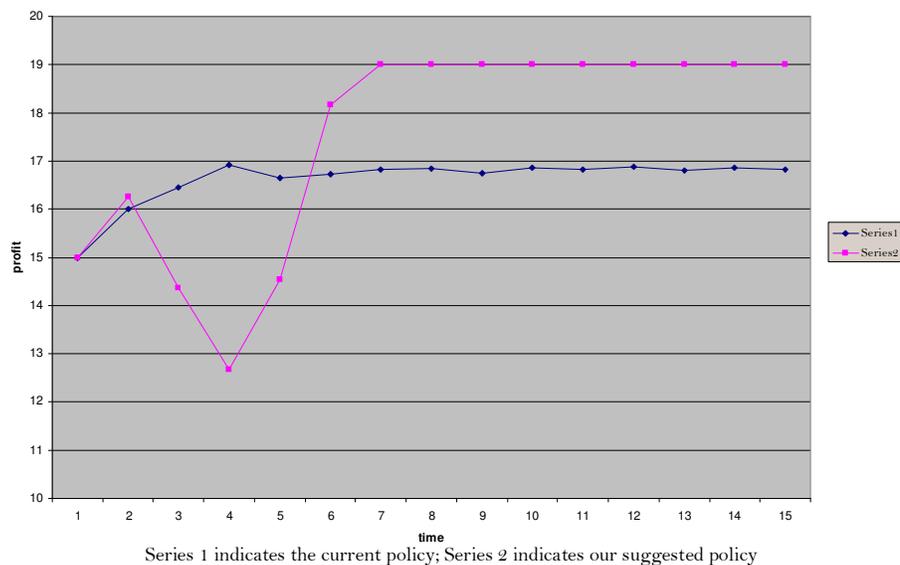
We decided to concentrate on:

- the stock of profits of a company
- the stock of quality of employees
- the turnover indicator (because this is an important decision variable in the current practice of the decision makers and also a useful indicator of the efficiency of retention policies, *ceteribus paribus*)

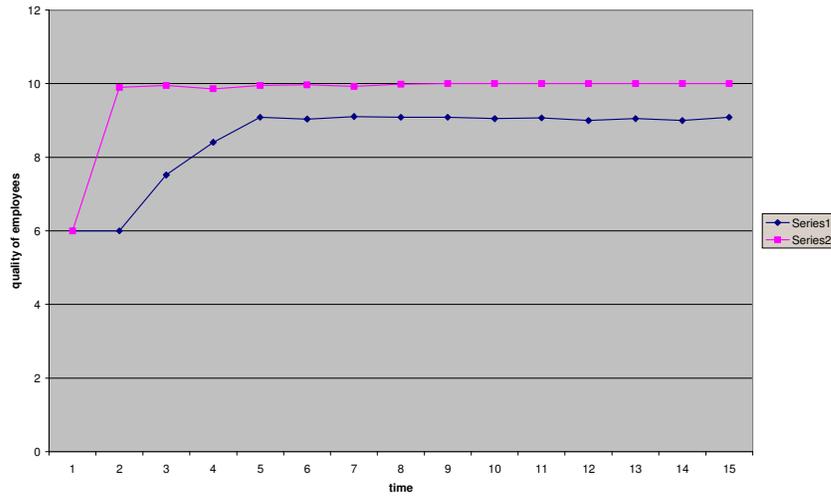
We believe that the real problem is policy makers' misperception or ignorance of the work related attitudes (stocks) and feedback loops affecting both their decision variables and the expected

outcome of their policies. In a study about the policy decisions process, Hauge (2004) asserts that when a loop is broken, or partly broken, a gap between the true value of a variable and the assumed value of this variable may develop. Similarly, as argued in the literature review, when people ignore accumulations, they reduce the time span of their thinking. The result of such misperceptions is an overestimation of the value of the stock and of the impact it has on the policies. Thus, policy makers will assume that the job satisfaction is higher than it actually is and disregard its influence on the turnover.

Reflecting the above mentioned statements in a graphical mode, we expect that implementing attitude oriented policies will follow a classical “worse before better” pattern for the profits of the firm: in the short term the profits will be lower because there are costs that implementing correct policies entangle, but the result in the medium and long run will be better than the current policies. This reference mode is associated with different value for the job satisfaction: low job satisfaction in the current policy, high job satisfaction in our suggested policy.

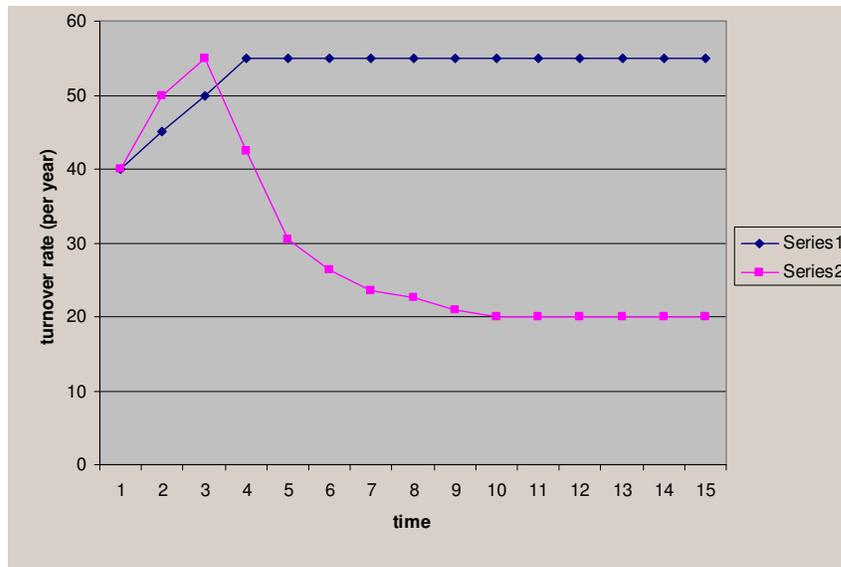


In terms of quality of employees, we believe that investing in coaching, as our policy will suggest, will yield better results due to the ease in transfer of knowledge to the workplace tasks, as argued by Holton & Naquin (2004), Baldwin and Ford (1988), Holton et al.(2000) and Knowles et al (1998). The increase will be faster in our suggested policy due to the favourable environment that facilitates learning.



Series 1 indicates the current policy; Series 2 indicates our suggested policy

Finally, we assume that the turnover rate will decrease as a result of investment meant to increase the satisfaction and commitment of employees, as these attitudes have an impact on the quit rate (Lichtenstein, 1998; Price and Mueller, 1981; Lum et al, 1998).



Series 1 indicates the current policy; Series 2 indicates our suggested policy(% per year)

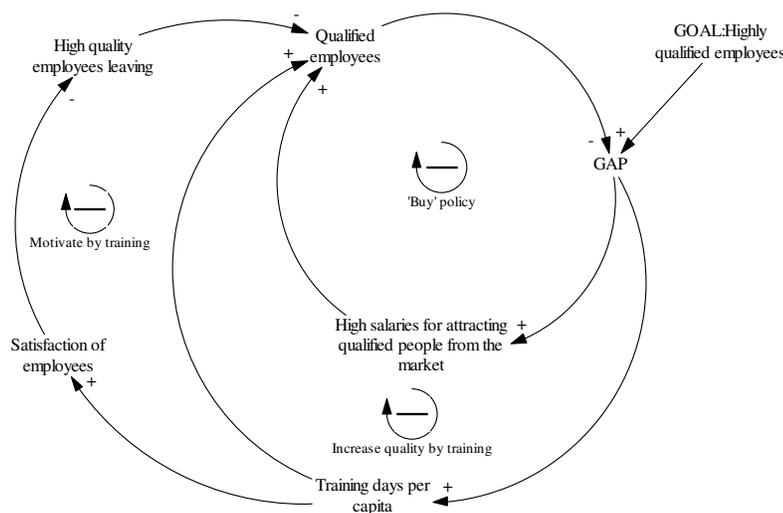
Model overview

In the literature review we showed, among other directions for research, the need to build explicit models for the problem of key employees' turnover. We stated that the current policies our company has in place are the "train" and the "buy" strategy. We also mentioned a few problems we think these policies might have. In this section we show the literature we used to validate our assumptions, and the model we built to analyze the impact of the current and suggested policies on a firm. Before going into detail about the variables, relationships, and equations, we will show an overview of the assumptions of the model using two SD tools: causal loop diagrams and stock and flow diagrams.

Causal loop diagrams (CLD)

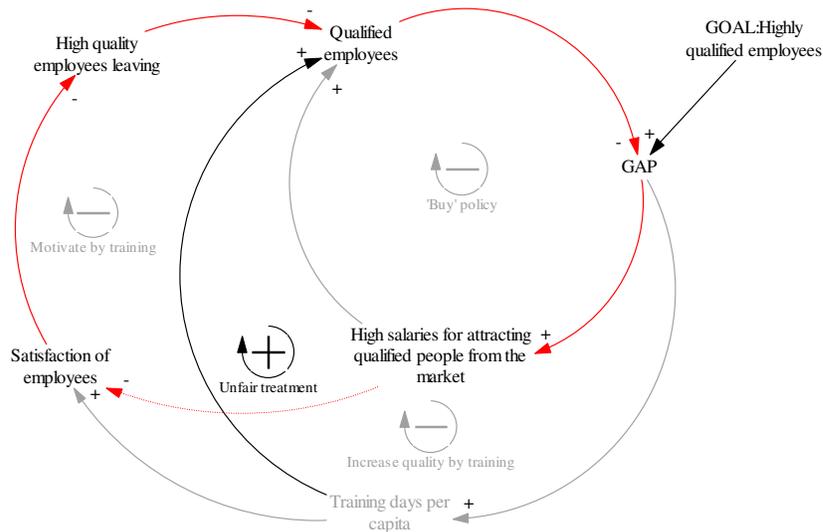
The causal loop diagram is a diagramming tool that captures the feedback structure of the system. It consists of variables connected by arrows that show the causal influences or links among the variables. The polarity of the links, the plus(+) or minus (-) sign indicate how the dependent variable changes when the independent variable changes. A plus sign indicates a same direction relationship, meaning an increase in variable A will determine an increase in variable B; a minus sign indicates an opposite direction relationship, meaning an increase in variable A determines a decrease in variable B.

The current policies employed and their assumed effects were outlined in the literature review section. We show again the CLD we used there.



Current policies and their **assumed** effect

“Buying” quality employees from the market is a quick solution when there is a high need for employees. This policy’s effect is that the company will offer very attractive salaries and benefits, often above the level current employees have. The feedback ignored (ignorance is noted in the CLD with a dashed line) is that the hiring policy breeds dissatisfaction for the current employees, which will in the end leave because they will get higher salaries elsewhere, as most companies have similar policies. In this way the very policy the company is using to increase retention is turning against her.



Ignoring the hiring policy feedback

With the “train” strategy, companies are trying, on one hand to train their employees and get them to the quality level required, and, on the other hand, to motivate them not to leave. There are several problems with this policy. First, training is NOT a motivation tool, training should be a need based intervention. Training is not among the determinants of job satisfaction, as literature clearly shows (we will come back to this literature when modelling the job satisfaction variable). The experience of the author as a trainer shows that very often people end up in training sessions without any clue as to why they are there. With a backlog of tasks to do when they return, training becomes a de-motivation tool.

We modelled the coaching effect as external because it represents the effort the employees make to help their colleagues or subordinates transfer the knowledge acquired in training. This is not an automatic process and it involves training of its own kind. We are not referring here to on-the-job training, but to something that requires something else: an open attitude towards feedback giving and receiving, about overt communication concerning performance, etc.

To make it clearer, let's take the example of an employee who goes to, say, a communication skills training. He spends 3 days learning about effective ways to communicate, to give and receive constructive feedback, to avoid being defensive when receiving critiques, etc. This should definitely improve the quality of his work, no matter what that work is, since communicating better avoids misunderstandings, re-work, and saves time. Now imagine this employee comes back to the office and tries to apply some of the things he has learned, but his colleagues mock him, his boss doesn't care and he has no chance whatsoever to apply his new knowledge. He will surely forget it quickly.

An effort concentrated on HR development reflects an open attitude towards learning. This is not very costly, it just implies proper training, and, most important of all, it implies an organizational climate that encourages transfer of learning. It is the author's experience that such learning and development policies encourage people to seek development themselves, and feel very rewarded when they are sent to training, because they have desired this. It is not so easy to model this complex network of decisions that finally lead to the employee feeling that the company cares for him, but it surely takes much more than just sending people to training.

Besides ignoring the above outlined feedbacks, it seems, from the CLDs, that the policy makers have a misrepresentation of the determinants of job satisfaction. We will review literature about job satisfaction later in this chapter, in order to build confidence in the validity of our claims.

Stock and flow diagrams

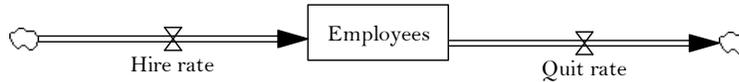
As shown in the methodology chapter, the stock and flow structures account for the state of the system over time and for any changes that might occur in this state. The notation we will use when discussing about stocks originates from Forrester (1961) and is based on the hydraulic metaphor – the flow of water into and out of reservoirs.

Notations

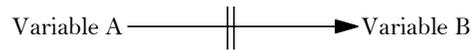
Whenever representing a stock we will use a box-like figure as the following:



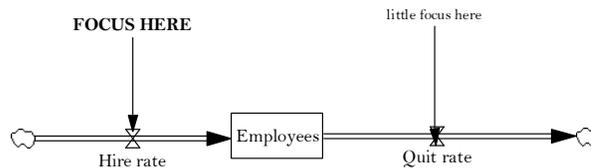
The only way this stock changes is by integrating its inflow or outflow (Sterman, 2000). The notation we will use for the flows is an arrow, with a valve, that shows the direction of the flow: in or out of the stock.



Not all the variables in our model are stocks or flows, even though, theoretically, we could reduce all the relationships in our model to stocks and flows. Some of the variables we will be showing are the so called auxiliary variables that, are functions of the stocks and/or constants, or exogenous variables. These variables will not be in boxes and they will be linked to other variables with arrows showing the direction of influence. If the influence of one variable on the other is delayed the arrow will look like this:



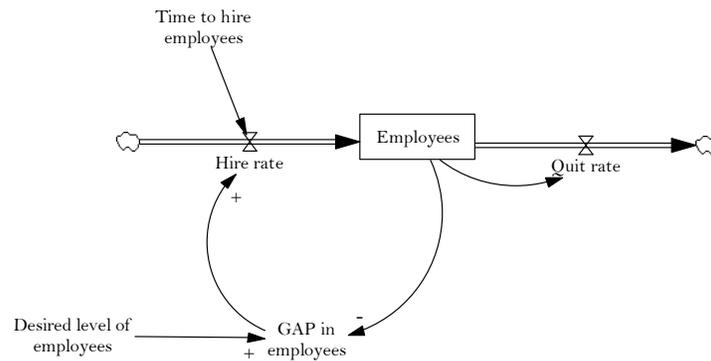
The problem we are modelling is the retention of valuable employees. The key stock here is the stock of employees. It seems, from the analysis of current policies, that the policy makers are concentrating more on the inflow of employees, as a means to maintain their stock of employees, and they are ignoring the causes for their employees quitting.



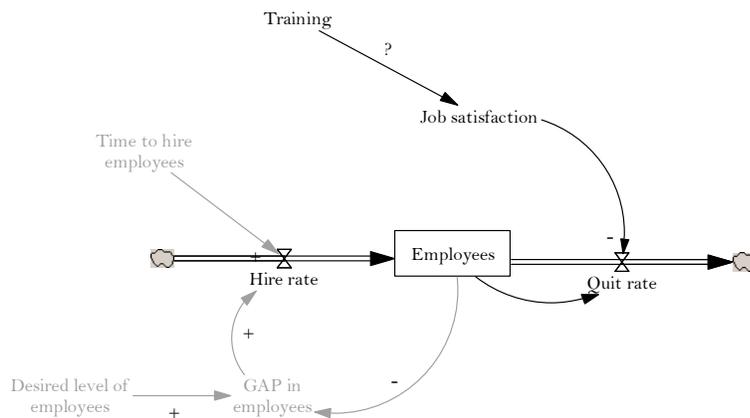
This is not a new problem. Warren (2002) showed the same pattern for other types of companies, which tend to focus more on the acquisition of new customers and do not have specific policies to address their churn. Sterman (1989a) found that subjects bias their decisions in the direction of what follows from static mental models, ignoring or adjusting insufficiently for the dynamic aspects of their tasks (misperceptions of feedback and stocks). Misperception of the simplest dynamics is an issue that has drawn much attention recently (see, for example the work of Moxnes, 2000, 2004). How can such a simple structure create misperception that has serious cost

implications?² To answer this question, let's look in more detail into the decision making process in our company.

The decision to hire employees comes from a gap between a desired level of employees and the current level. In other words, when employees leave, the company initiates a recruitment process to replace them. Similarly, if the business is growing and the number of employees is not sufficient, the company will hire more.

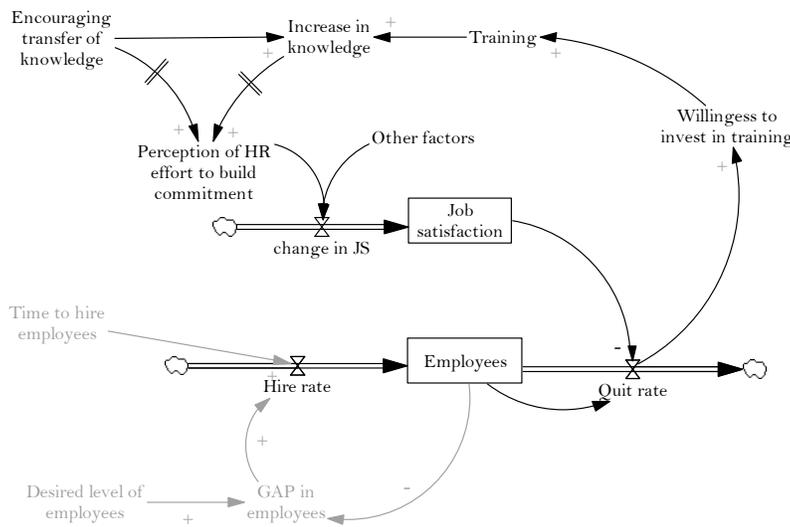


The focus is on hiring and the little focus on quitting is reflected in an ineffective policy to prevent it. In order to address the turnover, the company uses another policy it believes increases the job satisfaction (or as the subjects in our field study call it, “motivation”)³. Thus, in the mental model of policy makers, one important determinant of job satisfaction is the training, or more specifically, the fact the company shows the employees that it cares for them by giving them training.



³ Although motivation and job satisfaction are not entirely the same concept (motivation describes the drive to work, and is more an energetic concept), the subjects we interviewed did not seem to make the difference between them, using the two terms interchangeably.

As shown in the previous section, training is not a motivation tool. Training does, in the end, have an influence on job satisfaction, but the delay is very long and the relationship is not direct. There is no direct causal relationship between the two. Moreover, in order that the trainees perceive that the company is making an effort to build commitment and decrease turnover, there needs to be consistent and continuous effort to transfer the knowledge to the work place. Other factors contribute also to the building of job satisfaction, among which career opportunities and distributive justice.



We will back our claims about the influence and determinants of job satisfaction using psychology literature.

Job Satisfaction (JS)

Definition

Job satisfaction has been the most commonly studied variable in organizational research (Spector, 1997) and it has not lacked controversy. The most widely accepted definition of job satisfaction among scientists is given by Locke (1976, p. 1300): “a pleasurable or positive emotional state

resulting from the appraisal of one's job or job experiences". By the time Locke wrote this definition, 30 years ago (!), he had identified more than 3300 studies on this subject.

Determinants of JS

According to the Price Mueller revised model of job satisfaction (Agho, Price, Mueller, 1993), the major predecessors of, leading to a change in, job satisfaction are the following (with the definitions given by the authors, p 1012):

- Opportunity: availability of alternative jobs in the organization's environment
- Autonomy: degree to which employees have freedom to act independently on the job
- Distributive justice: degree to which rewards and punishments are related to performance inputs
- Internal labour market: extent to which the organization job structure is characterized by job ladders, entry limited to the bottom and upward mobility which is accompanied by a progressive development of skill and knowledge
- Integration: extent to which employees have close friends in their immediate work unit
- Pay: money and its equivalent received by employees for their services
- Routinization: degree to which a job is repetitive
- Work motivation: belief in the centrality of the work role in one's life
- Personality factors

The two factors which we will model explicitly are the distributive justice and the career opportunity, as encompassing both the concept of opportunity and the internal market as expressed by Agho, Price and Mueller (1993). We will describe them in detail later in this chapter.

The extent to which satisfaction might be determined by relatively stable personality variables, such as negative affectivity and positive affectivity (in the above model referred to as "personality factors") is one of the things largely accounted for in the literature (Staw & Ross, 1985; Staw et al, 1986; Watson & Clark, 1984; Brief et al., 1988; Agho, Mueller & Price, 1993). Although we recognize that this research is important and that it is an important predictor for job satisfaction, we have to relate to our client: our problem description addresses the actions of managers in order to retain their employees. As Sterman (2000) shows, we should model the things that the decision makers cannot change through policies, so we will not go into detail about personality.

Measuring JS

Although measuring job satisfaction may seem like a big challenge, there are several ways to do it. One of the most popular instruments is the Minnesota Satisfaction Questionnaire (MSQ), measuring more than 20 facets of job satisfaction. Other measures are the Job Satisfaction Survey (JSS), Job Satisfaction Inventory (JSI), etc. The most typical measure of job satisfaction found in an organization is the so called “employee opinion survey”(EOS), that measures the overall satisfaction with several aspects of the firm. Although this is far from a standardized instrument, it is a first step in measuring attitudes. An example of the type of questions asked in such a EOS is given in the following (Connolly & Connolly, 2005)

1. My job makes good use of my skills and abilities.
2. I receive the training I need to do my job.
3. I am given opportunities to improve my skills in this organization.
4. My job is challenging and interesting.
5. I am doing something I consider satisfying and worthwhile in my job.
6. My job offers me the opportunity to gain work experience in challenging new areas.
7. I like my job at this organization.
8. I understand the link between what I do and the organization's objectives.
9. The work I do is very important to the success of my organization.
10. I am doing something I consider really worthwhile.
11. I really feel I accomplish something each day.
12. I have personal control over the way my work must be done.
13. I feel the amount of work required of me is about right.

Each of the items is a statement that is either favourable or unfavourable about an aspect of the job. Respondents are asked to choose a number, typically from 1 (totally disagree) to 6 (totally agree), that corresponds to their agreement or disagreement about each item. We use a similar scale to measure job satisfaction in our model.

As we do not have a standardized unit of measure for job satisfaction, we modelled it as a capability and put a unit of measure called “job satisfaction unit”. The range of variation is from 1, indicating a low job satisfaction to 10, which shows a high job satisfaction. Especially important here is the *delay* with which this attitude is forming, set to 12 months. We consider the job satisfaction to be similar to an information delay, because it is similar to the “perception of” a variable, formed in time. According to Azjen (2001), although people can form many different beliefs about an object, it is assumed that only beliefs that are readily accessible in memory influence attitude at any given moment. “Readily accessible” suggests that the weight on recent events is higher than on past events. It implies that if the company has adopted a set of HRD policies it cannot expect their effect to last forever, but must constantly make sure that they are reinforced and acted upon accordingly, hence the long delay chosen.

Relationship job satisfaction - turnover

The job satisfaction is widely cited in the literature as a determinant of turnover (Lichenstein, 1998) and thus has a crucial influence in retention. We expect that policies addressing job satisfaction will also influence the turnover. One of the models of organizational turnover (Price & Mueller, 1986) has job satisfaction embedded as the first mediating variable in a system of causal linkages that produce turnover. Job satisfaction has been identified as the single most important reason why nurses leave their jobs (Lum et al, 1998). Some authors (Price & Mueller, 1981) say that the effect of job satisfaction on turnover is not direct, but mediated through the intention to leave. Hulin et al (1985), consistent with Fishbein and Azjen's work (1975) work on formation of attitudes, says that the availability of alternative job opportunities affects satisfaction, which in turn, influences behavioural intentions to quit and, through these intentions, quitting.

The process of social comparison (Festinger, 1954) constitutes a major determinant of job satisfaction, because the process of satisfaction results from the distance between two perceptions concerning aspects of the job which an individual values (Igalens & Roussel, 1998). In other words, the employee makes a mental calculus between what he/she thinks that the job satisfaction should be, and what it is at a particular point in time. We chose to model this influence on turnover as the difference between the maximum value of job satisfaction and the current value: the bigger the difference, the higher the intention to leave, so the higher the probability of turnover. There are of course other reasons why employees quit, that are not related to job dissatisfaction, like family relocation, acceptance into higher education, etc., factors that the employer cannot control, so we chose not to include them in our boundary.

Relation of job satisfaction to productivity and performance

In a qualitative and quantitative meta-analysis of the literature on the relationship between job satisfaction and job performance (Judge, Thoresen, Bono & Patton, 2001), the authors investigated 7 models and looked over 312 samples with a combined N of 54,417. Their research indicates that the overall mean true correlation between the job satisfaction and performance was 0.30. This study shows that there are other determinants important to job performance that account for 0.7 of the job performance that are mostly related to the organizational culture and individual determinants. The authors describe a series of mediators and moderators that affect the relation between the two concepts, among them norms, autonomy, personality, intentions performance

rewards system, etc. This shows that the very things involved in determining the job satisfaction not only influence it, but then later affect the way this relates to the job performance and productivity. The following scheme summarizes their findings:

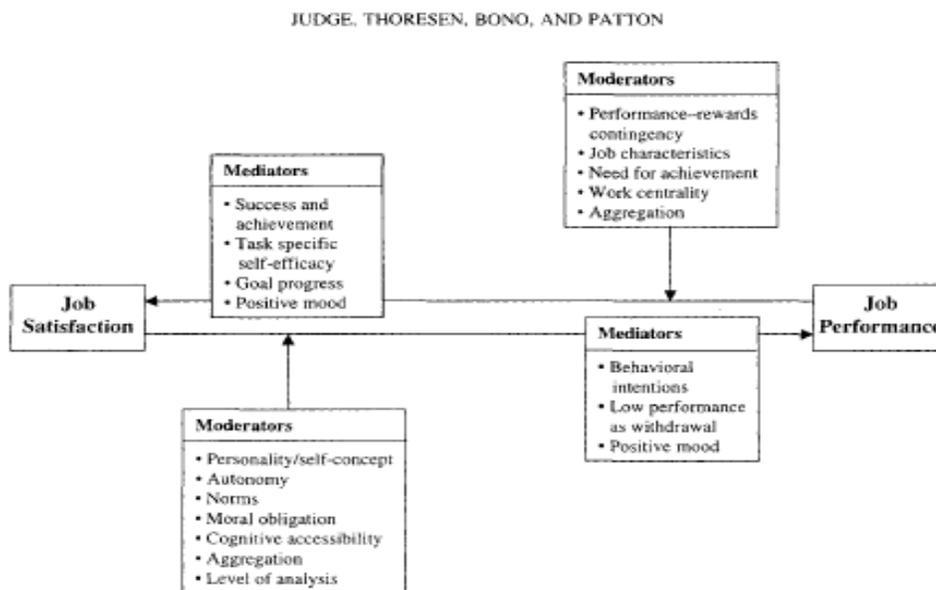


Figure 2. Integrative model of the relationship between job satisfaction and job performance.

Even in a very recent study of this much controversial relationship between job performance and satisfaction (Schleicher, Watt & Greguras, 2004), the authors took no position on the causality of the job satisfaction – performance relationship (i.e., does satisfaction cause performance or does performance cause satisfaction?), but merely investigated its conceptualization regarding and affective-cognitive consistency. As Judge et al. (2001) suggested, a truly integrative model would posit reciprocal relationships between job satisfaction and performance, suggesting a feedback structure.

Brief (1998) pertains that all the evidence in the literature shows that performance is NOT linked causally to job satisfaction, but that all have studied this on the individual level. He notes further on (p 43) that

“Organizations with more satisfied workers perform better than organizations whose workers are less satisfied. [...] the tricky part of the proposition is the meaning of *organizational performance*, for which there is lack of consensus in the literature”

There is a difference between the evaluation of overall job performance and a task-level assessment of job satisfaction, that yields different, though related, results (Taber & Alliger, 1995): global and facet measures were found to be consistent with, but only partly predictable from, individual task properties. Thus a study of the organizational level of job satisfaction would be very useful in clearing up this issue and we intend to model just that.

As shown by Brief (1998), there is a negative relation between job satisfaction and the turnover intention, that leads to the turnover behaviour. The relation is weaker, however, than the relation between job satisfaction and other so called “withdrawal behaviours” (frequent interruptions, absenteeism, lateness to work, wasting time while on duty, etc.). Hulin (1991) argues that this relation is stronger because the individuals cannot always afford to leave, so they develop what he calls “adaptive” behaviours, that influence drastically the productivity. These behaviours are bad for the organization, but seldom result in layoff - which would be bad for the employee. This is especially relevant in the Romanian society, still under the influence of communist times, where the norm was that the employee was paid anyway, no matter how much effort he put into his work. We can interpret this as an influence on the productivity of the employee: if he cannot afford to leave, he will be less productive if his satisfaction is low.

What is very clear about job satisfaction (Brief, 1998) is that it is a result of *interpretations* of job circumstances (e.g. *perceived* adequacy, fairness of pay, internal job market, etc.) As Rice et al (1989) show, the “have-want” discrepancies have the power to predict and explain job satisfaction very well. We modelled and integrated the concepts regarding job satisfaction in a SD model that shows endogenous causal links as part of a larger system, in other words, on an organizational scale, thus following both Brief's (1998) and Judge et al. (2001) suggestions of future research.

Model building

We will present in what follows the components and assumptions of our model. We will not present all the equations in the model, but we will explain the reasons and the literature that made us include specific variables in the model. A list with all the equations of the model is attached in Appendix 1.

The presentation of the model has the following structure.

- Model boundary
- Time horizon
- The general framework of employees
 - Hiring
 - Promoting
 - Quitting
- Job satisfaction
 - External employment opportunities
 - Career opportunities
 - Distributive justice
 - HR development investment
- HR quality
 - Training
 - HRD development
- Productivity

Model boundary

The variables we have decided to include in the model are those that we consider vital for showing the mechanisms of attitude forming and its influence on behaviours in organizational settings, as discussed in the literature review and in the problem description.

Endogenous	Exogenous	Excluded
<ul style="list-style-type: none"> • Job satisfaction • Career opportunities • Quality of employees • Training • Productivity • Costs, revenues and profits • Labour decisions 	<ul style="list-style-type: none"> • Job market • Desired production • Quality of employees hired • Unit price for widget produced and sold • Salary level • Training costs • Taxes • Coaching 	<ul style="list-style-type: none"> • Firing • Personality factors • Other reasons for quitting, not related to job satisfaction • Unions

We assume not to be able to influence directly the job market, since it is determined largely by macro economical factors that we are not modelling. To make the model simpler, we chose the desired production to be exogenous, so we are not showing any demand and supply in the market. Also, we assume that everything our company produces, it sells, but in accordance with a certain demand. This may seem as an over simplification, but our model's purpose is to show the mechanisms of work related attitudes in relation to the indicators companies are using as a basis for their HR policies, and show that even in the case of perfect stability they produce dynamics in the system.

Firing is very difficult on the Romanian market, even for the poor performers. The labour law, similar to the Norwegian one, states that a poor performer needs to have several chances to receive training and get coached, mechanisms which we explicitly showed in our model. Thus, the firing decision is reduced to a negative value of the adjustment for labour, meaning that the organization will not fire its employees, but hire less if there is a drop in production. We do not show the performance evaluation process entirely, we just show the goal setting in the distributive justice component.

Time horizon

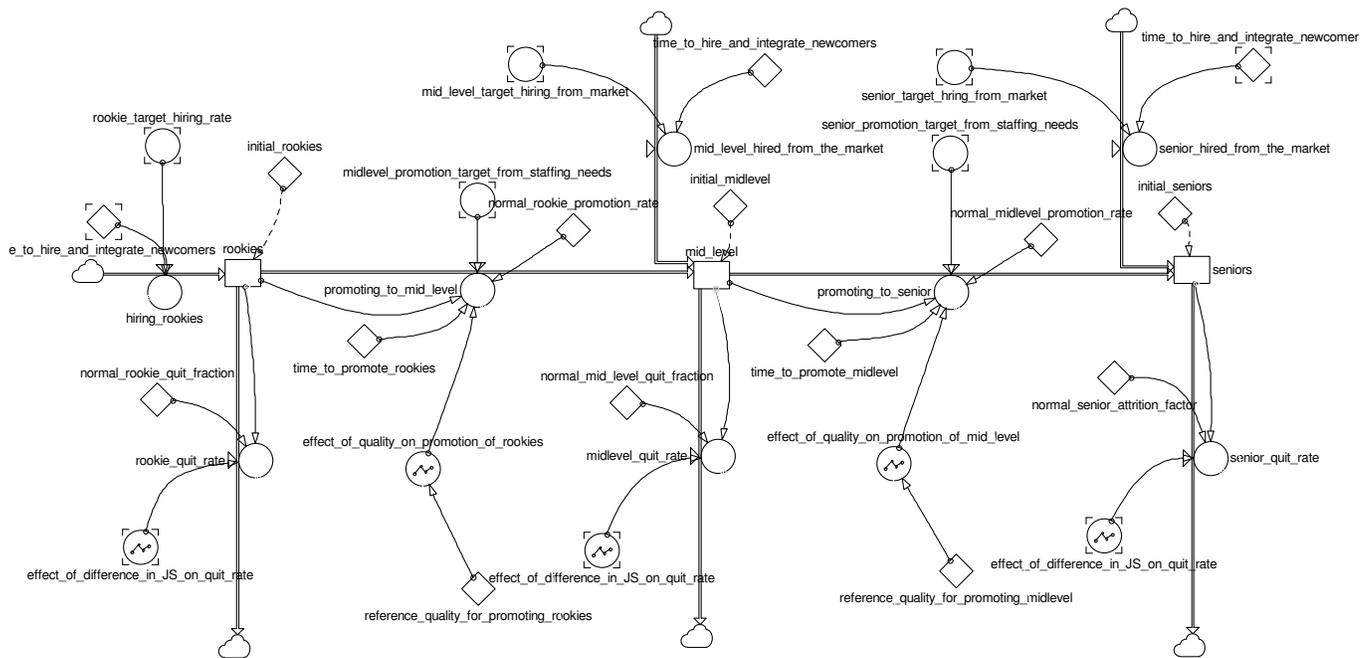
As most consultants agree (Tabacaru, unpublished field study; unreferenced, 2005; www.HR-Romania.ro), the current HR practices in Romania started in 2000, partly due to the transfer of knowledge from the expatriates in Romanian companies. Thus the time frame we chose is 15 years, from 2000 to 2015.

The general employee framework

We assume three stocks of employees: rookies, mid-levels and seniors. We chose to split the labour force in 3 in order to show the promotion system from one stock to another. We could have chosen just a 2 stock model, but we believed important to distinguish between the mid-level employees, that form the core of a telecom or banking company that we are modelling, and the seniors, who are either top level managers or very qualified specialists. This split is also justified by the representation of the double ladder promotion system (Hallenberg, 1970), because one might argue that not everybody should be promoted in a company. Dual ladder-systems provide that employees can follow two different types of paths after spending some time in the organization: one path is a

managerial one, and the second is a specialized technical or *professional* path. The dual ladder system normally provides a separate line of progression for the specialist, which will have both the status and financial rewards comparable to having chosen a managerial career path.

Although this system may posit some problems in a real organization, we merely want to represent that every type of employee could receive a change in status after staying with a company for a while, and move from one stock to another. In our model, we show the mechanisms that govern any of these systems.



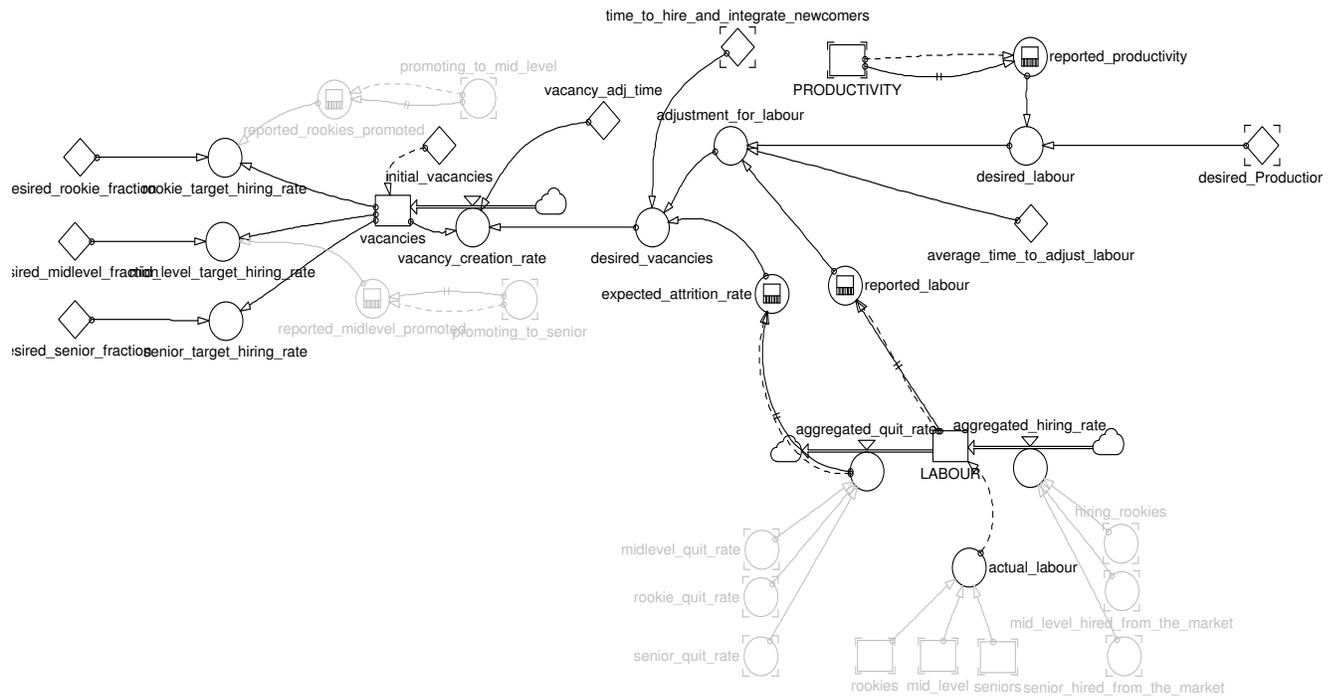
The employee stocks

- Hiring

The time to hire and integrate from the market incorporates two delays: the time to hire plus the time it takes for the people to become familiarized with the company procedures, culture and so on (Katz, 1982). Each stock of employees in the model is assumed to be fully productive, and the people that are promoted from inside do not need this time to get familiar with the company.

The target level of employees is given by a formulation inspired from Sterman's (2000) labour supply chain modelling. The desired labour is given by the productivity of the employees,

multiplied by a target fraction for each level of employees. Sterman (2000,) defines the desired labour as a fraction of desired output and average productivity. In this average productivity however, it is assumed that the workers work at their full potential all the time, since it is formulated as a potential output divided by the total number of employees.



Desired labour formulations

Since we model an influence of job satisfaction on productivity, we will not use Sterman’s formulation, but use an information average over time of the productivity. When the productivity is lower, and the desired output constant or growing, the need for people will be higher if the average productivity is lower. This labour “dependency” is part of an important feedback loop, in the context of the “buy” policy the company is currently using: less productivity means an increase for labour, it means more hiring.

- Promoting

The movement of employees from one stock to another is conditioned, on one part, by the normal rate of promotion, which is relatively small, and on the other part, by the ‘quality’ of the employees, namely how well they are performing in their job. This means that the better the employee is in doing his job, the higher the chances to be promoted.

*promoting to mid level = ((rookies*normal_rookie_promotion_rate+midlevel_promotion_target_from_staffing_needs)*effect of quality on promotion of rookies)/time to promote rookies*

People are also promoted because there are employees who are leaving. This promotion is a measure that relates to the company's policy: does it promote or does it hire from outside when an employee leaves? The decision to hire from outside or promote from within is given by a certain fraction of the people for each level, that takes values from 0 to 1, where 0 means that there is no hiring and that the only way to fill in the need for mid-level and senior employees is to hire, and 1 means that there is no promotion. This reflects the "make or buy" policy choice, underlined by Morrison & Adams (1991) and also noticed in our field study (Tabacaru, unpublished field study; unreferenced, 2005). We estimated that recruiting from outside leads to faster results than promoting from inside (short-term orientation vs. long term), and also yields more tangible results, because developing a person is something you measure very hard if you don't have a skills inventory or clear career path put in place. The fraction for promotion is given by "1- the fraction" for the hiring from the market.

*midlevel promotion target from staffing needs = (1-fraction_of_target_hiring_from_the_market)*mid level target hiring rate*

- Quitting

We assume there is a normal rate of quitting; however, this rate increases with job dissatisfaction. This is our main point of intervention and it is represented by the effect of job satisfaction (better said, the difference from the expected job satisfaction and the actual job satisfaction) on quitting.

*rookie_quit_rate = rookies*normal_rookie_quit_fraction*effect_of_difference_in_JS_on_quit_rate*

Job satisfaction

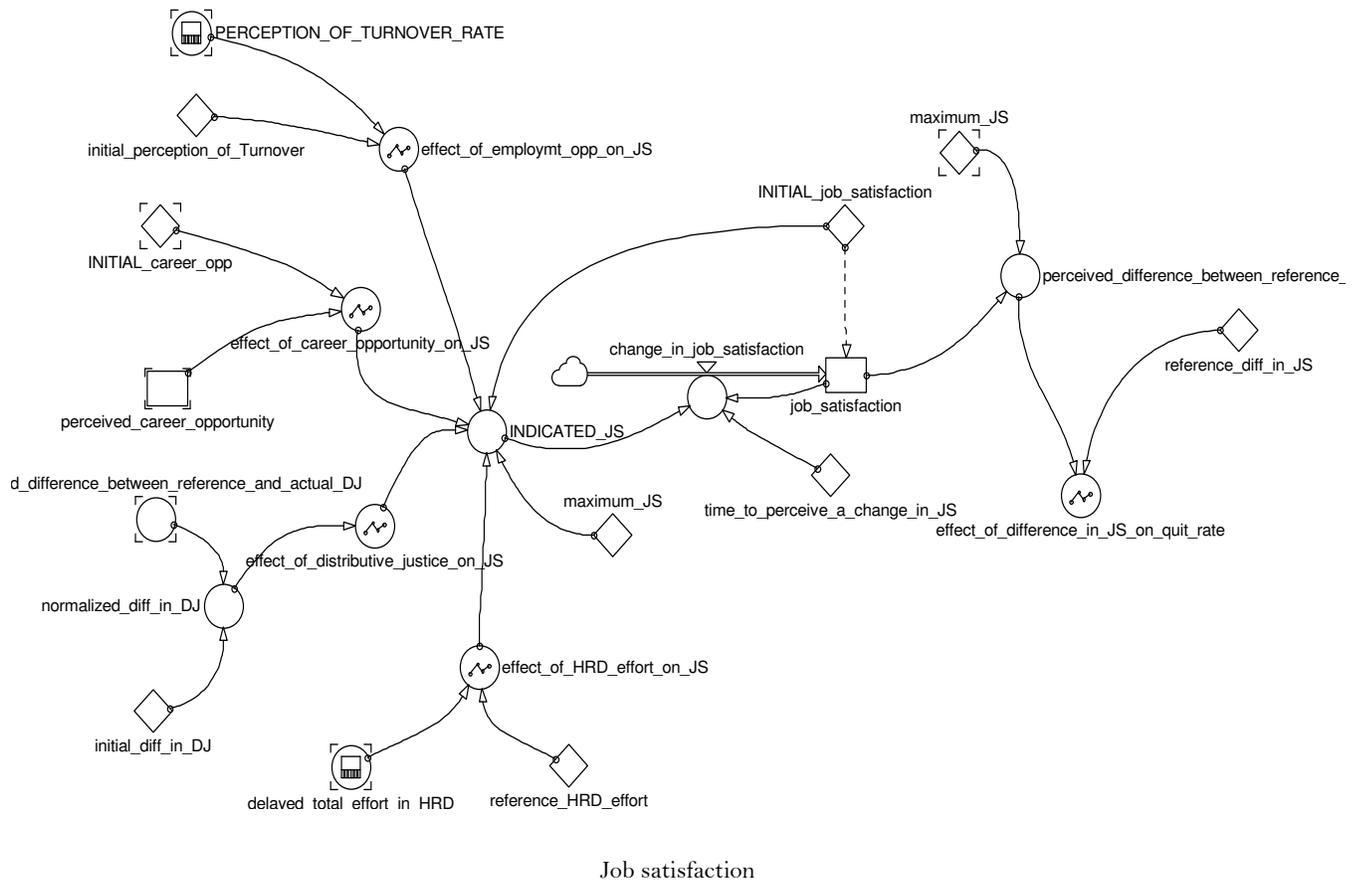
We chose to model job satisfaction as a stock having the determinants as outlined in the Price Mueller (1993) model. However, there are a few notable changes.

The factors influencing job satisfaction that we have chosen to model are the distributive justice, the career opportunity, the quality of the employee, and the job opportunities on the market. We define quality as the capital brought in by the employees in the form of knowledge, skills and abilities (well known as K.S.A. in the personnel psychology). The job opportunities on the market

are reflected by the perception of the turnover rate, because we assume that the employees would not leave unless they have an alternative job offer on the market (the author's experience shows that this is the case for the specialists: if they are dissatisfied, they start looking for a job and only after having found one they leave). Autonomy was excluded from the model because it does not represent a decisive feature in the Romanian workplace (Gallup study, 2005). The effects of 'integration' and 'job mix/routinization' result from investment in HRD (job diversification and investment in team building), so we addressed them in the 'Quality' variable.

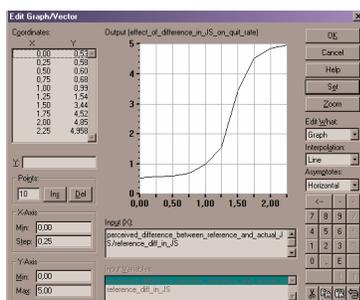
Pay is an important part in the Price Mueller model. In our model, we consider that pay influences turnover in two ways:

- One is the comparison with the external market, and that is reflected in the distributive justice variable, that is a determinant of job satisfaction.
- The other is when people evaluate if they get enough pay for the effort they have put in; this issue is addressed in the distributive justice variable.



The change in job satisfaction is tracked by a series of effects to an initial value of 3 what we called "JS units" meaning Job Satisfaction units. As argued before, JS implies an evaluation process. Thus, the important variable here is not the actual job satisfaction, but rather the difference between what is expected, the maximum job satisfaction possible, and what the employees feel. An alternative way of modelling it would have been with floating goals, but we chose the simpler modelling version.

As the difference in job satisfaction increases, meaning there is more discrepancy between the actual and the desired job satisfaction, the effect on turnover is larger. We believe this function describes the job satisfaction evaluation, with a slow adaptation when the situation is good, and the discrepancy is low, and a sharp increase when the discrepancy is high. This function relates with the process of adaptation described by Sterman (2000, p436), in which people adapt faster to higher income than they adapt to a drop in their income.



Effect of difference in job satisfaction on quit rate

- Employment opportunities(outside the company)

Agho, Mueller and Price's (1993) model states that when the market is perceived as relatively open to job movement, the individual assessment of the current job relative to the availability of other jobs leads to a lower job satisfaction. The way employees see this is through the turnover, because we assume employees will not leave unless they have an alternative job to go to. It is the author's experience that it is very likely that employees have access to the information about their colleagues leaving. If employees leave, it is an indicator that there are opportunities on the market, because nobody is laid off.

- Career opportunities

Career is defined by Arnold (1997) as "the sequence of employment related positions, roles, activities and experiences encountered by a person". This permits to see career as two-fold

oriented: one is inside the company, where a person can evolve either horizontally, by making his/her job more interesting, or vertically, by climbing up the so called 'career ladder' or hierarchy in the organization, and the second one a person's lifetime succession of jobs, from one company to another. We are concerned with the first type of mobility, inside one company. Among the most frequently used organizational interventions that regard career management are: internal vacancy notification, horizontal mobility, career paths, special projects, coaching/mentoring, individual counselling, training opportunities, succession planning, skills inventory, promotion/demotion, personal development plans, etc.

Why talk about career opportunities? When shortages resulting from a growth strategy are identified, the cost of employing, orienting, and training the additional personnel and the reduced productivity of present employees while the new employees are developed should be calculated (Morrison& Adams, 1991). If the mix of skills is inappropriate, it is possible to assess human resource costs for a strategy alternative using either a "make" or a "buy" career development strategy. This has been revealed by most of the consultants in our field study (Tabacaru, unpublished field study; unreferenced, 2005) and is also highlighted by Morrison& Adams (1991). A *buy* strategy would mean that the new skills that the company needs will be bought from the outside market, assuming the resulting effect of lower morale on retention and possibly productivity. On the other hand, a *make* strategy would require assessing and re-training employees to provide them with the knowledge required to work in the areas of the strategy.

In the field study we did, the single item that kept arising in every discussion with the consultants was the lack of career path in organizations. People enter the firm full of energy and willingness to work, to find out that there is no formal system to recognize their abilities and that the only way up is to leave to another firm, on a higher position. In fact, there seems to be a norm in multinational companies that are striving for good employees that almost nobody stays in a firm longer than 3-4 years (Tabacaru, unpublished field study; unreferenced, 2005). In this context of hopping from one firm to another, the employee has a lot to gain, since he is advancing in position or/and salary, but the firms are losing important intellectual capital. Yet they seem to prefer to import it rather than develop it, thus increasing even more their cost of HR management.

Holton et al (2004, p.71) suggest that one of the indicators of a successful development process in the organization is the measure of internal hiring:

“One of the fundamental purposes of development is to have people ready to fill vacant positions when needed. Thus an appropriate metric of development is the percent of vacancies that the organization is able to fill internally.”

It doesn't mean that all the positions should be filled internally, but they could if needed, because the company, through its HR department, is effectively preparing employees to take new responsibilities.

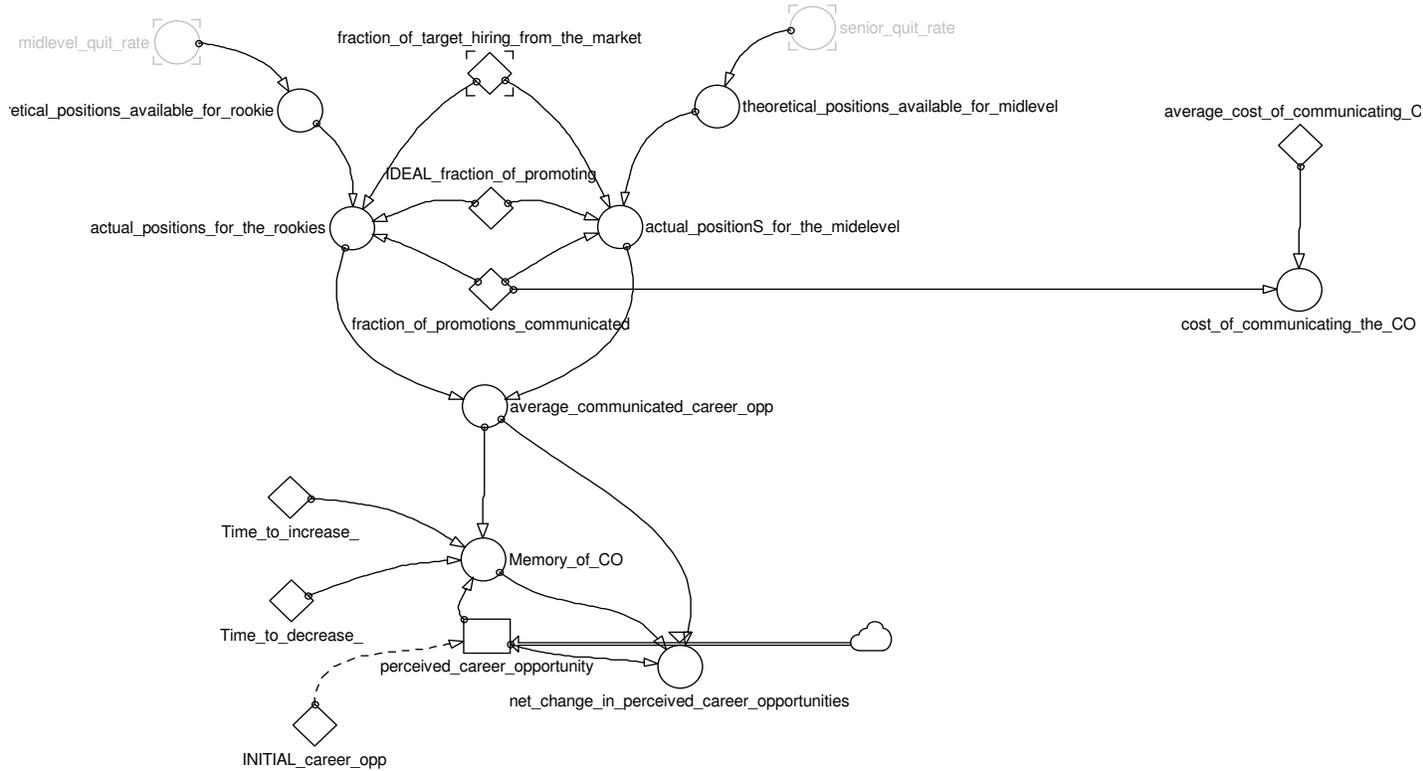
The variable “career opportunity” we employed in our model is derived from Holton & Naquin's proposal for HRD metrics (p 74)

$$\text{Development Quality} = \frac{\% \text{ vacancies filled internally with qualified people} - \text{vacancies attributable to business growth}}{\% \text{ vacancies desired to fill to internally}}$$

Holton & Naquin's measure of development quality takes into account the percentage of vacancies desired to fill in internally. That formulation is actually decided by the policy that the company wants to adopt regarding its employees. We defined an ideal promotion rate of 60% of all position available. Of course, at different periods in the life of a firm, that percentage may be different, with more “fresh” employees hired from the market an important part of a new product launch for example.

Communication of these promotions is very important. Research (Pfeffer, 1998) has shown sharing of information on, for example, strategy and company performance conveys to the employees that they are trusted. The communication of the positions available and of the promotions will very likely influence the feeling of “there is something good going on in this company”. It is advisable thus to advertise most positions also internally, because this way people can have an idea of the direction the company is going towards and what are the skills it needs. As research shows, it is important that employees are informed so that they can use the knowledge that resides in the firm to its fullest potential.

The only ones interested in promoting are the rookies and the mid-level employees. Seniors are considered to have other benefits associated to their positions (Achi&Mott, 1982; Tabacaru, unpublished field study; unreferenced, 2005).



Career opportunities

The time to perceive career opportunities is similar to the memory of layoffs concept found in Sterman (2000). People forget easily what is communicated, what they perceive in the recent period is much more important to them.

$$Memory\ of\ CO = IF(average\ communicated_career_opp \geq perceived_career_opportunity, Time_to_increase_ , Time_to_decrease_)$$

- Distributive justice

Principles of distributive justice are normative principles designed to allocate goods in limited supply relative to demand (Lamont, 2003). The definition that Price and Mueller give is the “degree to which rewards and punishments are related to performance inputs”, in other words, how the individual can relate the results of his effort to the rewards given by the company. This implies, of course, that the company has a system in place that evaluates performance and

distributes rewards and punishments accordingly. There are several ways one can do that, and we will refer to that of performance management, that implies feedback to the employee about his performance.

The performance management concept goes a step further than simple productivity measures and encompasses the Total Quality Management concept (Waldman, 1994). Defining clear objectives, and having a clear job description are essential for the employee in clarifying his/her role in the organization and identifying his/her own goals with the ones that the employer wants, thus achieving a high distributive justice evaluation. Therefore a system that formalizes the performance evaluation is crucial to attaining this goal. As Argyris (1962) points out, the formal organizations are very inclined to have control over their activities, as in measuring data on how well the firm is going, comparing it with the forecasted values, but they very often do this separating the performance of the job from its evaluation. The separation of these two leads to the individual not feeling responsible for the quality of his work.

The performance management process provides an opportunity for the employee and performance manager to discuss development goals and *jointly* create a plan for achieving those goals. Development plans should contribute to organizational goals and the professional growth of the employee. The process has several steps that have to be followed (Davis, 1995):

1. Job description & essential functions; annual goals

First, the employee has to know exactly what one has to do and how does one's work help achieve the organizational goals. This gives meaning to one's work and puts in the larger context of the organization.

2. Standards of performance

After deciding what the employee has to do, the supervisor together with the employee decide the standards of performance that need to be attained and how the job will be evaluated as good or bad, as specific as possible. Another point to be decided on is the time period for evaluation and also some intermediate meetings to discuss progress. This should give the employee the sense of involvement in his work and should provide an open communication channel between the supervisor and the employee.

3. Observation and feedback

This is a continuous process from both employee and supervisor. It is recommended that the process is documented in writing, so both parties have a common ground of discussion in the performance evaluation meetings.

4. Performance appraisal

This regards a formal bi-annual or annual meeting in which the standards of performance are discussed and an evaluation is given. A plan for future improvement of the skills that have not received a very good evaluation is made.

5. Performance development

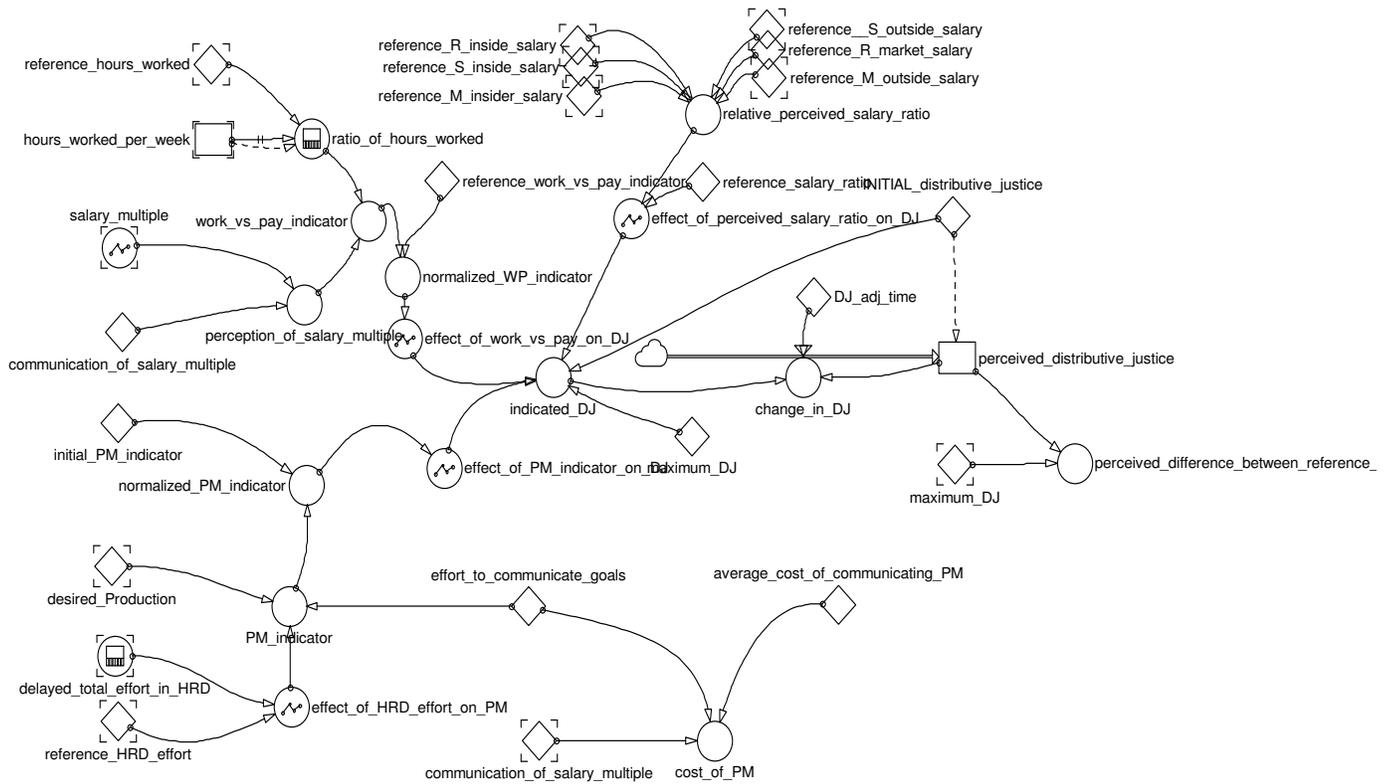
The skills and knowledge that have been agreed on in the previous steps are developed and checked for transfer.

It is very important to underline that this process is not governed by the manager or supervisor, but it is a joint result of both parts: employer- employee. Brinkerhoff& Dressler (1990, p 46) underline that an effective measurement of productivity should consider the following 4 criteria:

- a) quality: the measure must define and reflect quality of production and services
- b) mission and goals: the measure must define and assess only the outputs and services that are integrated with the organizational mission and strategic goals
- c) rewards and incentives: measures must be integrated with performance incentives, rewards systems and practices
- d) employee involvement: in order to have buy-in from the employees, they have to be involved in the measurement

How is performance management related to productivity and how are they influenced by the attitudes? The theory of planned behaviour by Azjen (1989) suggests that predicting behaviour from an attitude measure is improved if people believe that they have control over that behaviour. Similarly, even if an employee wants to perform better, it makes it much easier if he knows how well he is appreciated or how valuable his work is to the organization.

We tried to capture the communication of performance goals by what we called a "PM indicator", meaning the indicator of the performance management process described earlier, even though it only captures the first two steps of this process: the mutual agreement on the goals to be followed and the communication of the expectations of performance.



Distributive justice

As in the case of job satisfaction, the distributive justice is an evaluation of the distance between a desired and an actual state of the system. The change in the value of DJ is given by the influence of certain factors on a reference value. There are three main effects: the salary ratio, the work versus pay indicator and the performance management indicator.

The salary ratio variable reflects the evaluation employees make regarding the “Buy” policy described earlier. We assume that the employees have information about the salaries of the people who are just hired because, although in theory this information is secret, discussions about salary level are very frequent. In the Romanian culture, people often brag about their new jobs and the amount they managed to get as salaries when they moved from one place to another.

$$\begin{aligned}
 &relative_perceived_salary_ratio = \\
 &AVG((reference_R_inside_salary/reference_R_market_salary),(reference_S_inside_salary/reference_S_outside_salary),(reference_M_insider_salary/reference_M_outsider_salary))
 \end{aligned}$$

Another influence on the distributive justice describes how the individual relates the results of his effort to the rewards given by the company, a central point in the concept of distributive justice. In our model, we used a salary multiple to show the influence of the profit on the normal salary of employees, relating it to a sort of bonus system (*cited in Linard & Dvorsky, 2004*). The “work vs pay indicator” shows the mental calculus people do: what I have worked overtime, versus what the company has paid me extra. If the company pays according to the effort employees have put in, then the indicator is good, otherwise not. In order to capture this, we are weighing the amount of overtime employees are doing with the increase in their salaries. In Romania, in the industries we are describing (the banking and telecom business), the common practice, unfortunately, is that overtime is not paid. To avoid the legal hassles such a practice entangles, the companies say to their employees that they are not paid for the time they spend working, but by tasks performed in a day, and that the “usual” working hours are 8 per day, but they are expected to stay until they finish what they have to do. Thus, any overtime that is done to perform tasks that are required in a day, is usually not paid. There are other forms of compensation however, which are the increases or bonuses in the salary if the company goes well and makes enough profit.

work_vs_pay_indicator = ratio_of_hours_worked DIVZO perception_of_salary_multiple

As discussed earlier, it is important to represent explicitly the fact that people should know what is expected from them. If the effort to communicate goals is 1, it means that the goals are communicated and everybody knows what is expected of them.

HR quality

Quality of the employees is understood in terms of KSA (Knowledge, Skills and Abilities) that an employee has. The literature shows (Holton et al, 2000; Knowles et al 1998) that just sending an employee to training is not a guarantee that he/she will actually use the information, or KSA, gained there. Organizations wishing to enhance their return on investment from learning-training investments must understand the factors that affect transfer of learning, and then try to improve the factors inhibiting transfer. We think that it is important therefore to assume that people do not readily transfer what they have learned into their daily job tasks, but that there are factors influencing it.

Baldwin and Ford (1988) and more recently Holton et al.(2000) have identified three major factors influencing transfer of knowledge from training: climate (such as performance expectations,

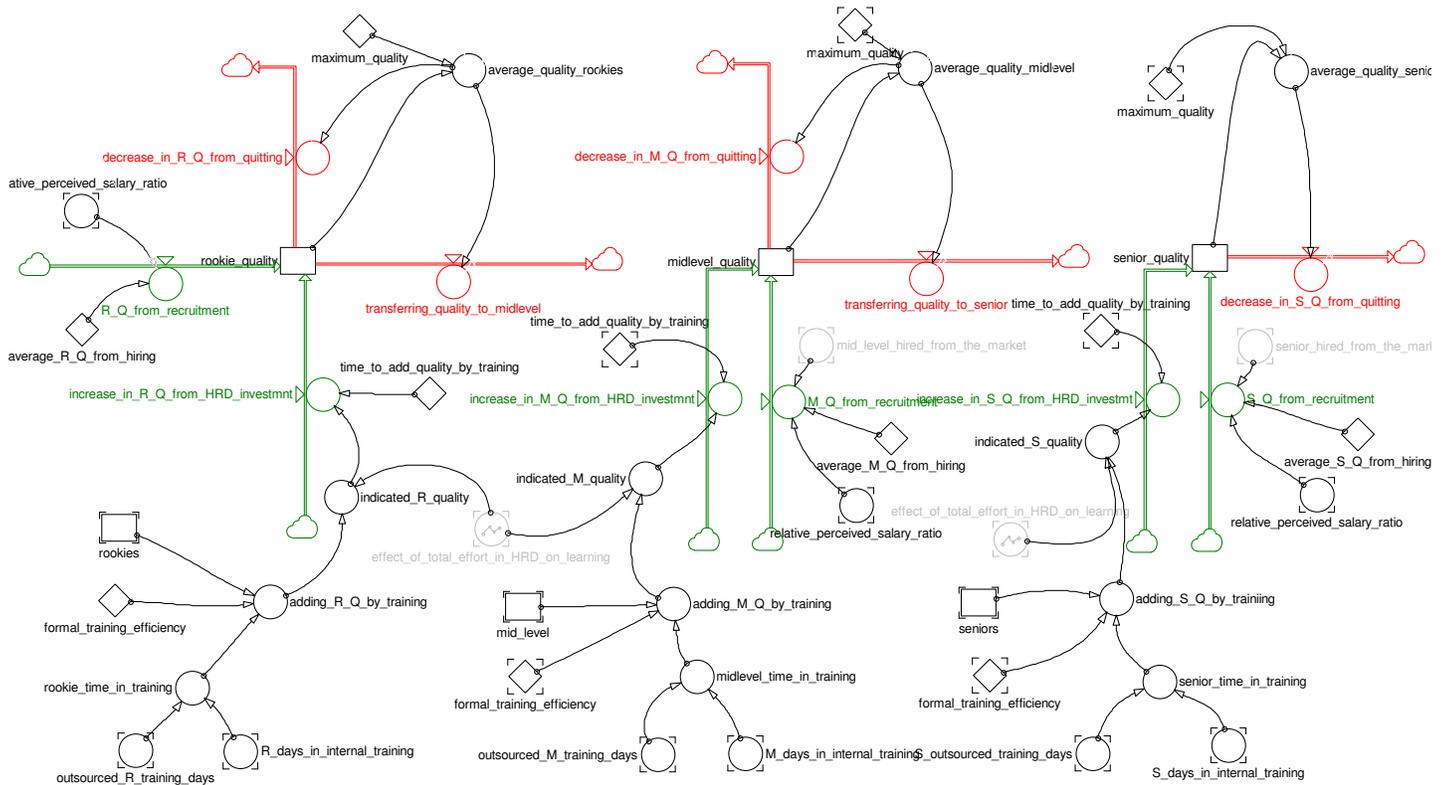
openness to change, performance coaching), job utility (which comprises factors like content validity of the training program, opportunity to use learning, transfer design or peer support) and rewards (which can be identified with external motivation, but also covers personal outcomes as prestige and absence of sanctions from the supervisor).

The adult learning literature suggests that adults need several conditions be met in order for them to actually benefit from a training program. Knowles et al (1998), in a revised version of the well known theory of andragogy, identified 6 adult learning principles: learner's need to know, self concept of the learner, prior experience of the learner, readiness to learn, orientation to learning and motivation to learn. In addition to this, Holton et al (2000) argue that from learning to transferring the knowledge to the specific work settings of each organization there are things to be done. In the instrument developed by the authors, named the "Learning Transfer Indicator", the authors identify the factors mediating transfer. Among the most important:

- "Transfer design", how does the firm plan that the knowledge be transferred to workplace situations, does it give or not any indication of this during the training program;
- "Opportunity to use", if the employee is given the opportunity to use the new information at work ;
- "Peer support": do the peers help the newly trained make use of his/her new knowledge,
- "Learner readiness": Is the employee ready to learn, does he/she find it important that he participates in this training program,;
- "Motivation to transfer": is the employee motivated to transfer the knowledge;
- "Supervisor support": does the direct supervisor encourage the employee to use the new knowledge, does he/she offer any opportunity to use the knowledge; and
- "Personal outcomes": will one be better evaluated, will he gain anything at salary or in status for using the knowledge.

In SD language, the above mentioned factors are mediating factors, meaning that they have an effect on the inflow that builds the quality capability. Thus, if the environment, the people and the rewards are favourable, the effect will be positive, adding up to the quality; if the environment is hostile, then no matter how good the training was, the transfer will not be complete. We define this influence using a nonlinear function.

The concept of quality relates to, as mentioned before, the concept of KSA (knowledge, skills and abilities) widely used in the organizational psychology terminology. We chose to model quality as a co-flow, with certain peculiarities, that we will explain in what follows. The measure for quality is given in quality units, which go from 1 to 10, where 1 is very poor quality and 10 very good quality. To make it easier to see, the inflows are marked in green and the outflows in red.



Quality of employees

There are several ways to add or lose quality. The classical way is to add training by hiring and lose by quitting. Since we have several cohorts of employees, and also because we will add quality by training, we have several inflows and outflows.

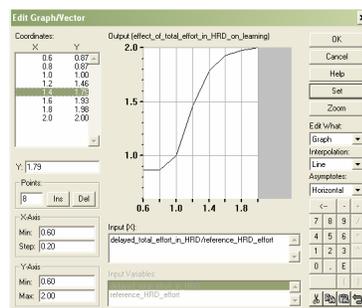
- Inflows

The main inflow is from hiring. The employees hired come with a certain level of expertise, or quality units. If the salaries that the company offers are higher for the employees that are hired than for the people inside the company, the quality of the people hired is increased by 25%, reflecting the result of the recruitment policy; attracting the best performers on the market. This may not always be the case, but it is one assumption we make. For example, in the case of midlevel employees:

$$M_Q_from_recruitment = mid_level_hired_from_the_market * (IF(relative_perceived_salary_ratio > 1, average_M_Q_from_hiring * 1.25, average_M_Q_from_hiring))$$

We also have an inflow from transfer of employees from one stock to another as they are being promoted.

Another important inflow is the one from the training. This inflow is influenced by the coaching activities. We say “influenced” because, as shown earlier, the help from colleagues and managers and a culture that encourages sharing, all mediate the transfer of KSA. We have chosen to model this as an effect of HRD investment to enhance coaching skills, on the adding of quality, as shown in the function:



Coaching influence on learning

- Outflows

There are two outflows from the quality stock: the outflow determined by the quit rate, and the one determined by the promotion to another level. Even though the employees that are promoted do not leave the company, by getting into a different level they will not be productive for the level they just left behind, because they no longer perform the same function/role. For example, for the mid-level employees:

$$decrease_in_M_Q_from_quitting = average_quality_midlevel * midlevel_quit_rate$$

$$transferring_quality_to_senior = promoting_to_senior * average_quality_midlevel$$

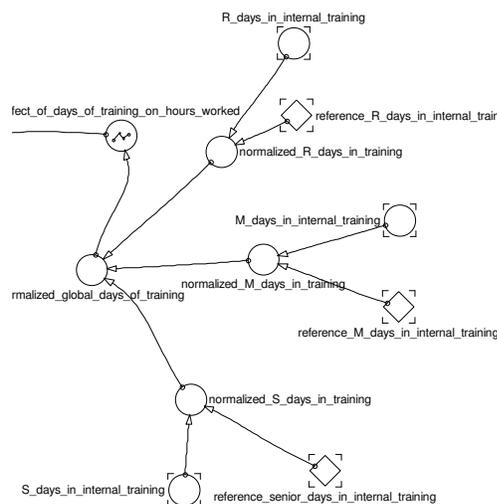
- Training

The training that the company is giving to its employees is a standard number of training days per year, estimated after discussions with HR consultants in Romania (Tabacaru, unpublished field study; unreferenced, 2005). As discussed earlier, one of the main decision variables in giving training to employees is the turnover rate against an industry standard. If the turnover is high, then the propensity to give training is high also; there is however a minimum of training days that most companies have per capita.

To capture this decision mechanism, we have defined a variable called “willingness to give training” that is dependent on the turnover rate and on the sensitivity to turnover that a company has at a certain point. The training days you will normally have are thus multiplied by the willingness to give training.

$$\text{Willingness_to_invest_in_training} = (\text{PERCEPTION_OF_TURNOVER_RATE} / \text{reference_market_turnover_rate})^{\text{sensitivity_to_turnover}}$$

As discussed earlier, there is a drawback to giving too much training: employees have to work more after the training to keep up with their performance goals, or productivity goals. What typically happens in the companies in Romania is that after an employee comes back from training, or even during training, he has to do overtime. This, in the long run, affects his productivity and also has an influence on distributive justice, through the “work versus pay” variable: if the overtime is big, and the payment is not accordingly, the employee will feel that the company is not fair with him/her.

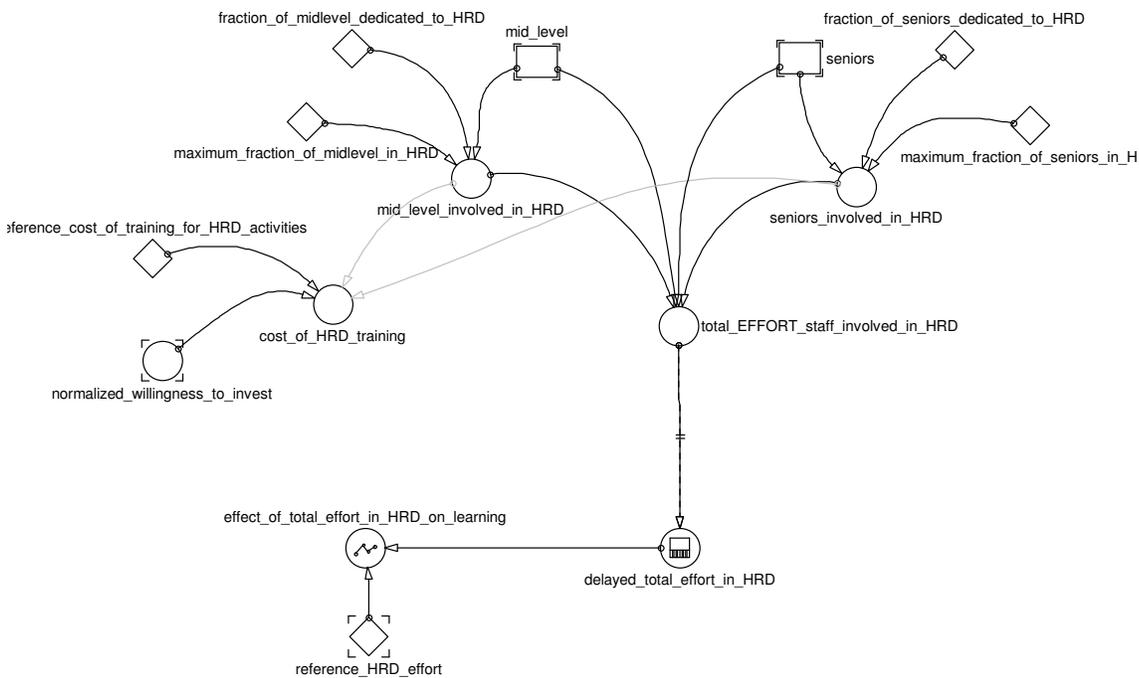


Too much training

We assume the training costs to be equal for all employee levels, even though the situation may not be as such in the real world. The training sessions for mid-level and seniors tend to cost more and also the location requirements are higher, so the prices should be higher than for the rookies. But it is also true that if a company sets some standards for its training premises, then it will apply it to all employees, no matter their status or years in the company. It is the experience of the author that companies do that.

- HR development investment

In the Mueller Price model of job satisfaction, two factors, considered determinants of the job satisfaction, namely 'integration ' and 'job mix/routinization', result from investment in HR development (job diversification and investment in team building), so we will address them with the HR development (HRD) investment indicator.



$$total_EFFORT_staff_involved_in_HRD = (mid_level_involved_in_HRD + seniors_involved_in_HRD) / (mid_level + seniors)$$

Investment in HRD in our model means that the company allocates people to coaching. This reflects the organizational culture that encourages people to help and support each other to evolve. The midlevel and senior staff involved in HRD is still included in the calculus for productivity since they are not providing on the job training, but merely willing to guide and involve their colleagues

in a corparative effort to improve the overall HR quality, like inviting to meetings, delegating and encouraging project work.

Productivity

Productivity results as a function of effort (Brinkerhoff& Dressler, 1990) and we chose to define it as a ratio between the outputs of an effort, divided by the inputs required doing the output: labour, energy, etc. Of course there are many more methods of measuring productivity (for a comprehensive review, see Neal & Hesketh, 2001). The terms “effectiveness” or “efficient” associated to productivity measurements reflect a process that produces the desired results. On the other hand, the term “performance” is used to refer to the proficiency with which individuals carry out behaviours or activities that are relevant to the organization (Motowidlo et al, 1997). We shall use henceforth “productivity” to refer to the measure of the employees’ work effort, influenced by the attitudes of the employees, as described earlier.

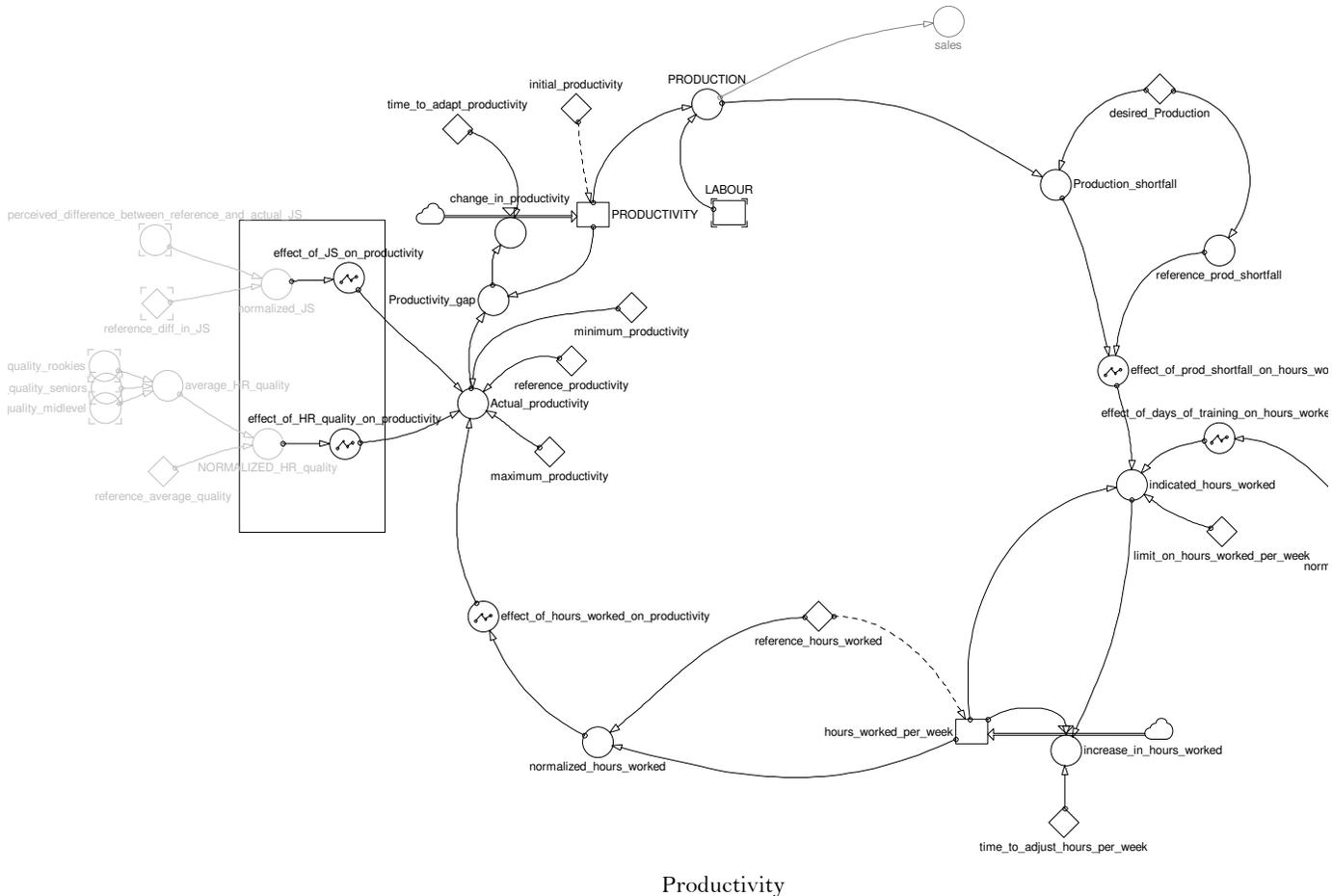
Productivity is influenced by the good quality of employees, and, as we have shown, by their job satisfaction. The good quality of employees means a good level of job related skills, and as literature shows, acquisition and development of new skills can explain up to 23% of the increase in productivity (Patterson, West, Lawthom, Nickell, 1998). Further more, organizations design performance evaluation and reward systems in order to (Lawler, 1977):

- a) induce individuals to join the organization
- b) motivate attendance and *performance effectiveness*
- c) reinforce the organizational structure by signalling to employees the instrumentalities of various outcomes

As we saw earlier, the relation between performance and job satisfaction defines a positive feedback loop: on one hand, the distributive justice, meaning the employees’ impression of their performance evaluation, partly determines their job satisfaction. On the other hand, their job satisfaction influences productivity, especially if they are dissatisfied, as in the case of withdrawal behaviours earlier explained.

We modelled productivity as a stock because we believe it represents a state of the system at a certain point in time. The effects of the reference productivity are given by the influence of job satisfaction and quality, already discussed, and the influence of overtime. We assume, in this simple

version of the model, that everything that the company produces, it sells. Thus production is only a function of productivity and labour.



Productivity

The inclusion of overtime has an explanation in the practices found in the companies we are modelling in Romania, from the author's experience. When the production goals are not met (due to labour or productivity decrease), the first measure that the company takes is to get the employees work overtime. For example, if the turnover is high and many employees are leaving, the employees left behind have to work harder to achieve the goals. Similarly, if their job satisfaction is low, and their productivity decreases, the reaction of the company will not be to investigate why the productivity has decreased, but increase the working time. As literature shows (Homer, 1985), overtime can increase productivity only until a certain point, when fatigue comes in and the productivity decreases.

$$\begin{aligned}
 & \text{Actual_productivity} = \\
 & \text{MAX}((\text{MIN}((\text{reference_productivity} * \text{effect_of_HR_quality_on_productivity} * \text{effect_of_JS_on_productivity} * \text{effect_of_hours_work} \\
 & \text{ed_on_productivity}), \text{maximum_productivity})), \text{minimum_productivity})
 \end{aligned}$$

A decrease in productivity will influence the desired labour. If people fail to perform according to standard, the company will hire more people to reach its indicated productivity, thus increasing its cost.

Summary

This chapter has presented the building of the model, from the first causal loop diagrams that defined the problem, the hypothetical reference mode, to the structure that we have built using Powersim software to test our policy (a complete list of equations is listed in the appendix of this paper). We tried to build confidence in our model by reviewing literature about job satisfaction, its determinants and the relationship with turnover and productivity, and also about the other variables in the model. We will now go on with showing a few validation points for the model.

5. VALIDATION

Most of the system dynamics scholars agree that validating a model is not an easy task and that the validation issue has been among the most controversial issues, even more crucial as new and complex modelling tools have emerged in recent years (Barlas & Carpenter, 1990). Greenberger et al (1976) note that:

“No model has ever been or ever will be thoroughly validated. ... ‘Useful,’ ‘illuminating,’ or ‘inspiring confidence’ are more apt descriptors applying to models than ‘valid’”.

Validation and verification are impossible (Sterman, 2000) because models are simplifications of what is going on in the real world. Following Forrester (1973) and Forrester and Senge (1980), we “validate” the model by trying to build confidence in the soundness and usefulness of our model. We have taken some steps towards this goal by building on psychology literature to show the misperception of the job satisfaction, and also by reviewing literature when building the model. We will perform several other tests recommended in the literature (Sterman, 2000; Barlas, 1989, 1996).

Direct structure test

As described earlier, this test aims to assess the validity of the model by direct comparison with knowledge and information about the real system (Forrester and Senge, 1980) and it consists of structural and parameter confirmation tests.

The structure and the causal relationships we presented are based on literature describing the importance of attitudes, especially job satisfaction, its determinants and consequences. Another validation point is that the current policies were elicited both after interviewing the real world actors, and by direct experience of the author participating in the system processes. Literature showing the relatively easy ignorance of intangible or soft factors was also reviewed. Considerable effort was put in to assess the most relevant studies in the domain, using the citation index of the ISI knowledge base.

The parameters we used in the model have real counter parts in most cases, except for the soft factors; we have showed however that there several ways to measure intangible concepts. The recommendation of Sterman (2000) is that parameter values are consistent with relevant

descriptive and numerical knowledge of the system, and they are assessed based on interviews, expert opinion or direct experience. The values chosen for the model were based both on the field study (Tabacaru, unpublished field study; unreferenced, 2005), and also estimated by the direct experience of the author, working as a HR consultant in Romania for over 5 years. All parameters were checked for dimensional consistency.

Structure oriented behaviour test

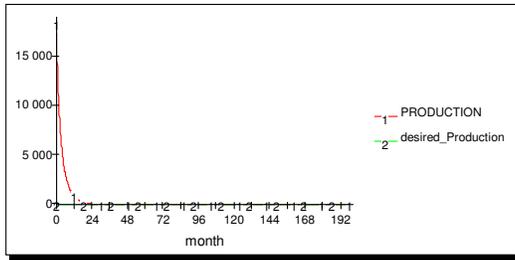
Extreme conditions

This test is meant to assess the plausibility of the model in response to extreme policies, shocks and parameters. Although some of these values parameters may never occur in the real world, the model should be robust when subject to extreme shocks and parameters (Peterson and Eberlein, 1994). All the divisions in the model were tested for 0 values at the denominator; we will not present all the results of the tests here. We will concentrate on two indicators: the desired production and the quality level. We compared the values of the extreme testing with the values of the model in equilibrium.

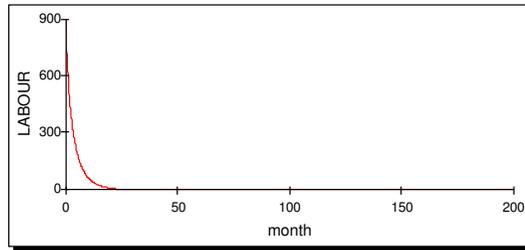
- Desired production = 0

If the desired production drops, it means that the firms' products are no longer demanded on the market. We expect that, as a consequence, the firm will no longer be willing to hire, even though it will not fire people, so the labour will drop radically. We also expect that the job satisfaction will remain as low as in the initial condition, since in our model its determinants are not related to the firms' performance on the market.

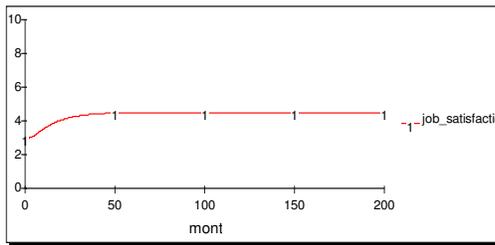
The model behaves as expected: labour and production drop to 0; profits drop to zero, and job satisfaction stabilizes at a low level.



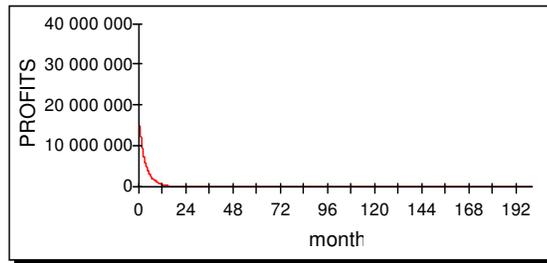
Production



Labour



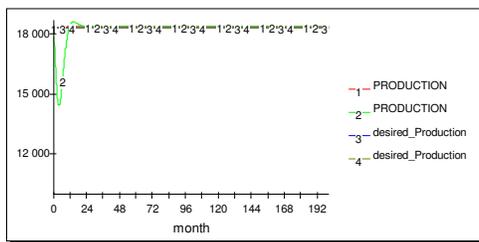
Job satisfaction



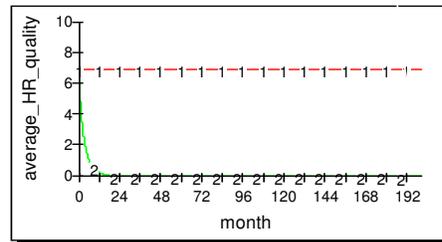
Profits

- Quality of employees hired = 0

If the quality of the new employees is zero, the overall quality of the employees should decrease. As a result, the productivity should decrease, the production should decrease and also the profits of the company. As the company responds to the decrease in productivity by hiring more people, the production should be back at the desired level after an initial drop, but the profits should still be lower, because the company has higher costs with the employees.



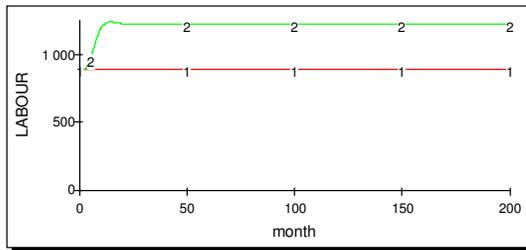
Production



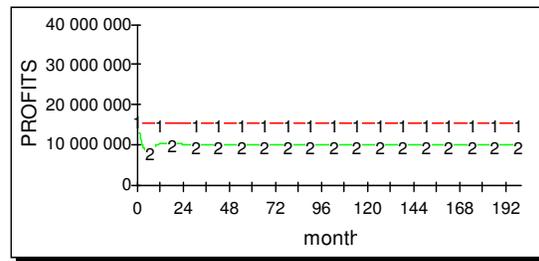
Average HR quality

As we see, the production adapts quite fast to the drop in productivity because the company hires more people, and it is back to the desired level after 1 year, overshooting a little because of the

delays involved in recruitment. The labour level however, reaches 1200 employees, that's 33% more than the 900 initial level of employees. The profits will be thus lower.



Labour



Profits

- Policy sensitivity test

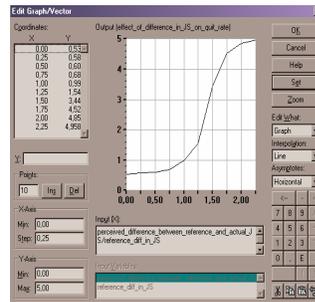
We performed a policy sensitivity test to see if the policies we suggest are sensitive to extreme values. Previously, we had tested the model on equilibrium values, and we have seen that it behaves as expected. We deemed important to see whether the policies we suggested stand scrutiny when facing extreme values, and whether the best considered policy remains the same after this test. The tests proved that our best suggested policy (see policy 3 in the chapter 6, Policy analysis) remains the best even with very small or very high values of parameters, like desired production, reflecting a fluctuating market demand.

Behaviour sensitivity

This test aims to discover if the model is very sensitive to changes in the functions that the modeller suspect as being both highly uncertain and likely to affect the conclusions drawn from the model (Randers 1980; Forrester and Senge, 1980). The two functions in our model that deserve a special attention are the influence job satisfaction on turnover and the influence the coaching on the quality of employees. These two functions were approximated by the author based on literature and direct experience in the system. If the model is very sensitive to a change in the shape of these nonlinear functions, which would mean that our conclusions are not valid for a different shape of the function, which other authors may believe more appropriate. If the functions are not too sensitive, that would mean that the dynamics of the system are mainly responsible for the results of the policies.

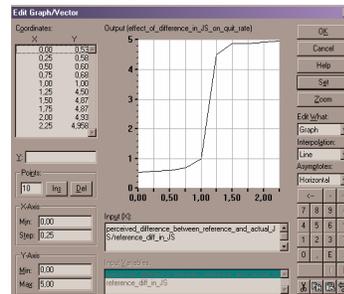
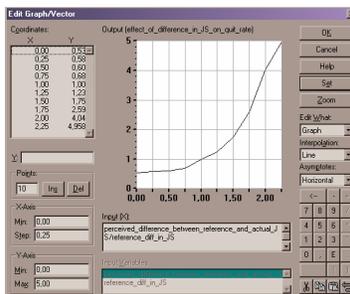
- Job satisfaction and turnover

The job satisfaction influences the turnover through the difference between the current and an expected maximum value: the bigger the difference, the higher the effect on turnover. Following Sterman's (2000) recommendations for constructing a nonlinear function, we defined the following function:



The influence of JS on turnover

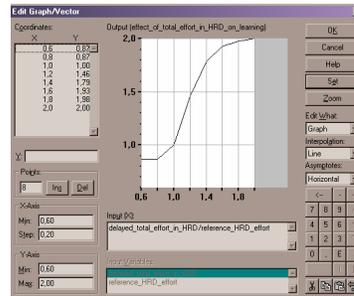
The increase is slow at the beginning, and becomes quite steep as the difference grows, following the same pattern Sterman (2000) described for adapting to a drop in income, and which mechanism we explained in the literature review on job satisfaction. We tested different shapes of the job satisfaction, with an even steeper increase, and also with a more flat increase. The model was not sensitive to the change. This is consistent with Sterman (2000) who says that in models of human systems, numerical sensitivity matters little, if at all.



Different non-linear formulations of the influence of JS on turnover

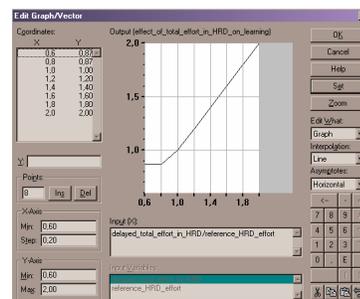
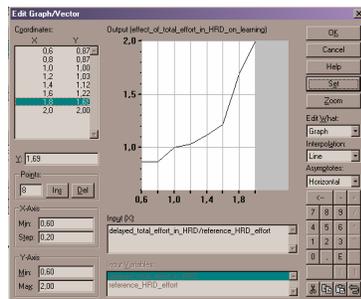
- HRD investment and quality

As we showed both in the literature review and in the model building, transfer of knowledge from training, or, in the terms we used in our model, translation of days of training into quality units, is mediated by the effort the company makes to encourage the new knowledge usage in the daily tasks. The effect such an effort has on the quality acquisition is defined by the following function:



Effect of HRD effort on learning

To test our model's sensitivity to this function, we modified the function, similar to the JS case. The model was not sensitive to change.



Different non-linear formulations of the influence of HRD investment on learning

Integration error

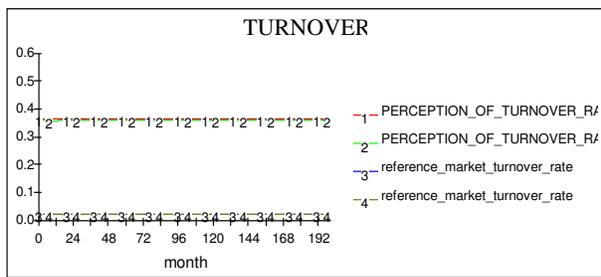
The result of our model should not be sensitive to the choice of the time step or integration method. We used the "DT error" test suggested by Sterman (2000) and we found no sensitivity to the time step, not to the integration method. The time step we used throughout the modelling process was .125.

Behaviour reproduction

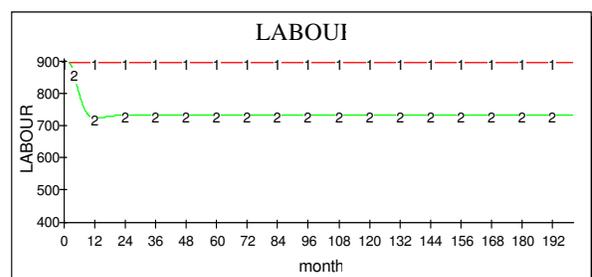
This test, although described by Sterman (2000) as a method to fit the historical data to the data produced by the model, is a very useful test to assess the general findings of the model, and if the model reproduces the problem it was initially conceived for. Since we do not have a real reference mode, just verbal descriptions of the situation in Romania, we will try to see if these descriptions match the behaviour of the model as described in the hypothetical reference modes, without the use of statistical data. We described the current situation as one in which the companies used 2 policies to account for a turnover higher than the standard on the market. We put our model in equilibrium and then set the two current policies to see if the behaviour of the model matches the description from the field study.

In the *equilibrium* mode (line nr 1 in the simulations), we assume no training, no communication of career opportunities, 100% hiring for the market, and, consequently, low initial values for job satisfaction, distributive justice and perception of career opportunities. In the *base case policy* mode(line nr 2 in the simulations), we set the training days above the reference value on the market, to account for an increase in the training given to employees, and also a higher value for the salaries of the people hired form the market..

Let's first look at the main indicators the company is following: turnover, number of employees, quality of employees and profits.



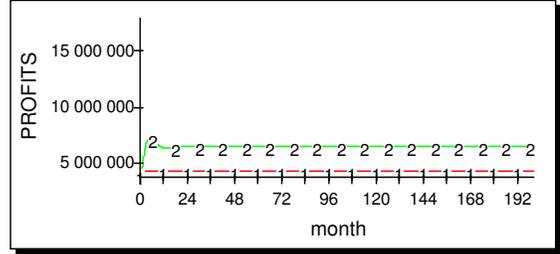
Turnover versus the benchmark value



Labour



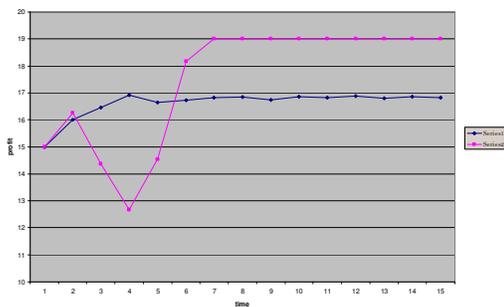
Average HR quality



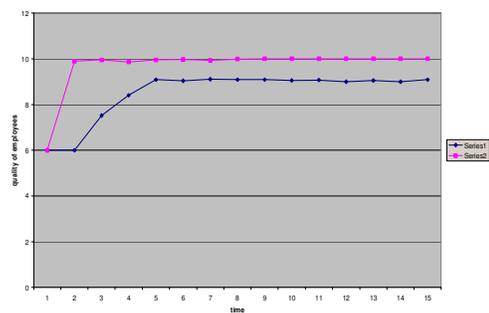
Profits

We can see that the turnover decreases a little when the policy is introduced, but then soon comes back to the initial value, much above the industry standard. As a result of the increase in costs, but also as a result of the increase in the quality of employees, the productivity increases and the company needs less people to do the same job. The turnover is still high; but the profits are higher, as a result of fewer and more productive employees.

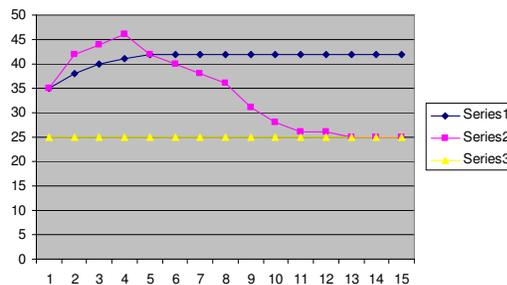
In the hypothetical reference mode, we assumed a similar behaviour in the current policy (noted with series 1, blue): for the profits, a slight increase, a slight increase also for the quality. The turnover doesn't change too much, so the model doesn't behave exactly as we hypothesized; nevertheless, there are good reasons for the turnover to stay the same rather than increase even more, all else being equal.



Profits

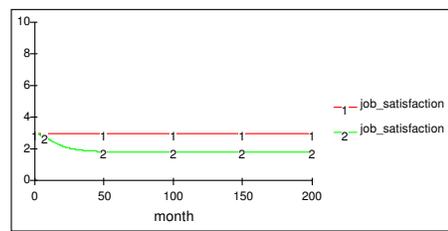


Quality



Turnover (% per year)

A very important question is: are the people satisfied? The answer is no, the employees are not satisfied, and this is one good reason why the turnover fight mechanisms don't work.



Job satisfaction (1=equilibrium mode; 2= base case)

Even if the employee job satisfaction is very low, so there is little chance, according to literature, to decrease the turnover, some companies will settle with this. We believe this reproduces the situation in Romania, since the practice of the training for increasing the quality of employees is very rewarding and widely spread. At the same time, the retention problem is not addressed at all. The problems that the high turnover of specialists entangles (and from which we modelled only the recruitment costs) are still there. Since our focus was to design better retention policies, the main indicator for us is the turnover. In the current policy, the turnover is not reduced, thus representing the situation in Romania that our study described.

Boundary adequacy test

This process of testing the boundaries was an iterative one while doing the modelling, so we will only make a few points here.

One of the first boundary adequacy tests we did concerned the organizational commitment variable in our model. We originally had two influences on the turnover, as the literature describes, job satisfaction AND organizational commitment being the key employee attitudes that influence the turnover. (Ostroff et al, 2003; O'Reilly, Chatman& Caldwell, 1991; Carmeli, 2005). We tested our model for the impact of the organizational commitment structure, and finally decided to exclude it, since its inclusion did not add too much to our conclusions and made our model bigger and more complicated to understand.

The present boundary of the model has also been checked when deciding to make the demand for the product exogenous (through the desired production variable). We decided not to model the economy, since it would have made the model much too difficult to understand, and we wanted to show the mechanisms that govern the company, not the economy.

Another interesting to test was the inclusion of the quality of newly employed people. We defined it exogenously, but we tried to see what if this quality is dependant on the quality of employees the company already has. Such a claim would make sense because good quality employees build a good reputation, which helps both sales and the recruitment of even higher quality employees (Warren, 2002).

We defined the equation for quality of new employees as

$$\text{Average_q_from_hiring} = \text{initial_q_from_hiring} * \text{effect_of_current_q_on_recruiting_quality}$$

, where the effect was defined as function of the average quality versus a reference value.

The results showed a slight improvement in the quality of employees, but the difference did not make a significant impact on any of the other important indicators of the model. Thus, we decided not to include this formulation and keep the original one from the model.

Summary

We tried to build more confidence in our model by presenting some of the test we performed in order to validate it. Although parameters estimation in the case of the soft factors is based mainly on literature review and experience of the author working in HR departments, without further empirical validation, we believe that the model reproduces the main feedback loops involved and it helps enlarge the policy makers' mental model. We will present, in the next chapter, some of the policy analysis we performed.

6. POLICY ANALYSIS

This chapter represents an important contribution of the thesis, as it consists of an analysis of different policies and their impact on the main indicators of the firm. We first discuss the reference case (the equilibrium) and the base case (the current policies the company is using) and we show the soft factors the company fails to take into account. Then we go on with presenting our alternative policies to the “train” and “buy” strategies, policies that take into consideration the job satisfaction and its determinants.

Reference case

We initialize our model in equilibrium. The equilibrium values describe the situation in the market if no policy for increasing the job satisfaction is in place, and the main way of replacing employees that leave is by hiring from outside. The value of willingness to invest in training is 0 and the fraction for hiring employees from the market is 1, the maximum. No promotion is in place, so the employee job satisfaction has a low value: 3, on a 0 to 10 scale. The value for the distributive justice is 5, on a 0 to 10 scale, since the salaries for current employees are the same as for the people that are just being hired from the market. The career opportunity value is zero, since there is no real chance of promotion for the employees. Furthermore, we assume that the initial value of quality is 7 units on a 1 to 10 scale, where 1 is the minimum and 10 the maximum, reflecting a relatively good quality of employees.

Base case - current policies

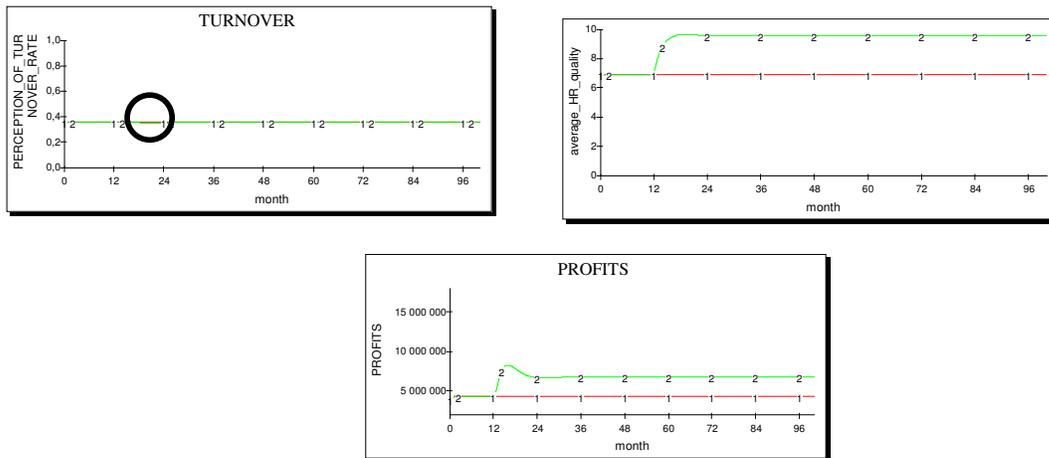
We have modelled the base case as reflecting the current policies, with the 2 strategies in place: “train” and “buy”. The policies are reflected in the values of the parameters as follows:

- Number of training days: higher value than the reference value on the market
- Salary for people being hired: higher than for the current employees.

Our company does not have any other policy in place to increase the satisfaction of its employees, other than giving them training (which it believes increases satisfaction). Although this seems highly improbable, it is very often the case. The HR departments in Romania are rarely performing

other functions than recruitment, personnel administration and, more recently, training. We do not refer here to isolated events, meant to boost the motivation of the employees from time to time, but to policies that are in place and that have an impact on daily decisions.

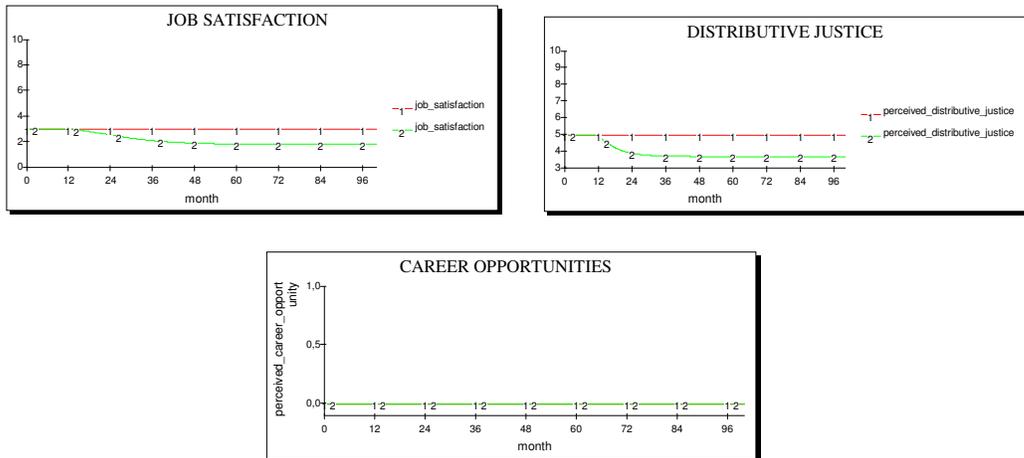
We present in the next graphs the results of the current policies on the profits, the quality of employees and the turnover. In order to show the difference from the reference value, we introduce the current policies after 1 year.



The profits increase with the introduction of the training policy (that increases the quality of employees) and they stabilize at a higher value than the initial one. This increase in profit can be a good incentive to the company: one cause- one effect being established, it stops here with the HR investments.

However, the decrease in turnover is negligible and it does not last for long. But if the training policy was meant to increase the satisfaction and thus decrease the turnover, why doesn't that work?

To answer this question, let's look at the variables which we assume the company is NOT looking at: the job satisfaction and two of its determinants, career opportunities and distributive justice. We assume that these are the variables that the company is not taking into account, in other words **these are the stocks that the company is ignoring.**



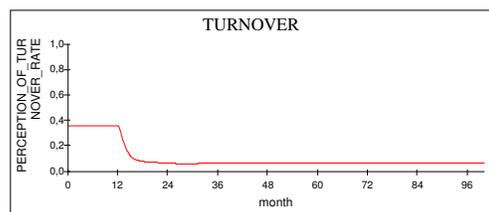
1=equilibrium values; 2=current policies

Both job satisfaction and distributive justice values are decreasing with the introduction of this policy, while career opportunity stay zero, since the company is not promoting at all (the hiring rate from the market is set to 1, meaning that every vacancy is filled with people from the market). The maximum value for both job satisfaction and distributive justice is 10, while the ideal fraction for career opportunities is 1. The value of these stocks reflects the perception of the employees of their work environment. Having said this, since the job satisfaction is decreasing, turnover cannot decrease.

Is job satisfaction really ignored?

To test whether our assumptions about the misperception of job satisfaction are true, we wanted to see how the current policies work, if we ignore the influence of satisfaction.

In the following graph, we assume that the influence of job satisfaction on the turnover is 1. The result should be the one that the company is counting on: the reduction in turnover. As in the previous policy test, we introduce the policy after 1 year.



We see that the graph reproduces what should happen in the system if the current mental model of managers were right: the turnover decreases considerably, which is exactly what the company wants. Unfortunately, this is not what is happening in the real world, and we will try to figure out policies that decrease the turnover AND take into consideration the job satisfaction and its determinants.

We have performed a number of policy analyses; we will not present all of them here. Rather, we chose to present the ones that are most counterintuitive and show that investing in only one factor that determines the job satisfaction does not yield as good results (it even yields worse results) as investing in all of the determinants at the same time.

Alternatives to the “Buy” policy

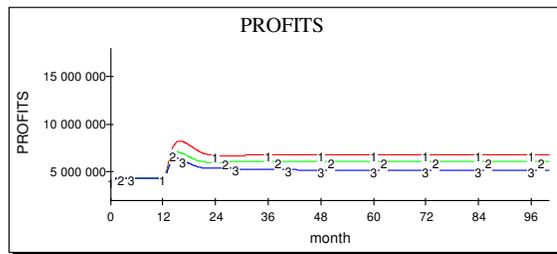
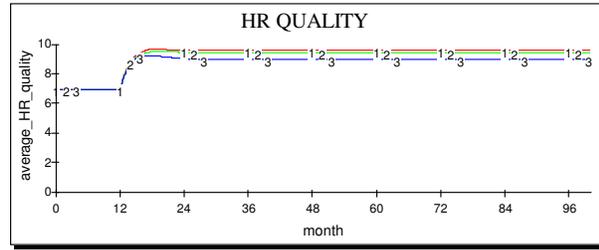
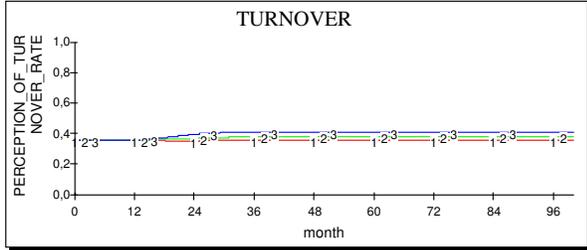
Policy 1: promote

A first policy we want to test addresses the career opportunity variable as a precedent of job satisfaction. The current policy is that all the vacancies are filled in with people from the market, and there are practically no promotions in place, but they are not communicated on an organizational scale.

Having a promotion policy does not necessarily mean that the company has to fill in all vacancies with internal candidates (Holton & Naquin, 2004). Promotion makes employees feel that there is another reward for their performance other than the pecuniary one. It shows that the company gives them a chance to prove their KSA and compete with the outside candidates. A promotion system does not mean that only internal candidates are considered. For these reasons, we defined an ideal promotion rate of 60% of the candidates. We recognize that this may not be true at all times in the company, depending on the stage it is in, but we assumed the company to be in stable stage of its life, so we could focus on the HR mechanisms involved.

There are two parameters we can change in this policy: the fraction of people hired from the market, and the communication of promotions. The communication of promotions accounts for the importance of people knowing that promotions happen, and this communication can be done either by naming the persons promoted, or by communicating a percentage of promotions form the total vacancies. In our case, we assume that our company communicates the percentage of promotions. Having such a system in places entangles costs, and we acknowledged that point and modelled it.

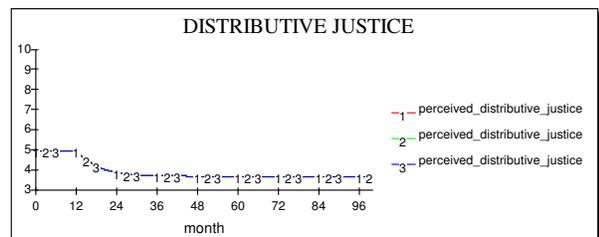
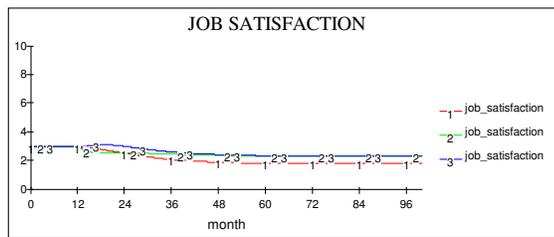
We will first run the model with different fractions (0.7 and 0.4) of promotion from the market, but keeping the communication to 0.5. This means that people might the company is only partly consistent in communicating promotions. The initial perception of career opportunities is .2. We will compare this run with the base case.



LEGEND: 1= base case; 2= Policy 1a: hiring fraction from market is .7 (30% of vacancies are filled by promotions); 3=Policy 1b: hiring fraction from market is .4 (60 % of vacancies are filled by promotions)

If we look at the stocks the company is following, this looks like a disaster policy: the turnover increases, the profits decrease and the quality of the people decreases also. It seems that this policy only entangles costs, and the results are not at all the ones expected. It simply doesn't work.

Let's look now at the ignored stocks to try to explain why this is happening.



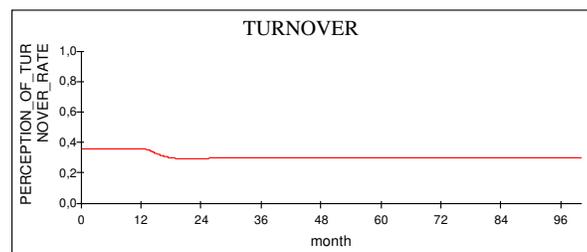
LEGEND: 1= base case; 2= Policy 1a: hiring fraction from market is .7 (30% of vacancies are filled by promotions) 3=Policy 1b: hiring fraction from market is .4 (60 % of vacancies are filled by promotions)

Even though the perception of career opportunities increases, that is not enough to make a major difference in the job satisfaction, which remains really low, with a very little difference from the base case, even as more money and time is spent in the promotion policy. The communication of these promotions is still .5, but even if we put it to 1, the turnover stays high and the job satisfaction low.

We have to remember that promoting means much longer time to adapt to the desired labour level, as opposed to the hiring case, where you just take people from the market when you want them. Of course, there is a delay involved in hiring (3 months), but it is much shorter than the delay in forming people, developing them (18 and 12 months, for mid-level and seniors, respectively). And if the company doesn't do anything else to increase their job satisfaction, people continue to leave, and the company faces an even bigger turnover, because of the time it takes you to fill out the vacancies.

Just increasing the career opportunities in the company and communicating them, even though it sounds like a good policy to start with, does not suffice to make the employees happy. This policy is isolated from anything else, so the company is not transmitting consistent signals. On one hand, it is promoting a lot of people. On the other hand, it is giving higher salaries for a mid level employee that has just been hired than for one that has just been promoted, showing that it values more people from the market than people from within the company. It also does a poor job in communicating performance goals, and showing *why* the people are promoted, so employees do not have the information to correlate performance with promotion. They might as well believe promotions are arbitrary. The signals are contradictory and that cannot increase job satisfaction.

To make sure that the delay is an important factor responsible for these results, we tried to reduce the delays in making the transit from one stock of employees to the other. The results show that the turnover decreases if the delay is decreased with a promotion policy in place, so if the company would want this policy to work, it could work through its procedures to promote people more quickly. This would not change much however, for the job satisfaction, in isolation from any other measure to increase the latter.



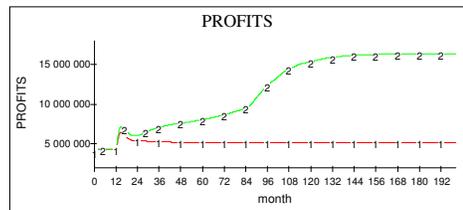
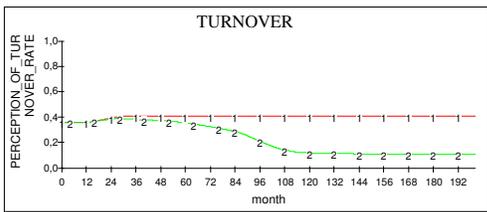
As companies tend to look for one cause - one effect relationships, starting with this policy would be a hoax. It looks that doing just this, just increasing the number of promotions in the company and communicating this fact, does not help. In fact, this policy would address only one determinant of the job satisfaction, but completely ignore the rest. The results are far from the expected ones.

Policy 2: promote AND reward

In this second policy we want to test if communicating the goals of performance has an impact on the stocks we are following. We will keep the promotion policy, policy 1, and assume that the company does not give up after seeing the results of the first policy, but tries adding another HR policy, namely communication of the performance standards. We recognize this is a highly counterintuitive way of behaving, because companies normally give up after having tried one policy, especially if it did not give the expected results.

Through this policy, we address the distributive justice variable, since the performance management is one of its important components. We also modify the salaries, by setting the same salaries for the newcomers as for the old-timers. We will have addressed then 2 of the job satisfaction determinants: career opportunities and distributive justice. We will compare this policy with policy 1.

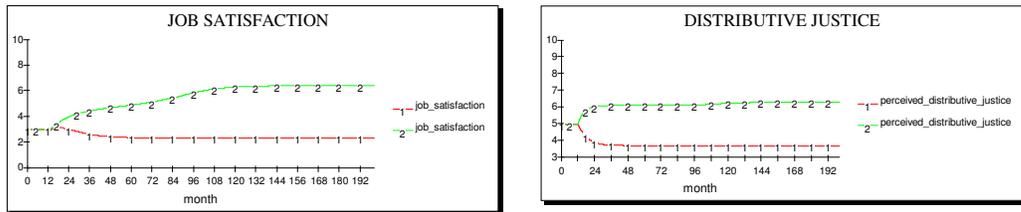
- a)Same salary for employees who stay and the newly employed



LEGEND: 1= Policy1 ; 2= Policy 2a-same salary

The results on the short term are not spectacular; they follow the same trend as in policy 1. After 3 years of the same policy, however, the turnover starts to decrease, the quality to increase and the profits go up to almost triple the initial value.

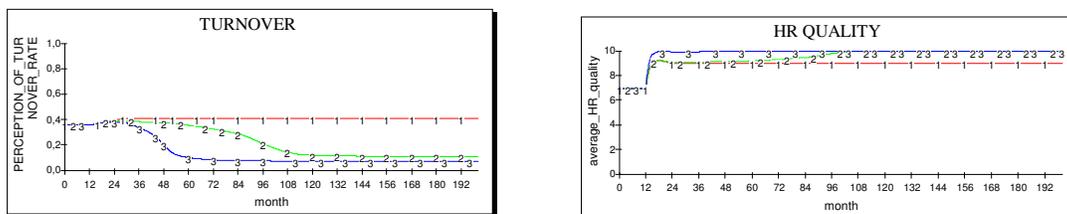
Looking at the soft variables now, we see that the job satisfaction slowly increase after the introduction of the policy, and it stabilizes at a value twice as big as the initial value. The distributive justice also increases considerably compared to policy 1. It takes time for the employees to build commitment and modify their job satisfaction perception, especially starting from a low value of job satisfaction, but this policy certainly is a good start.

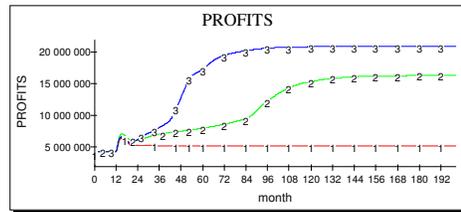


LEGEND: 1= Policy1; 2= Policy 2a-same salary

- b) Bigger salaries for employees who stay

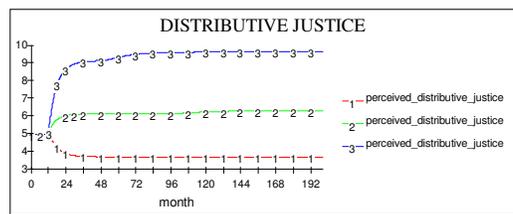
Let's see now what happens if we set the salaries of the insiders higher than the ones of the new comers. This should reflect the fact that an employee can not reach the maximum salary level as soon as he/she comes on board, and that staying with a company for while is worthwhile in terms of money. Although this may seem as a counterintuitive policy at this point, because companies try to attract valuable employees from the market, it reflects a focus on retention, not on hiring. The salary level we set is still above the average on the Romanian market, and with satisfied employees, the company should be able to attract valuable candidates.





LEGEND: 1= Policy 1; 2= Policy 2a; 3= Policy 2b-bigger salaries for insiders

This policy makes a big difference, although not immediately. The turnover starts decreasing faster than in policy 2a and the increase in the quality of employees is much faster. The profits reach a much higher value after the third year. To explain these results, let's look at our soft variables.



LEGEND: 1= Policy 1; 2= Policy 2a; 3= Policy 2b-bigger salaries for insiders

Investing in job satisfaction determinants pays off. It would seem that the increase in distributive justice, as a result of a differential pay policy leads to a more steeper increase in job satisfaction. The more satisfied employees don't leave so easily, the turnover decreases and the profits reach a very high level.

Having the long term perspective is essential. We can see that at first not even this policy does yield good results. The turnover increases a little in the first 2 years, and the profits decrease. We have to remember that there are costs associated with these policies' implementation and that there are very long delays until a change in perception takes place. The soft variables are crucial in explaining the success of the policies and showing that the delays in the system concern them too.

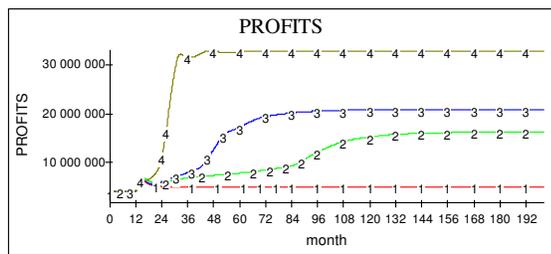
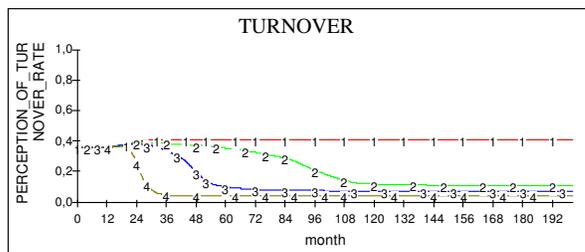
If we compare this policy with the hypothetical reference mode we described in the model building chapter, where we assumed there that the results will be worse off in the beginning, when the policy is introduced, but the end results will pay off, we can see that our results show this.

Alternative to the “Train” policy

Policy 3: promote AND reward AND coach

We showed that the company is giving training to the employees, but it seems that it is doing that partly for the wrong reasons. Apart from wanting to train the employees because training increases the employees' quality, the company seems to believe that it increases their job satisfaction, and we showed literature which says it doesn't, or not in the way they expect it.

However, training is far from being a bad policy. We want to suggest here a policy that helps increase the quality of employees faster AND help the job satisfaction of employees. This policy takes into account the necessities for transfer of knowledge as outlined in the literature (Knowles et al, 1998; Holton et al, 2000). It addresses the HRD investment indicator, which reflects the organizational culture that encourages people to help and support each other to evolve. The midlevel and senior staff involved in HRD is still included in the calculus for productivity since they are not providing on the job training, but merely willing to guide and involve their colleagues in a corporative effort to improve the overall HR quality, like inviting to meetings, delegating and encouraging project work. Let's see the results of this policy. We compare this policy with the previous ones we already introduced.



LEGEND: 1= Policy 1; 2= Policy 2a; 3= Policy 2b-bigger salaries for insiders;4=Policy 3

We see that the quality level increases rapidly, and that the turnover falls much quicker than in policy number 2. Profits skyrocket fast, also. How can we explain these results? If we look at the job satisfaction, the answer is evident.

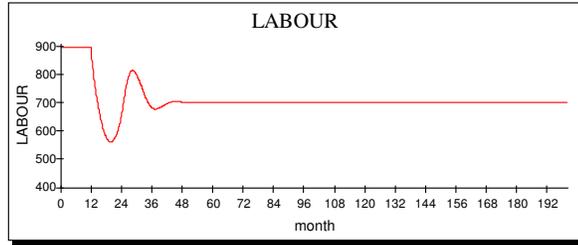


LEGEND: 1= Policy 1; 2= Policy 2a; 3= Policy 2b-bigger salaries for insiders;4=Policy 3

If we compare the results of this policy, that addresses all the determinants of the job satisfaction, with the base case, we can see the difference. The turnover decreases, the quality increases, the profits increase: all the results the company is looking at. We stated in our hypothesized reference mode that our suggested policy would yield better results, and those results would be correlated with a high level of job satisfaction. It is the case in our ideal policy.

Let's try to describe in more detail this ideal policy. First thing, it *promotes*. An employee that has performed well, and has stayed in the company for long enough, knows that if there is a vacancy in the company, he has a chance of applying for that position. His knowledge, skills and abilities are valuable to the company. Second thing, it *rewards*. It communicates the performance standards employees need to accomplish, it gives higher salaries for employees that stay than for the ones that have just joined the organization, and it gives bonuses if profits are higher then expected. Last, but not least, it *coaches*. If training is taking place, the people inside the company are willing (and trained) to help transfer of knowledge in the real work situations, to encourage learning and to be open to critique of the current work habits. Wouldn't you want to work here?

An interesting last thing to look at is the labour graph, since it shows a typical result of a delay in dynamic systems: oscillations.



Policy 3

The number of employees decreases because the overall productivity increases, so the company needs less people to perform the same jobs. Since in our policy we promote more, meaning a much longer delay in getting the desired labour, and the job satisfaction increases slowly, with a 12 month delay, the labour stock oscillates. The labour stabilizes at a lower level than in the base case with employees more satisfied and more productive.

Summary

Our policy analysis suggests that the more determinants of job satisfaction you tackle, the better results in turnover you get. The best policy we suggested not only decreases the turnover three times, but it also increases the profits and the quality of employees, *ceteribus paribus*. More satisfied employees perform better, and the balance between costs and results of these job satisfaction oriented policies is definitely in the favour of the last one.

7. CONCLUSIONS

This thesis attempted a response to the retention of specialist problem in the banking and telecom businesses in Romania and tried to find the best policy to address it. We built on literature from both system dynamics and psychology domains, and we tried to show that the policy makers misperceive the real causes of turnover and thus design inefficient policies to fight it. Job satisfaction is one important component of turnover and we believe that the managers have a faulty mental model or ignore the determinants of job satisfaction, and thus do not attend to them.

Smedslund (1963) has shown that people typically attend to the probability of an outcome given the “present” cue only and that there is a bias towards correlating two instances simply by associating the presence of the two, ignoring the probability of one or both being absent. There is reasonable consensus (Weiner, 1985) that, in policy design, search for a cause is elicited by either an unexpected event or by a failure in an otherwise familiar and successful task. In other words, policy designers will only look for a cause if something goes wrong or unexpected, and then stop looking when they will have found a first possible cause to explain that. A good example of this type of bias is the companies' focus on training, as a means to increase job satisfaction, even though the two are not directly linked. We showed that job satisfaction has other important determinants too, and that addressing all of them yields better results than designing policies just for one determinant.

The policy we deemed works best for retaining quality employees was the one that encouraged training, but also the transfer of knowledge acquired through training, once the employee has come back in his work environment. Our recommended policy also fostered promotion and showed the employees that the knowledge they acquire while staying in the company is valued and rewarded. Finally, we showed that an increase in the salary for the people that stay in the firm and the communication of performance goals add to the employee's feeling satisfied, and thus more committed to stay in the company.

We did not re-invent the wheel. The “all inclusive” policy we recommend is in place in many countries around the world and is part of the HR package of the most successful companies that attach importance to their employees. It is not the case, unfortunately, for the companies in Romania we investigated. The important contribution of this thesis, however, is that we managed

to come to the same result (a policy addressing more than one job satisfaction determinant) following a different route, that of system dynamics modelling and psychology literature.

The results of the ideal policy we recommend look almost too good to be true. We acknowledge the fact that these results depend strongly on the assumptions we made, yet there is definitely an interesting area to explore. Probably the main contribution of this thesis is having mechanisms driving the change in job satisfaction more explicit and having shown important feedback loops that are being ignored when designing HR policies. In SD modelling the job satisfaction was often seen as “morale”, with maximum 2 influences on its change (see Warren, 2002; Sveiby, Linard and Dvorsky, 2002). We believe that the both managers and SD scholars could benefit from the enhancement in structure that this thesis presents.

Further research

We recognize that measuring such soft variables as job satisfaction and its determinants is far from being perfect. However, it remains valuable to have constructed qualitative cause-and-effect diagrams which identify how soft variables and intangibles might combine to impact on variables such as “change_in_job_satisfaction” and ultimately “job_satisfaction”. Quantification, combining and validating remain problematic and this thesis is just a first attempt to continue research in this domain. How to overcome the problems identified here remains a challenge for system dynamics researchers and practitioners. There is no simple answer to that.

Another drawback of the modelling of job satisfaction is that we aggregated the individual responses to the company's policies and showed the assumed overall impact. As literature shows, the individual interpretations of such policies are quite important, since every person comes with a unique experience in a company, experience that is very important when judging the events.

In a more realistic model, feedback from the market performance of the firm could be included, since it is related to the status of the employee (personal determinants of the job satisfaction). Also, the model could be enlarged to include other influences on turnover, like organizational commitment. The model could also include the impact on the firm of the fluctuation of the demand.

Finally, we believe it would be very useful to have one specific company to test this model on, with data from its specific decision making processes and expected results. In this way, the policy makers detailed mental models and the impact of showing them a model of the system could be better evaluated and confronted with our assumptions.

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Web resources

www.HR-Romania.ro, accessed on a monthly basis between August 2004 and May 2006.

ANNEX

List of equations

init Cost = 10233105
 flow Cost = $+dt \cdot \text{change_in_costs}$
 init hours_worked_per_week = reference_hours_worked
 flow hours_worked_per_week = $+dt \cdot \text{increase_in_hours_worked}$
 init job_satisfaction = INITIAL_job_satisfaction
 flow job_satisfaction = $+dt \cdot \text{change_in_job_satisfaction}$
 doc job_satisfaction = This is an average job satisfaction for all employees. It makes sense to model it like that, and not at the individual level of employees, since you tend to compare yourself a lot with the level of satisfaction of the other employees: if everybody is happy and you are the only one dissatisfied, you might want to reconsider that position
 init LABOUR = actual_labour
 flow LABOUR = $+dt \cdot \text{aggregated_hiring_rate} - dt \cdot \text{aggregated_quit_rate}$
 init M_hired_from_outside = 399.00055
 flow M_hired_from_outside = $-dt \cdot \text{Rate}_{78} + dt \cdot \text{Rate}_{75}$
 doc M_hired_from_outside = It is assumed that once the market midlevel are promoted, they will have the same salary as the people that have promoted since rookies.
 init mid_level = initial_midlevel
 flow mid_level = $-dt \cdot \text{midlevel_quit_rate} + dt \cdot \text{mid_level_hired_from_the_market} - dt \cdot \text{promoting_to_senior} + dt \cdot \text{promoting_to_mid_level}$
 init midlevel_quality = 2800
 flow midlevel_quality = $-dt \cdot \text{transferring_quality_to_senior} + dt \cdot \text{increase_in_M_Q_from_HRD_investmnt} + dt \cdot \text{M_Q_from_recruitment} - dt \cdot \text{decrease_in_M_Q_from_quitting}$
 init perceived_career_opportunity = INITIAL_career_opp
 flow perceived_career_opportunity = $+dt \cdot \text{net_change_in_perceived_career_opportunities}$
 init perceived_distributive_justice = INITIAL_distributive_justice
 flow perceived_distributive_justice = $+dt \cdot \text{change_in_DJ}$
 init PERCEIVED_Revenues = INITIAL_CAPITAL
 flow PERCEIVED_Revenues = $+dt \cdot \text{change_in_revenues}$
 doc PERCEIVED_Revenues = We do not assume a greenfield firm, but that has been acting in a market for some time and it has some revenues in a form of reserve
 init PERCEIVED_SALARY_COST_INSIDE = SALARY_COST_OF_PEOPLE_FROM_INSIDE
 flow PERCEIVED_SALARY_COST_INSIDE = $+dt \cdot \text{change_in_inside_salary_cost}$
 init PERCEIVED_SALARY_COST_OUTSIDE = SALARY_COST_OF_PEOPLE_FROM_OUTSIDE
 flow PERCEIVED_SALARY_COST_OUTSIDE = $+dt \cdot \text{change_in_market_salary_cost}$
 init PRODUCTIVITY = initial_productivity
 flow PRODUCTIVITY = $+dt \cdot \text{change_in_productivity}$

```

init   rookie_quality = 1200
flow   rookie_quality = +dt*R_Q_from_recruitment
        -dt*transferring_quality_to_midlevel
        -dt*decrease_in_R_Q_from_quitting
        +dt*increase_in_R_Q_from_HRD_investmnt
init   rookies = initial_rookies
flow   rookies = +dt*hiring_rookies
        -dt*promoting_to_mid_level
        -dt*rookie_quit_rate
init   S_hired_from_the_outside = 299.78
flow   S_hired_from_the_outside = -dt*Rate_79
        +dt*Rate_76
init   senior_quality = 2400
flow   senior_quality = +dt*increase_in_S_Q_from_HRD_investmnt
        +dt*S_Q_from_recruitment
        -dt*decrease_in_S_Q_from_quitting
init   seniors = initial_seniors
flow   seniors = +dt*senior_hired_from_the_market
        -dt*senior_quit_rate
        +dt*promoting_to_senior
init   Total_hidden_training_cost = 0
flow   Total_hidden_training_cost = +dt*change_in_hidden_cost
init   Total_REAL_training_cost = 0
flow   Total_REAL_training_cost = +dt*change_in_measured_cost
init   vacancies = initial_vacancies
flow   vacancies = +dt*vacancy_creation_rate
aux    aggregated_hiring_rate =
hiring_rookies+mid_level_hired_from_the_market+senior_hired_from_the_market
aux    aggregated_quit_rate = midlevel_quit_rate+rookie_quit_rate+senior_quit_rate
aux    change_in_costs = (Calculated_cost-Cost)/time_to_perceive_costs
aux    change_in_DJ = (indicated_DJ-perceived_distributive_justice)/DJ_adj_time
aux    change_in_hidden_cost =
((Total_hidden_cost_ML+Total_hidden_cost_R+Total_hidden_cost_S)-
Total_hidden_training_cost)/time_to_accumulate
aux    change_in_inside_salary_cost = (SALARY_COST_OF_PEOPLE_FROM_INSIDE-
PERCEIVED_SALARY_COST_INSIDE)/time_to_calculate_salary
aux    change_in_job_satisfaction = (INDICATED_JS-
job_satisfaction)/time_to_perceive_a_change_in_JS
aux    change_in_market_salary_cost = (SALARY_COST_OF_PEOPLE_FROM_OUTSIDE-
PERCEIVED_SALARY_COST_OUTSIDE)/time_to_calculate_salary
aux    change_in_measured_cost =
((cost_of_HRD_training+Total_cost_R+Total_measured_cost_S+Total_cost_ML)-
Total_REAL_training_cost)/time_to_accumulate
aux    change_in_productivity = Productivity_gap/time_to_adapt_productivity
aux    change_in_revenues = (Calculated_revenues-
PERCEIVED_Revenues)/time_to_perceive_revenues
aux    decrease_in_M_Q_from_quitting = average_quality_midlevel*midlevel_quit_rate
aux    decrease_in_R_Q_from_quitting = rookie_quit_rate*average_quality_rookies
aux    decrease_in_S_Q_from_quitting = senior_quit_rate*average_quality_seniors
aux    hiring_rookies = rookie_target_hiring_rate/time_to_hire_and_integrate_newcomers

```

aux increase_in_hours_worked = (indicated_hours_worked-
 hours_worked_per_week)/time_to_adjust_hours_per_week
 aux increase_in_M_Q_from_HRD_investmnt =
 indicated_M_quality/time_to_add_quality_by_training
 aux increase_in_R_Q_from_HRD_investmnt =
 indicated_R_quality/time_to_add_quality_by_training
 doc increase_in_R_Q_from_HRD_investmnt = The influence of the HRD effort is not adding
 quality points in itself, but mediates the transfer of knowledge, as Holton and Naquin (2004) show it
 aux increase_in_S_Q_from_HRD_investmnt =
 indicated_S_quality/time_to_add_quality_by_training
 aux M_Q_from_recruitment =
 mid_level_hired_from_the_market*(IF(relative_perceived_salary_ratio> 1,
 average_M_Q_from_hiring*1.25, average_M_Q_from_hiring))
 doc M_Q_from_recruitment = THE QUALITY IF PEOPLE ATTRACTED IS INCREASED IF
 THE SALARIES ARE HIGHER
 aux mid_level_hired_from_the_market =
 mid_level_target_hiring_from_market/time_to_hire_and_integrate_newcomers
 aux midlevel_quit_rate = IF
 ((mid_level*normal_mid_level_quit_fraction*effect_of_difference_in_JS_on_quit_rate)<=mid_level
 ,(mid_level*normal_mid_level_quit_fraction*effect_of_difference_in_JS_on_quit_rate),(mid_level*
 normal_mid_level_quit_fraction))
 aux net_change_in_perceived_career_opportunities = (average_communicated_career_opp-
 perceived_career_opportunity)/Memory_of_CO
 aux promoting_to_mid_level =
 ((rookies*normal_rookie_promotion_rate+midlevel_promotion_target_from_staffing_needs)*effect
 of_quality_on_promotion_of_rookies)DIVZ1 time_to_promote_rookies
 aux promoting_to_senior =
 ((mid_level*normal_midlevel_promotion_rate+senior_promotion_target_from_staffing_needs)*effe
 ct_of_quality_on_promotion_of_mid_level) DIVZ1 time_to_promote_midlevel
 aux R_Q_from_recruitment = hiring_rookies*(IF(relative_perceived_salary_ratio> 1,
 average_R_Q_from_hiring*1.25, average_R_Q_from_hiring))
 doc R_Q_from_recruitment = THE QUALITY OF PEOPLE ATTRACTED IS INCREASED IF
 THE SALARIES ARE HIGHER
 aux Rate_75 = mid_level_hired_from_the_market
 aux Rate_76 = senior_hired_from_the_market
 aux Rate_78 = (M_hired_from_outside DIVZ1
 mid_level)*(midlevel_quit_rate+promoting_to_senior)
 doc Rate_78 = it is assumed that probability of the people coming from the market to leave is the
 same as for those coming from a long promotion chain; the number of market people is weighed
 against the total number of employees
 aux Rate_79 = (S_hired_from_the_outside DIVZ1 seniors)*senior_quit_rate
 aux rookie_quit_rate = IF(
 (rookies*normal_rookie_quit_fraction*effect_of_difference_in_JS_on_quit_rate)<=rookies,(rookies
 *normal_rookie_quit_fraction*effect_of_difference_in_JS_on_quit_rate),(rookies*normal_rookie_q
 uit_fraction))
 aux S_Q_from_recruitment =
 senior_hired_from_the_market*(IF(relative_perceived_salary_ratio> 1,
 average_S_Q_from_hiring*1.25, average_S_Q_from_hiring))
 doc S_Q_from_recruitment = THE QUALITY IF PEOPLE ATTRACTED IS INCREASED IF
 THE SALARIES ARE HIGHER

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aux  senior_hired_from_the_market =
senior_target_hring_from_market/time_to_hire_and_integrate_newcomers
aux  senior_quit_rate = IF
((seniors*normal_senior_attrition_factor*effect_of_difference_in_JS_on_quit_rate)<=seniors,(senior
s*normal_senior_attrition_factor*effect_of_difference_in_JS_on_quit_rate),
(seniors*normal_senior_attrition_factor))
aux  transferring_quality_to_midlevel = promoting_to_mid_level*average_quality_rookies
aux  transferring_quality_to_senior = promoting_to_senior*average_quality_midlevel
aux  vacancy_creation_rate = (desired_vacancies-vacancies)/vacancy_adj_time
aux  actual_labour = mid_level+rookies+seniors
aux  actual_M_internal_training_days = M_days_in_internal_training*mid_level
aux  actual_positionS_for_the_midelevel = (theoretical_positions_available_for_midlevel*((1-
fraction_of_target_hiring_from_the_market)/IDEAL_fraction_of_promoting)*fraction_of_promotio
ns_communicated)/theoretical_positions_available_for_midlevel
aux  actual_positions_for_the_rookies = (theoretical_positions_available_for_rookie*((1-
fraction_of_target_hiring_from_the_market)/IDEAL_fraction_of_promoting)*fraction_of_promotio
ns_communicated)/theoretical_positions_available_for_rookie
aux  Actual_productivity =
MAX((MIN((reference_productivity*effect_of_HR_quality_on_productivity*effect_of_JS_on_pro
ductivity*effect_of_hours_worked_on_productivity),maximum_productivity)),minimum_productivity
)
aux  actual_R_internal_training_days = rookies*R_days_in_internal_training
aux  actual_S_internal_training_days = seniors*S_days_in_internal_training
aux  adding_M_Q_by_training =
midlevel_time_in_training*formal_training_efficiency*mid_level
aux  adding_R_Q_by_training = rookie_time_in_training*formal_training_efficiency*rookies
aux  adding_S_Q_by_training = senior_time_in_training*formal_training_efficiency*seniors
aux  adjustment_for_labour = (desired_labour-reported_labour)/average_time_to_adjust_labour
aux  average_communicated_career_opp =
AVG(actual_positionS_for_the_midelevel,actual_positions_for_the_rookies)
aux  average_HR_quality = AVG(average_quality_midlevel,
average_quality_rookies,average_quality_seniors)
aux  average_ML_payroll_per_training_day =
(ML_monthly_salary/training_days_in_a_month)*mid_level
aux  average_quality_midlevel = MIN((midlevel_quality/mid_level),maximum_quality)
aux  average_quality_rookies = MIN((rookie_quality/rookies),maximum_quality)
aux  average_quality_seniors = MIN((senior_quality/seniors),maximum_quality)
aux  average_R_payroll_per_training_day =
(reference_R_inside_salary/training_days_in_a_month)*rookies
aux  average_S_payroll_per_day = (S_monthly_salary/training_days_in_a_month)*seniors
aux  Calculated_cost =
recruitment_costs+taxes+(total_PERCEIVED_salary_cost)+cost_of_communicating_the_CO+Total
_REAL_training_cost+other_costs+cost_of_PM+production_cost
aux  Calculated_revenues = indicated_sales*price_per_unit
aux  cost_of_communicating_the_CO =
fraction_of_promotions_communicated*average_cost_of_communicating_CO
aux  cost_of_HRD_training =
(mid_level_involved_in_HRD+seniors_involved_in_HRD)*reference_cost_of_training_for_HRD_a
ctivities*normalized_willingness_to_invest

```

aux cost_of_PM =
average_cost_of_communicating_PM*(effort_to_communicate_goals+communication_of_salary_multiple)
aux delayed_total_effort_in_HRD = DELAYINF(total_EFFORT_staff_involved_in_HRD, 3,3)
doc delayed_total_effort_in_HRD = It takes a while for the employees to see the effort the company has put into them and feel the difference.
aux desired_labour = desired_Production/reported_productivity
aux desired_vacancies =
MAX(0,((adjustment_for_labour+expected_attrition_rate)*time_to_hire_and_integrate_newcomers*willingness_to_hire))
aux effect_of_career_opportunity_on_JS = GRAPH(perceived_career_opportunity DIVZ1 INITIAL_career_opp,0,0.25,[0.37,0.37,0.54,0.68,1,1.35,1.44,1.44"Min:0;Max:4;Zoom"])
aux effect_of_days_of_training_on_hours_worked =
GRAPH(normalized_global_days_of_training,0,0.2,[1,1,1,1,1,1,1.3,1.36"Min:0;Max:1.4"])
aux effect_of_difference_in_JS_on_quit_rate =
GRAPH(perceived_difference_between_reference_and_actual_JS/reference_diff_in_JS,0,0.25,[0.53,0.58,0.6,0.68,0.99,1.54,3.44,4.52,4.85,4.958"Min:0;Max:5"])
aux effect_of_distributive_justice_on_JS =
GRAPH(normalized_diff_in_DJ,0,0.25,[1.31,1.3,1.28,1.19,1,0.61,0.47,0.44"Min:0;Max:2;Zoom"])
aux effect_of_employmt_opp_on_JS = GRAPH((PERCEPTION_OF_TURNOVER_RATE DIVZ1 initial_perception_of_Turnover),0,0.25,[1.25,1.25,1.25,1.2,1,0.81,0.74,0.74"Min:0;Max:2;Zoom"])
doc effect_of_employmt_opp_on_JS = If employees leave, it is an indicator that there are opportunities on the market, because nobody is layed off and finds himself unemployed. In the equilibrium mode, the companies ignore what is going on the market, since their initial perception has nothig to do wth the market value of turnover.
aux effect_of_hours_worked_on_productivity =
GRAPH(normalized_hours_worked,0.5,0.1,[0.84,0.85,0.87,0.88,0.93,1,1.09,1.18,1.18,1.18,1.18"Min:0.5;Max:1.5;Zoom"])
doc effect_of_hours_worked_on_productivity = The longer you work, your energy level drops and you are less effective
aux effect_of_HR_quality_on_productivity =
GRAPH(NORMALIZED_HR_quality,0,0.2,[0.66,0.66,0.68,0.75,0.84,1,1.28,1.39"Min:0;Max:1.5;Zoom"])
aux effect_of_HR_quality_on_sales =
GRAPH(NORMALIZED_HR_quality,0,0.2,[0.82,0.82,0.85,0.86,0.92,0.99,1.22,1.25"Min:0;Max:1.4"])
aux effect_of_HRD_effort_on_JS =
GRAPH(delayed_total_effort_in_HRD/reference_HRD_effort,0,0.2,[0.68,0.73,0.82,0.86,0.92,1,1.27,1.37,1.37,1.37,1.4"Min:0;Max:2"])
doc effect_of_HRD_effort_on_JS = it is hypothesized that if people feel that they have been invested in, they will feel more satisfied in their job. According to literature (Price & Mueller, 1986), job mix and routinization are factors that influence the JS. These two factors are improved by investing in the development of employees, not from classical training but from coaching and job rotation and efforts.
aux effect_of_HRD_effort_on_PM =
GRAPH(delayed_total_effort_in_HRD/reference_HRD_effort,0,0.2,[0.61,0.61,0.61,0.61,0.73,1,1.35,1.4"Min:0;Max:1.5;Zoom"])

aux effect_of_job_satisfaction_difference_on_sales =
 GRAPH(normalized_JS,0,0.25,[1.42,1.42,1.42,1.31,1,0.79,0.65,0.6,0.54,0.53,0.51"Min:0;Max:1.5;Zoom"])

aux effect_of_JS_on_productivity =
 GRAPH(normalized_JS,0,0.2,[1.22,1.22,1.2,1.16,1.09,1,0.89,0.81,0.76,0.76"Min:0;Max:1.5"])

doc effect_of_JS_on_productivity = Job dissatisfaction yields stronger results on productivity than satisfaction, since the dissatisfied people may display withdrawal behaviours

aux effect_of_perceived_salary_ratio_on_DJ =
 GRAPH(relative_perceived_salary_ratio/reference_salary_ratio,0,0.25,[0.77,0.77,0.77,0.84,1,1.41,1.49,1.49"Min:0;Max:1.5"])

aux effect_of_PM_indicator_on_DJ =
 GRAPH(normalized_PM_indicator,0,0.25,[0.72,0.72,0.77,0.82,1,1.1,1.2,1.27,1.31,1.31"Min:0.2;Max:1.5;Zoom"])

doc effect_of_PM_indicator_on_DJ = the effectiveness of communicating the goals:
 COMMUNICATING WHAT IS EXPECTED OF THEM MAKES PEOPLE PERFORM BETTER

aux effect_of_prod_shortfall_on_hours_worked = GRAPH(Production_shortfall DIVZ1
 reference_prod_shortfall,0,0.25,[1,1,1,1,1,1.11,1.27,1.33,1.33,1.33"Min:0;Max:2;Zoom"])

aux effect_of_quality_on_promotion_of_mid_level =
 GRAPH(average_quality_midlevel/reference_quality_for_promoting_midlevel,0,0.25,[0.62,0.62,0.62,0.71,1,1.16,1.21,1.21"Min:0;Max:1.5"])

aux effect_of_quality_on_promotion_of_rookies =
 GRAPH(average_quality_rookies/reference_quality_for_promoting_rookies,0,0.25,[0.66,0.66,0.67,0.7,1,1.11,1.21,1.21"Min:0;Max:1.5"])

aux effect_of_total_effort_in_HRD_on_learning =
 GRAPH(delayed_total_effort_in_HRD/reference_HRD_effort,0.6,0.2,[0.87,0.87,1,1.46,1.79,1.93,1.98,2"Min:0.6;Max:2"])

aux effect_of_work_vs_pay_on_DJ =
 GRAPH(normalized_WP_indicator,0,0.25,[2.11,2.11,1.96,1.61,1,0.87,0.76,0.76"Min:0;Max:3"])

aux expected_attrition_rate = DELAYINF(agggregated_quit_rate, 2,3)

aux external_cost_ML =
 ((outsourcing_cost+other_development_costs)*(outsourced_M_training_days*(mid_level/12)))

doc external_cost_ML = The mid-levels are divided by 12, because the training takes place in groups of 12 people usually, so the cost o the training day is not per person, but per group of 12

aux external_cost_R =
 ((outsourcing_cost+other_development_costs)*outsourced_R_training_days*(rookies/12))

doc external_cost_R = The rookies are divided by 12, because the training takes place in groups of 12 people usually, so the cost of the training day is not per rookie, but per group of rookies

aux external_cost_S =
 ((outsourcing_cost+other_development_costs)*(S_outsourced_training_days*(seniors/12)))

doc external_cost_S = The seniors are divided by 10, because the training takes place in groups of 10 people usually, so the cost o the training day is not per person, but per group of 10

aux hidden_cost_ML = average_ML_payroll_per_training_day*actual_M_internal_training_days

aux hidden_cost_R = actual_R_internal_training_days*average_R_payroll_per_training_day

aux hidden_cost_S = actual_S_internal_training_days*average_S_payroll_per_day

aux indicated_DJ =
 MIN((INITIAL_distributive_justice*effect_of_PM_indicator_on_DJ*effect_of_work_vs_pay_on_DJ*effect_of_perceived_salary_ratio_on_DJ), maximum_DJ)

aux indicated_hours_worked =
 MIN(limit_on_hours_worked_per_week,(hours_worked_per_week*effect_of_prod_shortfall_on_hours_worked*effect_of_days_of_training_on_hours_worked))

```

aux  INDICATED_JS =
MIN((INITIAL_job_satisfaction*effect_of_HRD_effort_on_JS*effect_of_employmt_opp_on_JS*ef
fect_of_distributive_justice_on_JS*effect_of_career_opportunity_on_JS),maximum_JS)
aux  indicated_M_quality =
adding_M_Q_by_training*effect_of_total_effort_in_HRD_on_learning
aux  indicated_R_quality =
adding_R_Q_by_training*effect_of_total_effort_in_HRD_on_learning
aux  indicated_S_quality =
adding_S_Q_by_trainiing*effect_of_total_effort_in_HRD_on_learning
aux  indicated_sales =
sales*effect_of_HR_quality_on_sales*effect_of_job_satisfaction_difference_on_sales
aux  internal_cost_ML =
((mid_level/12)*M_days_in_internal_training)*(direct_costs_of_internal_learning_events+internal_t
raining_expenses)
doc  internal_cost_ML = The mid-levels are divided by 12, because the training takes place in
groups of 12 people usually, so the cost o the training day is not per person, but per group of 12
aux  internal_cost_R =
(R_days_in_internal_training*(rookies/12))*(direct_costs_of_internal_learning_events+internal_train
ing_expenses)
doc  internal_cost_R = The rookies are divided by 12, because the training takes place in groups of
12 people usually, so the cost o the training day is not per rookie, but per group of rookies
aux  internal_cost_S =
((seniors/10)*S_days_in_internal_training)*(direct_costs_of_internal_learning_events+internal_train
ing_expenses)
doc  internal_cost_S = The seniors are divided by 10, because the training takes place in groups of
10 people usually, so the cost o the training day is not per person, but per group of 10
aux  M_days_in_internal_training =
normalized_willingness_to_invest*reference_M_days_in_internal_training
aux  Memory_of_CO =
IF(average_communicated_career_opp>=perceived_career_opportunity,Time_to_increase_,Time_to
_decrease_)
aux  mid_level_involved_in_HRD = mid_level*
MIN(fraction_of_midlevel_dedicated_to_HRD,maximum_fraction_of_midlevel_in_HRD)
aux  mid_level_target_hiring_from_market =
mid_level_target_hiring_rate*fraction_of_target_hiring_from_the_market
aux  mid_level_target_hiring_rate = (vacancies*desired_midlevel_fraction)*willingness_to_hire
aux  midlevel_promotion_target_from_staffing_needs = (1-
fraction_of_target_hiring_from_the_market)*mid_level_target_hiring_rate
aux  midlevel_time_in_training = M_days_in_internal_training+outsourced_M_training_days
aux  normalized_diff_in_DJ =
perceived_difference_between_reference_and_actual_DJ/initial_diff_in_DJ
aux  normalized_global_days_of_training = AVG(normalized_M_days_in_training,
normalized_R_days_in_training, normalized_S_days_in_training)
aux  normalized_hours_worked = hours_worked_per_week/reference_hours_worked
aux  NORMALIZED_HR_quality = average_HR_quality/reference_average_quality
aux  normalized_JS =
perceived_difference_between_reference_and_actual_JS/reference_diff_in_JS
aux  normalized_M_days_in_training =
M_days_in_internal_training/reference_M_days_in_internal_training
aux  normalized_PM_indicator = PM_indicator/initial_PM_indicator

```

```

aux   normalized_R_days_in_training =
R_days_in_internal_training/reference_R_days_in_internal_training
aux   normalized_S_days_in_training =
S_days_in_internal_training/reference_senior_days_in_internal_training
aux   normalized_willingness_to_invest = Willingness_to_invest_in_training DIVZ0
reference_willingness_to_invest_in_training
aux   normalized_WP_indicator = work_vs_pay_indicator/reference_work_vs_pay_indicator
aux   outsourced_M_training_days =
normalized_willingness_to_invest*reference_outsourced_M_training_days
aux   outsourced_R_training_days =
normalized_willingness_to_invest*reference_outsourced_R_training_days
aux   perceived_difference_between_reference_and_actual_DJ = maximum_DJ-
perceived_distributive_justice
aux   perceived_difference_between_reference_and_actual_JS = maximum_JS-job_satisfaction
aux   perception_of_salary_multiple = salary_multiple*communication_of_salary_multiple
doc   perception_of_salary_multiple = what the company has communicated as profit related to the
effort put in by the employees;
aux   PERCEPTION_OF_TURNOVER_RATE = DELAYINF(TURNOVER_RATE, 2,2)
aux   PM_indicator = ((desired_Production*effort_to_communicate_goals)DIVZ1
desired_Production)*effect_of_HRD_effort_on_PM
doc   PM_indicator = People should know what is expected from them. Every employee should be
able to say this phrase"I know what is expected from me and I receive constant feedback about my
work." This indicator includes
1.production goals, because
individual goals should be set in accordance with the bigger company goals, so the employee feels
that his work is important for the company
2. effort put in by the other employees to give feedback about performance (a skill that is trained)
aux   PRODUCTION = MAX(0,(LABOUR*PRODUCTIVITY))
aux   production_cost = PRODUCTION*cost_of_production_per_unit
aux   Production_shortfall = MAX (0,(desired_Production-PRODUCTION))
aux   Productivity_gap = Actual_productivity-PRODUCTIVITY
aux   profit_per_employee = PROFITS/LABOUR
aux   PROFITS = (PERCEIVED_Revenues-Cost)-CAPITAL_COST
doc   PROFITS = PROFITS MINUS CAPITAL COSTS ARE TAXATED!!!
aux   R_days_in_internal_training =
normalized_willingness_to_invest*reference_R_days_in_internal_training
aux   ratio_of_hours_worked = DELAYINF(hours_worked_per_week, 3, 3) DIVZ0
reference_hours_worked
doc   ratio_of_hours_worked = The overall impression of the hours worked in the past 3 months
aux   recruitment_costs =
hiring_rookies*average_cost_to_recruit_a_rookie+mid_level_hired_from_the_market*average_cost
_of_midlevel_hired+senior_hired_from_the_market*average_cost_of_senior_hired
aux   reference_prod_shortfall = desired_Production/20
aux   relative_perceived_salary_ratio =
AVG((reference_R_inside_salary/reference_R_market_salary),(reference_S_inside_salary/reference
__S_outside_salary),(reference_M_insider_salary/reference_M_outside_salary))
aux   relative_profit_per_employee = profit_per_employee/target_profit_per_employee
aux   reported_labour = DELAYINF(LABOUR,2,3)
aux   reported_productivity = DELAYINF(PRODUCTIVITY, 2,3)
aux   rookie_target_hiring_rate = (vacancies*desired_rookie_fraction)*willingness_to_hire
aux   rookie_time_in_training = outsourced_R_training_days+R_days_in_internal_training

```

```

aux  S_days_in_internal_training =
normalized_willingness_to_invest*reference_senior_days_in_internal_training
aux  S_outsourced_training_days =
normalized_willingness_to_invest*reference_outsourced_S_training_days
aux  SALARY_COST_OF_PEOPLE_FROM_INSIDE =
(seniors*reference_S_inside_salary+mid_level*reference_M_insider_salary+rookies*reference_R_i
inside_salary)*salary_multiple
aux  SALARY_COST_OF_PEOPLE_FROM_OUTSIDE =
(M_hired_from_outside*reference_M_outside_salary+reference__S_outside_salary*S_hired_from_t
he_outside)*salary_multiple
aux  salary_multiple =
GRAPH(relative_profit_per_employee,0,1,[1,1,1.16,1.22,1.22"Min:0;Max:1.5;Zoom"])
doc  salary_multiple = It shows that if the company has profit, the salaries will increase. If the
profit is low, the salaries remain the same.
aux  sales = PRODUCTION
doc  sales = In this simple model we assume that everything we produce is sold, thus ignoring the
competition and the demand from the market; we have, however a limit to growth:)
aux  senior_promotion_target_from_staffing_needs = (1-
fraction_of_target_hiring_from_the_market)*senior_target_hiring_rate
aux  senior_target_hiring_rate = vacancies*desired_senior_fraction*willingness_to_hire
aux  senior_target_hring_from_market =
senior_target_hiring_rate*fraction_of_target_hiring_from_the_market
aux  senior_time_in_training = S_days_in_internal_training+S_outsourced_training_days
aux  seniors_involved_in_HRD =
seniors*MIN(fraction_of_seniors_dedicated_to_HRD,maximum_fraction_of_seniors_in_HRD)
aux  taxes = PROFITS*tax_percentage
doc  taxes = The tax in Romania is 16%
aux  theoretical_positions_available_for_midlevel = senior_quit_rate
doc  theoretical_positions_available_for_midlevel = The employees do not typically know the
positions available from the growth of the firm, but they know when people leave.
aux  theoretical_positions_available_for_rookie = midlevel_quit_rate
doc  theoretical_positions_available_for_rookie = The employees do not typically know the
positions available from the growth of the firm, but they know when people leave.
aux  Total_cost_ML = external_cost_ML+internal_cost_ML
aux  Total_cost_R = external_cost_R+internal_cost_R
aux  total_EFFORT_staff_involved_in_HRD =
(mid_level_involved_in_HRD+seniors_involved_in_HRD)/(mid_level+seniors)
aux  Total_hidden_cost_ML = hidden_cost_ML
aux  Total_hidden_cost_R = hidden_cost_R
aux  Total_hidden_cost_S = hidden_cost_S
aux  Total_measured_cost_S = external_cost_S+internal_cost_S
aux  total_PERCEIVED_salary_cost =
PERCEIVED_SALARY_COST_OUTSIDE+PERCEIVED_SALARY_COST_INSIDE
aux  Total_training_cost = Total_hidden_training_cost+Total_REAL_training_cost
aux  TURNOVER_RATE = aggregated_quit_rate/LABOUR
aux  willingness_to_hire = IF (desired_Production>0, 1,0)
aux  Willingness_to_invest_in_training =
(PERCEPTION_OF_TURNOVER_RATE/reference_market_turnover_rate)^sensitivity_to_turnover
doc  Willingness_to_invest_in_training = It should function of training budget- they want to spend
it all every 12 months!

```

aux work_vs_pay_indicator = ratio_of_hours_worked DIVZ0 perception_of_salary_multiple
doc work_vs_pay_indicator = This variable is a mental calculus people do: what I have worked extra versus what the company has payed me extra. If the company pays according to the effort put in, then the indicator is good, otherwise not.

const average_cost_of_communicating_CO = 200
doc average_cost_of_communicating_CO = The typical way of communicating is a monthly newsletter or any other monthly event the compnay might organize. It doesn't matter what fraction of promotion you communicate, the cost is the same if you put 4 names or 100 in the same event.

const average_cost_of_communicating_PM = 400
const average_cost_of_midlevel_hired = 1500
const average_cost_of_senior_hired = 3000
const average_cost_to_recruit_a_rookie = 500
const average_M_Q_from_hiring = 7.0177
doc average_M_Q_from_hiring = 7.0177
const average_R_Q_from_hiring = 6
doc average_R_Q_from_hiring = Quality goes from 1 to 10
const average_S_Q_from_hiring = 8.00670
doc average_S_Q_from_hiring = 8.00670
const average_time_to_adjust_labour = 2
const CAPITAL_COST = 20000
const communication_of_salary_multiple = 1
doc communication_of_salary_multiple = it has value from 0.5 to 1, where 0 is no communication and 1 is accurate communication
const cost_of_production_per_unit = 300
const desired_midlevel_fraction = 0.39
const desired_Production = 18393.1
doc desired_Production = 18393.1 ref
const desired_rookie_fraction = .45
const desired_senior_fraction = .16
const direct_costs_of_internal_learning_events = 1500/30
doc direct_costs_of_internal_learning_events = The salary of the internal trainer(per month, but divided to fit a day's training)
const DJ_adj_time = 6
const effort_to_communicate_goals = .5
doc effort_to_communicate_goals = Goes from 0 to 1; 0 meaning that there is no effort at all, 1 that everything is done
const formal_training_efficiency = 2
const fraction_of_midlevel_dedicated_to_HRD = .05
const fraction_of_promotions_communicated = 0
doc fraction_of_promotions_communicated = The best way to build a constant perception of career opportunities is to communicate them as such. People will hear that their colleagues are promoted, but the information that the promotion is related to an overall program will not be there, so it is not very valuable.
const fraction_of_seniors_dedicated_to_HRD = .05
const fraction_of_target_hiring_from_the_market = 1
const IDEAL_fraction_of_promoting = .6
const INITIAL_CAPITAL = 14275000
doc INITIAL_CAPITAL = 27314963
const INITIAL_career_opp = 0
const initial_diff_in_DJ = 5

```

const INITIAL_distributive_justice = 5
const INITIAL_job_satisfaction = 3
doc INITIAL_job_satisfaction = It goes from 1 to 10
const initial_midlevel = 400
const initial_perception_of_Turnover = .36634
const initial_PM_indicator = 0.5
const initial_productivity = 20.437682508504800947872464501108
const initial_rookies = 200
const initial_seniors = 300
const initial_vacancies = 989.12
const internal_training_expenses = 20
doc internal_training_expenses = The cost of food and training materials delivered to participants
const limit_on_hours_worked_per_week = 48*4
doc limit_on_hours_worked_per_week = This is the limit defined by the Romanian legislation is
48 hrs per week; we multiply by 4 weeks/month
const maximum_DJ = 10
const maximum_fraction_of_midlevel_in_HRD = .3
const maximum_fraction_of_seniors_in_HRD = .2
const maximum_JS = 10
const maximum_productivity = 25
const maximum_quality = 10
const minimum_productivity = 10
const ML_monthly_salary = 1500
const normal_mid_level_quit_fraction = .065
const normal_midlevel_promotion_rate = 0.001166
const normal_rookie_promotion_rate = 0.03
const normal_rookie_quit_fraction = .15
const normal_senior_attrition_factor = .035
const other_costs = 20000
const other_development_costs = 200
doc other_development_costs = It reffers to other costs like cost of renting training classes, and
catering for external events
const outsourcing_cost = 4320
doc outsourcing_cost = the average payment is 1200 euros per day of training
const price_per_unit = 1500
doc price_per_unit = We assume a highly priced widget.
const reference__S_outside_salary = 3000
const reference_average_quality = 7
const reference_cost_of_training_for_HRD_activities = 50
const reference_diff_in_JS = 3
const reference_hours_worked = 42*4.1
doc reference_hours_worked = The normal working hours is 40 per week, but everyone stays on
average 2 hours more each week without complaining. Times 4 / month
const reference_HRD_effort = .05
const reference_M_days_in_internal_training = 0.25
doc reference_M_days_in_internal_training = aprox 3 days per year
const reference_M_insider_salary = 1500
const reference_M_outside_salary = 1500
const reference_market_turnover_rate = .025

```

doc reference_market_turnover_rate = This is an average of a normal turnover rate of 3% per year, which means 0.25 per month

const reference_outsourced_M_training_days = .30

doc reference_outsourced_M_training_days = 2 days per year per mid level employee, ref.16

const reference_outsourced_R_training_days = .16

doc reference_outsourced_R_training_days = The field study revealed 1 day of outsourced training per year per rookie (the value given here is per month). The reality of the Romanian market says that mid-level and seniors get most of the training in a company.ref .085

const reference_outsourced_S_training_days = .5

doc reference_outsourced_S_training_days = 3 days of training per year for senior level,ref.25

const reference_productivity = 26.892

const reference_quality_for_promoting_midlevel = 7

const reference_quality_for_promoting_rookies = 6

const reference_R_days_in_internal_training = 1

doc reference_R_days_in_internal_training = Rookies spend more time learning procedures and firm specific knowledge, an average of 1 day per month

const reference_R_inside_salary = 800

const reference_R_market_salary = 800

const reference_S_inside_salary = 3000

const reference_salary_ratio = 1

const reference_senior_days_in_internal_training = .085

doc reference_senior_days_in_internal_training = 1 day per year

const reference_willingness_to_invest_in_training = 0

const reference_work_vs_pay_indicator = 1

const S_monthly_salary = 3000

const sensitivity_to_turnover = .4

const target_profit_per_employee = 19264.18

const tax_percentage = .16

const time_to_accumulate = 1

const time_to_adapt_productivity = 1

const time_to_add_quality_by_training = 3

const time_to_adjust_hours_per_week = 1/8

doc time_to_adjust_hours_per_week = The adjustment to hours worked is done very fast, as the request for more production is felt; this is the fast reaction lane!

const time_to_calculate_salary = 1

const Time_to_decrease_ = 7

doc Time_to_decrease_ = Employees will not remember the promotions for long; the process of communicating them needs to be ongoing

const time_to_hire_and_integrate_newcomers = 3

const Time_to_increase_ = 3

doc Time_to_increase_ = People adapt to the promotions communicated in about 3 months

const time_to_perceive_a_change_in_JS = 12

const time_to_perceive_costs = 1

const time_to_perceive_revenues = 1

const time_to_promote_midlevel = 12

doc time_to_promote_midlevel = (12)

const time_to_promote_rookies = 18

doc time_to_promote_rookies = (18)

const training_days_in_a_month = 30

const vacancy_adj_time = 1