

A System Dynamics Approach to Evaluate Incentive-based Policies, Human Resource Motivation and Performance of Public Sector Organizations

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Abstract

This paper tries to analyze - through a System Dynamics approach - positive and negative effects caused by human resources' (de)motivation in terms of productivity and quality of performance in public sector organizations. Therefore, motivation is here meant as an inclination to fill a gap between a desired and an actual level of productivity; this can be achieved through a set of policies aimed to encourage, sustain and address human resource behaviour in a working setting. As a consequence of such policies, public sector organizations would increase their productivity and effectiveness, thereby improving the level of wealth to the community they work for. But how does work motivation influence public sector organizations productivity? Do workers, if motivated, become more productive both in quantitative and qualitative terms? How to relate workers' perception about motivation and their positive or negative reaction at work? Is it possible, and how, to use motivation in order to improve the organization's performance over time?

Answering the above questions is very difficult; however, the aim of this paper is to investigate and link – through a System Dynamics approach - those variables which affect both motivation and productivity. Particularly, the paper is virtually divided in four sections: in the first one a description of the observed problematic behaviour of public sector organizations' productivity is introduced by considering the resistance that specific motivational policies show over time. Those policies are basically related to the performance that public workers as a whole express during a given time interval.

The second section contains the work hypothesis which consists in a dynamic model able to replicate the problematic behaviour on the basis of the relations among those significant variables affecting both productivity and motivation of public workers. Then, the third one provides the runs of such model and the consequent explanation of how it replicates the observed behaviour.

Finally, in the last section a set of policies is introduced and commented in order to suggest possible solutions and future scenarios that could stem from the application of such policies.

As a result, findings show how important is supporting Public worker management by using a dynamic approach to better understand and steer those trade-offs emerging from the linkages between motivation, productivity and worker satisfaction.

Keywords: *Productivity, Motivation, Human Resources, Public Sector Organizations, Performance Management, System Dynamics.*

1. Introduction

In the last decade citizens and local communities have strongly been claiming for improvements in quality and effectiveness of Public sector organizations' action.

Public sector organizations are indeed seen as old bureaucratic machines, unsuitable to respond to community needs and expectations (Delfgaauw & Dur, 2004). This is also believed true by looking at the low level of community satisfaction due to the bad public services.

On the other hand, in order to sustain countries development and enlarge their consensus, politicians have begun to focus on how to improve public sector performance, especially in times of economic crisis and high taxation. The policy here consists in enhancing the productivity of organizations, but the specific ways for achieving such goal are often confused and strictly depend on the characteristics of the specific context. Given a certain workload, productivity actually represents the capacity of the organization to provide services in a certain time period to the community which it works for. Together with service quality and efficiency, productivity is a fundamental driver of organizational performance (Ammons, 1992). In other words, since organizations primarily include people, productivity corresponds to the aggregated result of skills, commitment and professionalism that those people individually dedicate to

their job activities. This means that public workers are the main actors which directly influence the productivity of organizations and, as a consequence, their performance towards community over time.

Several theories, mainly based on ‘private sector’ experiences, have highlighted the importance of workers’ motivation as the most powerful lever able to lead organizations towards higher level of performances (Cardona, Lawrence & Espejo, 2003; Gächter & Falk, 2000; Lazear, 2000; Konrad & Pfeffer, 1990; Salancik & Pfeffer, 1977; Campbell Balfour, 1953). In other words, the higher the public workers’ motivation is, the higher a public sector organization’s productivity will be.

The above relation between productivity and workers’ motivation allows one to introduce the problem observed in the largest part of public sector organizations, i.e.: a diminishing return from motivation policies. Particularly, as the following graph portrays, the working hypothesis here is that, when public managers design and carry out motivational policies, such policies are initially followed by a significant increment of productivity. However, often such a productivity increase proves to be unsustainable in a longer time horizon. This means that the behaviour of an organization may show resistances to motivational policies over time.

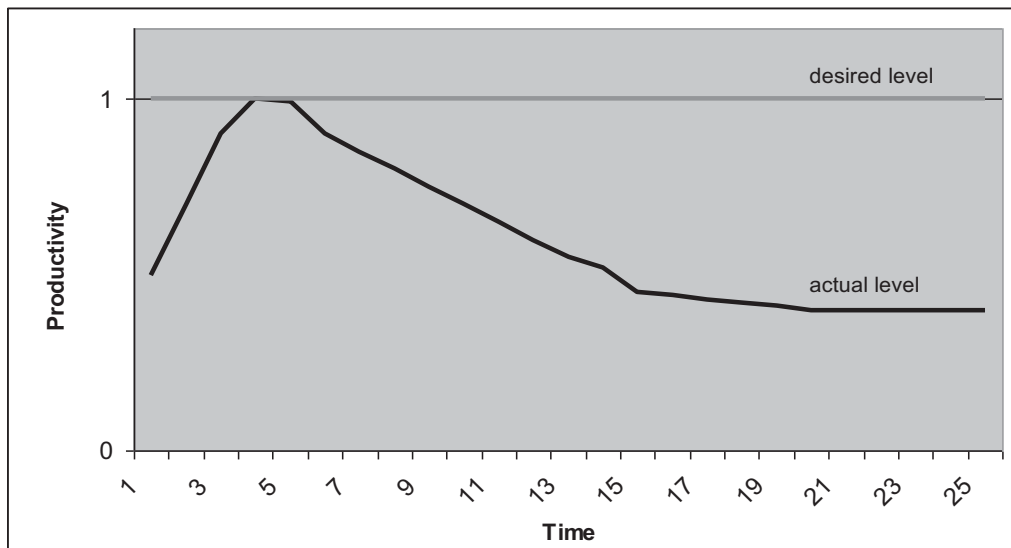


Figure 1 Problematic behaviour of public workers productivity

The above hypothesis does not result from specific surveys conducted by the authors. It, rather, arises from direct observations of real phenomena in various ‘public sector’ organizations, and on the current debate and wider stream of research on the topic of ‘incentives versus performance’ (Edwards, 1976; Konrad & Pfeffer, 1990; Kreps, 1997; Bauer, 2004).

Graphically, the desired level of performance is represented by the total workload which should be completed in a given time period. Under these assumptions, public managers promote actions to increase workers’ motivation to fill the gap between the actual and the desired productivity.

Motivational policies consist in a number of actions which are believed capable in contributing to enhance productivity and improving the organizational wealth in public sector organizations.

Possible motivational measures are related to:

- *Productivity-linked incentives.* If workers are conscious that their organization will reward them through monetary incentives whenever their performance achieves high levels, then they reasonably will increase their commitment at work. This requires clarity and precision in defining objectives, communication among workers and certainty of remunerations. In so doing, managers have to arrange an evaluating system capable in measuring both individual and aggregated performances of workers and in linking them to planned objectives. If so, workers will also enhance their trust, accountability and participation in the activities of their organization. In particular, a non-linear relation exists between the

reward and the motivation: basically, the higher the reward is, the higher the motivation will be, but in proximity of the extreme values (0 – 1) the curve slows down due to the realistic difficulty in achieving those values. The relation between such incentives and the motivation of workers is synthesized in the following graph (Dixit, 2002):

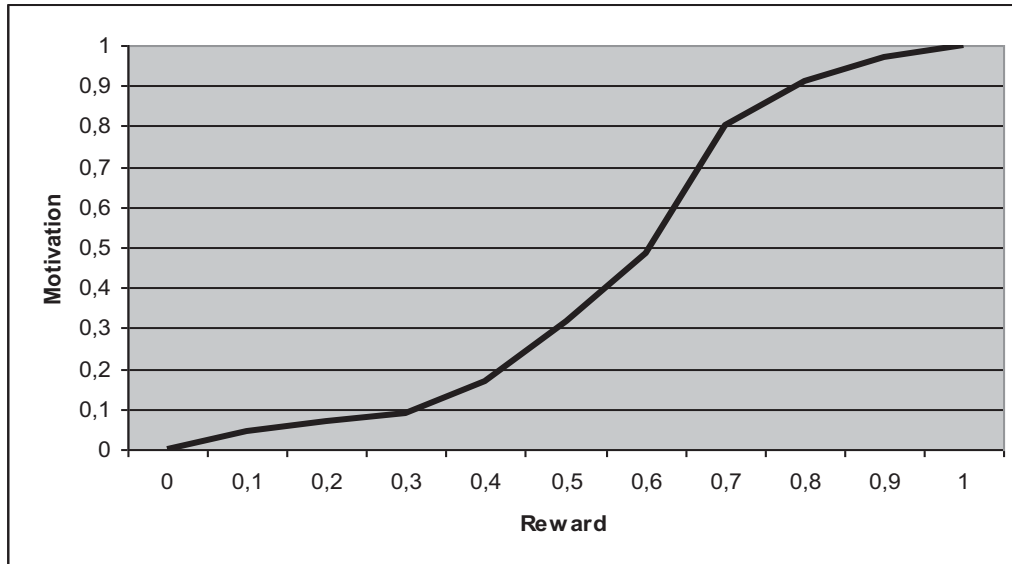


Figure 2 The effect of the reward on the motivation of public workers

- *Frequency of productivity-linked incentives.* A non-linear relation exists between the frequency in delivering rewards and the motivation of workers. Actually, if workers receive those incentives after a too long time, they will tend to increase their individual productivity only just in the period close to their performance evaluation; in the same logic, if workers are frequently rewarded, then this will be perceived as ordinary and not as something that the organization exclusively acknowledges to its deserving workers. In both cases, the motivational power of productivity-linked incentives is weakened. This implies the need of choosing the proper frequency of reward.

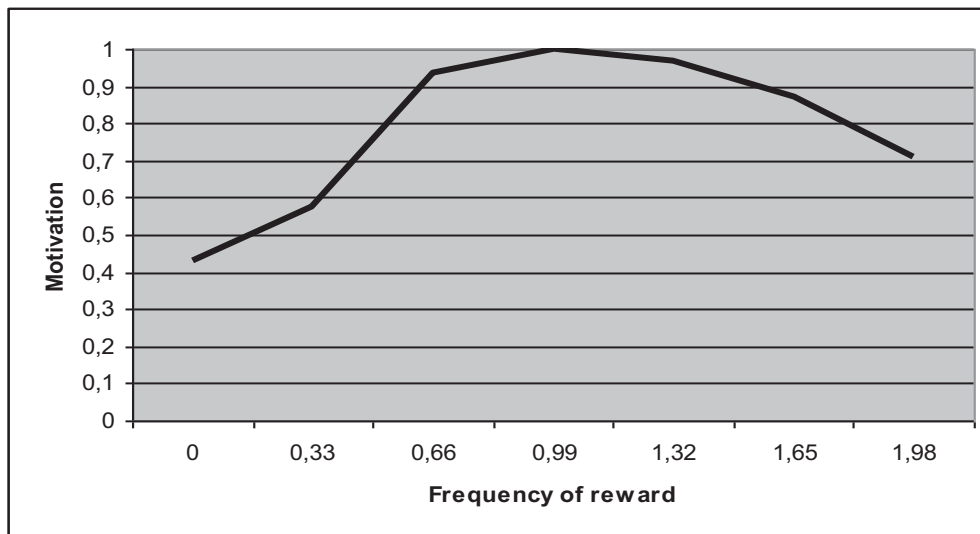


Figure 3 The effect of the frequency of the reward on the motivation of public workers

- *Career promotion effect.* The third motivational tool allows one to enhance workers' productivity by acting on their intrinsic job satisfaction. Promotions and career opportunities are the basis of a profitable competition among workers and, as a consequence, lead the performance of the organization at higher levels. In this way, workers strongly feel themselves as part of the organization and are indeed pushed to be more productive (Achi & Mott, 1982). Particularly, the relation between the effect of career promotions and workers' motivation is showed in the following graph. The esteemed data of the graph stem from literacy-based approximations which overall state that workers' advances in terms of position or/and salary increase their motivation and job satisfaction. (Tabacaru, 2008; Gibbons, Simpson, 2006; Gunn, Brenner & Mjosund, 1968).

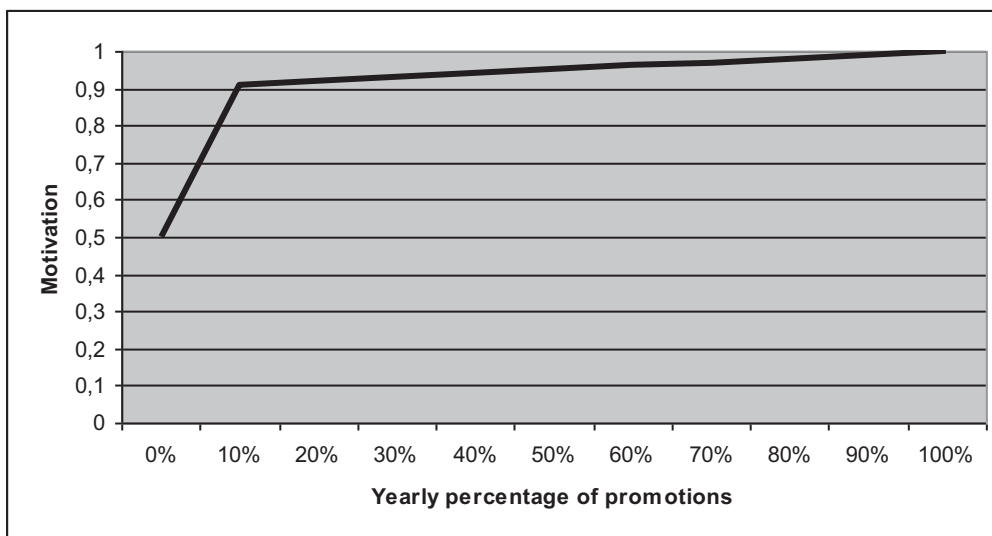


Figure 4 The effect of career promotions on the motivation of public workers

Particularly, such policies are suggested from 'private sector' experiences which have approved to be effective. But in the public sector motivational dynamics are more complex than in the private and this is due to a number of reasons (Ammons, 1992):

- *Absence of market pressure.* Public sector organizations are not called to be more competitive; they are used to operate as "unregulated monopolies" and tend to behave accordingly (Osborne & Plastrik, 2000; Harlow, 1977; Downs, 1977; Niskanen, 1971).

- *Political factors that influence decision making processes.* Politicians often use public sector organizations as a tool for both enlarging their consensus among citizens and repay those lobbies which had sustained their political nomination through new hires. This leads to gigantic personnel proportions of such organizations and, as a consequence, to difficulty in governing.

- *Bureaucratic socialization process.* The informal process by which veteran workers introduce new workers to the culture of a public sector organization can have a powerful influence on subsequent performance. So organizations that have lost their zeal for effectiveness may find great difficulty in attempting to break from that pattern.

- *Lack of accountability.* Public managers and employees accordingly prefer to avoid any kind of accountability for their actions or failures.

- *Focus on outputs rather than on outcomes.* Managers just focus on the result of their specific department rather than on the bigger picture of whether their efforts are achieving positive changes in the lives of citizens or producing other results they were designed to bring.

- *Short time horizon of politicians and top managers.* This is recognized as a negative effect of the so called "spoil system". In this case, it is hard to sustain relevant organizational changes because strategies and processes of implementation are fragmented, interrupted or cancelled. Thus, the ambiguity of

objectives together with bureaucratic rigidities – including above all an extreme focus on rules and procedures – lead workers to prefer a status quo condition instead of productivity-oriented changes.

- *Unsuitable incentives plans.* Monetary incentives are delivered without taking into account the effective productivity expressed by workers during a certain period. As a result, workers cannot perceive such incentives as something that motivate and push them to be more productive. Ammons noted that “governments at all levels not only fail in most cases to provide adequate rewards and recognition for superior performance, but they often reward managers who have expanded their budgets and increased the number of persons they supervise”. The above features are findable in the largest part of public sector organizations and represent a significant limit for the longevity of those positive productivity-linked effects that stem from workers motivation policies.

In the next section, using a System Dynamics approach, we will introduce and describe the model developed trying to understand the sources of motivational policies’ resistance through the analysis of the relations among variables.

2. Model structure

This section contains a detailed discussion of each components of the model and an explanation of how they could replicate the problematic behaviour of public workers productivity. The structure hypothesis is based on those variables and dynamics that are findable in the largest part of public sector organizations, that is, such a model is adaptable to different public sector bodies.

First of all, the model considers a generic workforce configuration which is based on the skills classification of workers (Kunc, 2008; Hafeez, Aburawi & Norcliffe, 2004; Hafeez & Abdelmeguid, 2003). Particularly, the structure distinguishes:

1. Rookies, as workers at their first job experience, that is, low skilled operators. Their productivity is lower than that of other workers and, in order to improve their skills, they need training and know how sharing with more skilled workers.

2. Medium skilled workers, which offer their developed competencies to the organization. They have achieved a medium level in their job career and are called to provide training to rookies. Their productivity is higher than that of rookies but lower than that of skilled workers. To be promoted to the next career level (Skilled workers), they have to wait new skilled workers’ retirements or policies that allow to hire and maintain more skilled workers.

3. Skilled workers, as ‘veteran’ workers which have developed relevant and wide competencies in the sector: this means that their productivity is the highest of the entire organization. As medium skilled workers, they are also called to provide training to rookies.

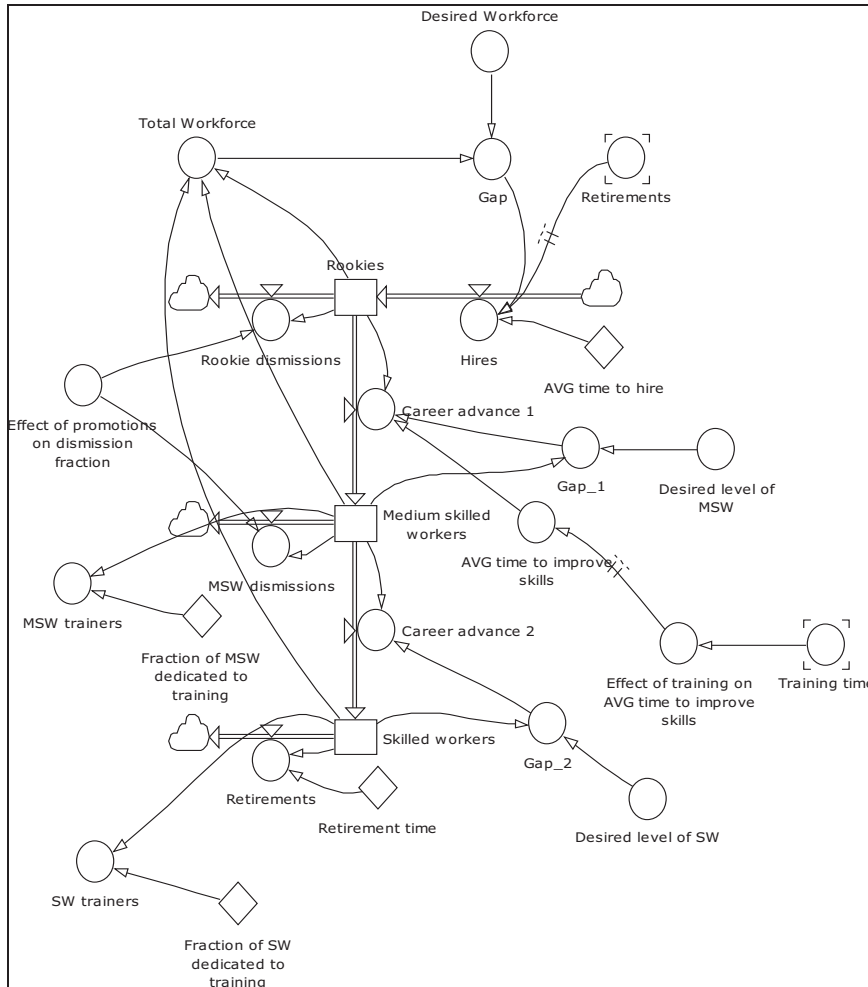


Figure 5 A general structure of workforce composition in public sector organizations

As it has been already mentioned, different levels of productivity correspond to each workforce's category. In this way, given the number of workable hours per week, it is possible to calculate the total productivity of the workforce. Such amount of hours also takes into account the number of weekly hours dedicated to training.

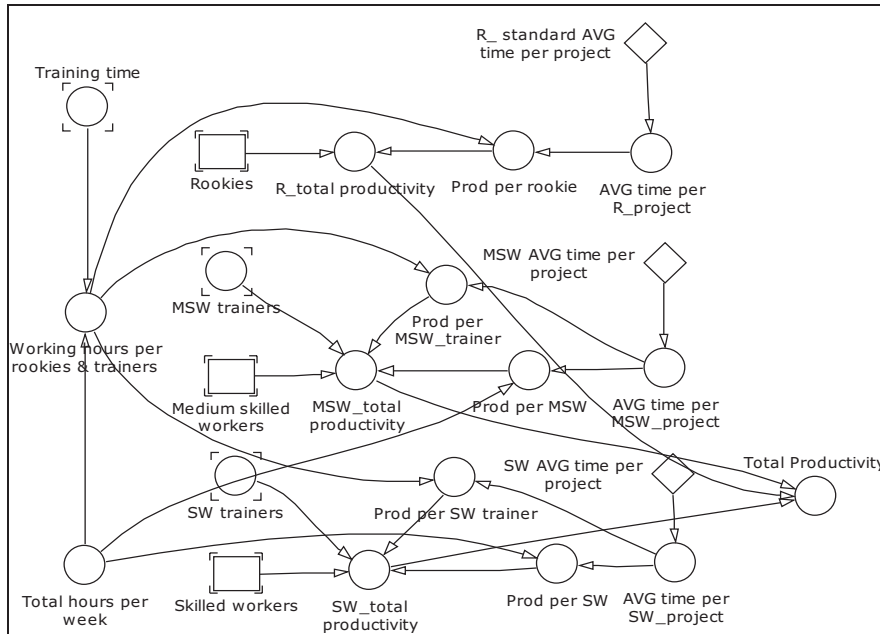


Figure 6 A general structure of workforce productivity in public sector organizations

On the one hand, training reduces the general productivity of the organization but, on the other, increases both the quality of the done work and the skills of workers whom, due to this, can be promoted more rapidly (Seibert, Kraimer & Liden, 2001).

Furthermore, the model considers the overtime that employees should work whenever the weekly workload exceeds the general productivity. Such a circumstance also involves the decrease of hours dedicated to training and its effects on other linked variables (Oliva & Sterman, 1999).

The lasting effect of overtime is one of the main causes of the burnout of the human resources, that is here meant as the experience of occupational tedium or physical, emotional, and mental exhaustion (Pines & Kafry, 1978). Most commonly, burnout is defined as a syndrome of emotional exhaustion, depersonalization, and a lack of a sense of personal accomplishment that occurs in response to chronic exposure to occupational stressors (Maslach & Jackson, 1982). As a result, burnout negatively affects the motivation of workers.

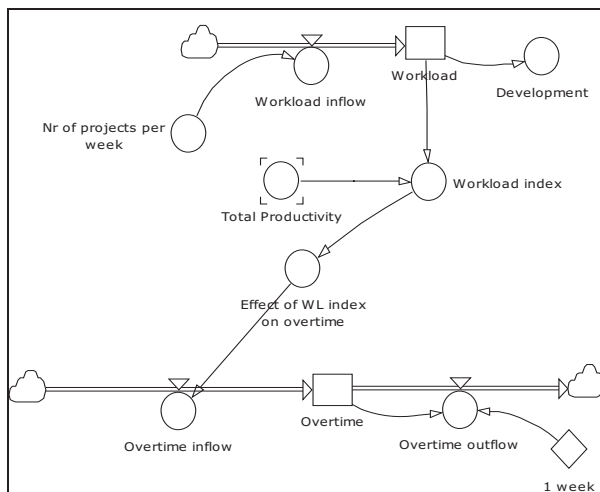


Figure 7 The overtime structure in public sector organizations

The model hypothesizes that the weekly workload inflow consists on a number of projects that workers should complete by the end of the week. In a secondary step, this workload also needs to be reviewed - and eventually improved - in order to guarantee a satisfying level of quality to end users (Rodrigues & Williams, 1998). Of course this process reduces workers' productivity but, on the other hand, quality can also be improved through the training activities.

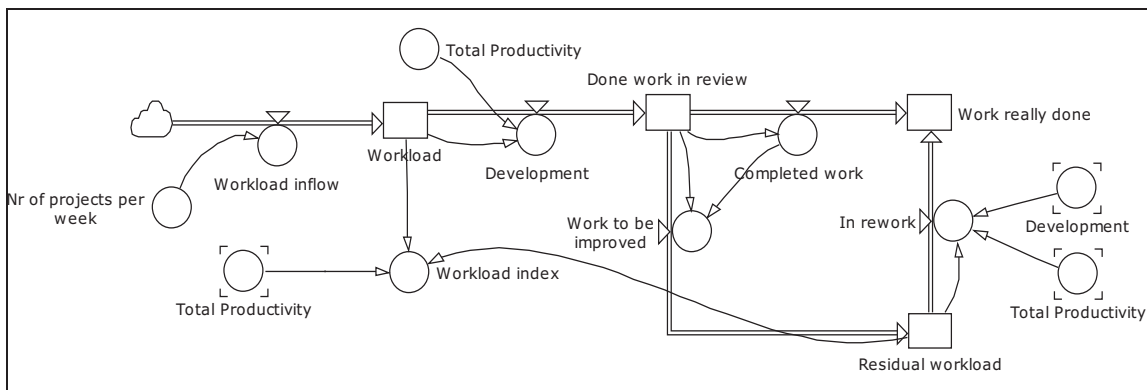


Figure 8 A general workload structure in public sector organizations

All the above structures are linked one to each other through the dynamics of motivation. Particularly, the reward that managers recognize to workers depends on a performance index which compares the weekly amount of completed workload to the weekly amount of total workload. In other words, higher values of such a performance index lead to higher rewards and this enlarges workers job satisfaction and; therefore, push them to increase their productivity. On the other hand, if the performance index achieves unsatisfying values, then workers do not receive rewards and their lack of motivation negatively influences their productivity at work over time.

In both cases, the dominance of a major reinforcing loop involves one of the two opposite situations:

1. a productive organization with motivated and rewarded workers;
2. an inefficient organization with de-motivated and unrewarded workers.

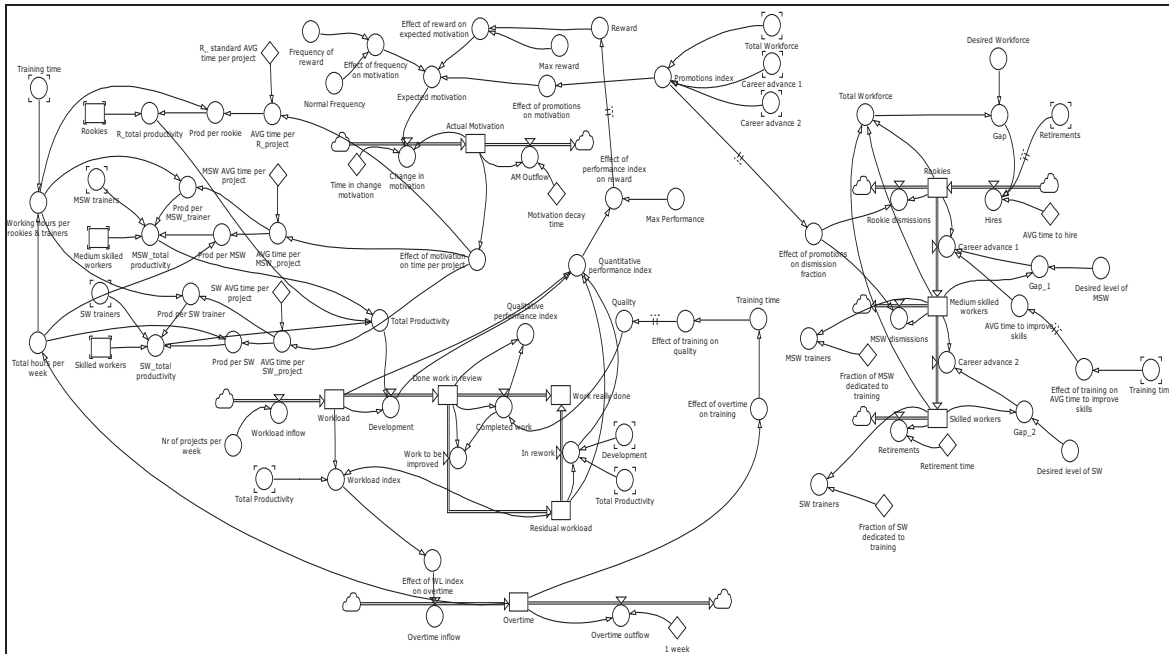


Figure 9 A model structure of workforce productivity and motivation in public sector organizations

Given the above model structure and its hypothesis, the next section shows its simulations in order to replicate the problematic behaviour of public workers productivity over time.

3. Base simulation

First of all, the model needs to be calibrated on the observed problematic behaviour. This means that the model must be in accordance with the known "physical laws" of the observed system and also provide usefulness and transmits confidence to end users (Forrester & Senge, 1980).

Usefulness depends on whether the model is addressing the problem areas where managers and decision makers need support, while confidence rests on the model's ability to produce results consistent with managers' mental models (Sterman, 2000). Particularly, the model is calibrated to reproduce the observed behaviour of the workers' productivity in public sector organizations. The simulation time horizon is 250 weeks.

The frequency of rewards' delivery is externally fixed and equal to one per year as suggested by common practices in both 'public' and 'private' organizations. On the other hand, it appears clear by looking at the model structure that the amount of rewards and the career advance effects endogenously depends on all the other included variables and on the loops they shape.

The total desired workforce is set at 100 workers and particularly: 30 skilled workers, 55 medium-skilled workers and 15 rookies. A skilled worker is able to complete a project in 3 hours, a medium-skilled worker in 6 hours and a rookie in 10 hours.

As a result, the base simulation - portrayed in Figure 10 - shows a strong overshoot and collapse pattern of productivity similar to the case observed.

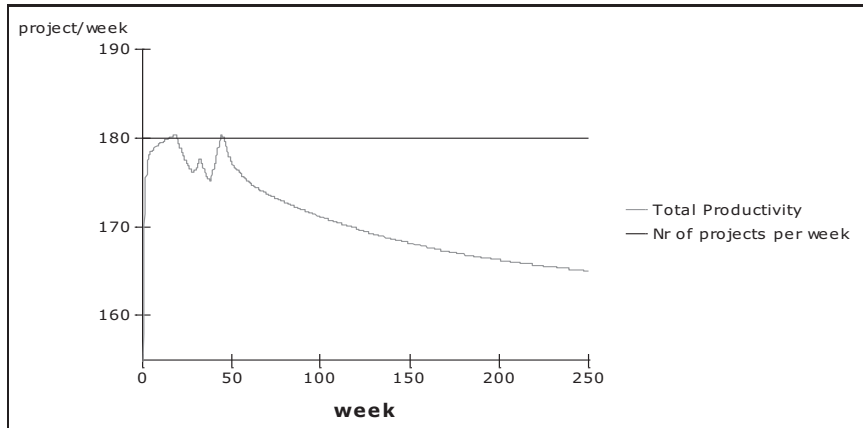


Figure 10 Base simulation of public workers' productivity

Given a constant workload inflow equal to 180 projects per week, at first productivity strongly increases due to the effect of workers' motivation that increases as well. Then, it starts to oscillate trying to fill the gap with the desired productivity, but at a certain point it collapses because of the unsustainable lack of motivation that workers are experiencing.

The low level of productivity is evaluated by managers through the performance index of the workforce - that represents the measure to deliver rewards to deserving workers -; in this case, the absence of rewards strongly contributes to de-motivate workers and increases the gap in productivity of public sector organizations. In other words, workers are not motivated and, due to this, their productivity goes down until it stabilizes at a not satisfying level, that is, a level below the desired one, corresponding to the total weekly workload.

In the largest part of the cases public managers have revealed difficulty in facing such vicious circle among 'productivity', 'workers' motivation' and 'productivity bonus'. Moreover, workers have to produce more effort by remaining for more than their regular working hours to complete their workload. This consequently hampers their training. Due to this, it is logically hard to develop skills and competencies, therefore, the overall career advance is slowed down and causes a lack of job satisfaction and motivation in the workforce: workers will be more motivated to leave their jobs in such organization. Figure 11 shows the behaviour of the actual motivation of workers.

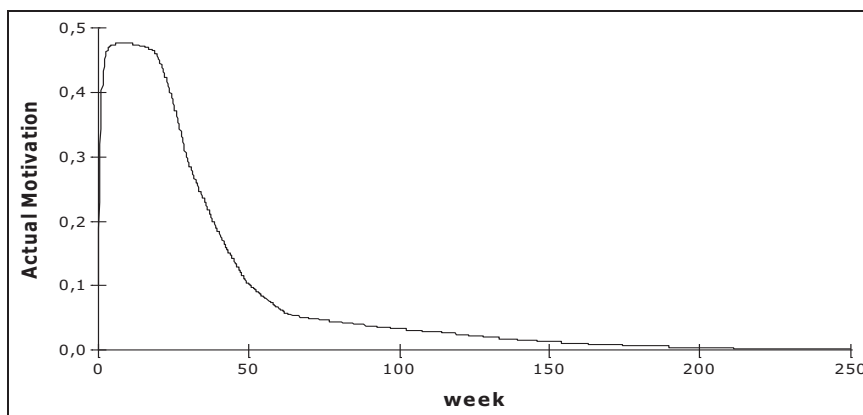


Figure 11 Base simulation of public workers' motivation

It should be noted that productivity trends are rough estimates of real public sector organizations and the simulated behaviour is numerically sensitive to parameters and shapes of table functions. Therefore, the simulated behaviour appears to adequately track the problematic behaviour of workers' productivity.

4. Policy analysis

In this phase, policies and strategies are postulated and tested. Particularly, we introduce two policies. When these policies or strategies are tested for robustness under varying external conditions, this is referred to as scenario modelling.

In the model we introduced, workers' productivity strictly depends on their motivation. This means that acting on motivation's drivers will allow managers to increase productivity of a given public sector organization. To this end, in the design of the first policy we focus on 'reward' as the main factor which can contribute to the goal's achievement. Differently from the model structure, in the definition of such policy the 'reward' does not represent a productivity bonus – linked to the workforce performance index – but just a tool to improve their performance whenever the actual level of productivity is lower than the desired one.

Under these assumptions, we now do not consider such motivational 'tool' as a reward for the past high performance of the workers, but - more correctly - just as an incentive to increase their productivity in the future (Tosi, Werner, Katz & Gomez-Mejia, 2000). What we do to test the policy is to fix a constant amount of incentives at a medium level, equal to 0,55 on a scale between 0 and 1.

Figure 12 shows the simulation's result of workers' productivity after the implementation of the described policy.

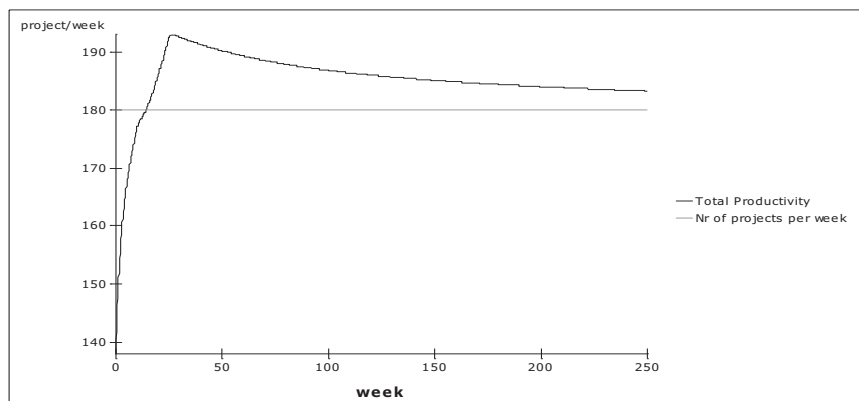


Figure 12 The effect of a constant incentive-based policy on workers' productivity

Particularly, the productivity rapidly increases even exceeding the desired level of productivity identified by the weekly workload. Then, it smoothly decreases by achieving the weekly workload level over time.

Figure 13 portrays the behaviour of the actual workers' motivation during the application of the incentive-based policy.

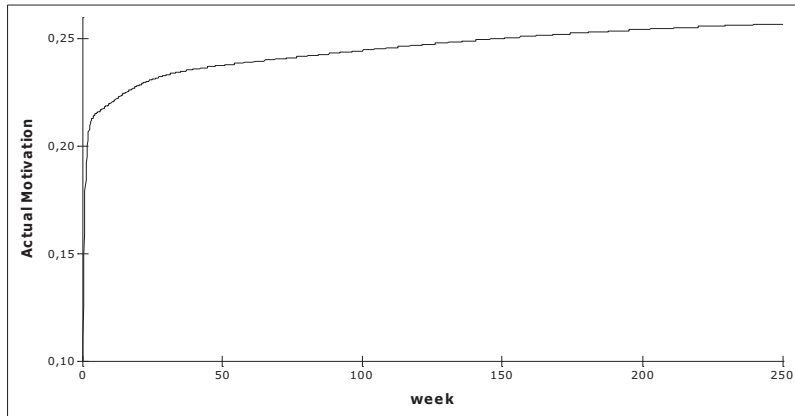


Figure 13 The effect of a constant incentive-based policy on workers' motivation

The above simulation shows different trends compared to the base run as seen in the last paragraph: in this case, motivation actually grows up searching for an equilibrium point.

Nevertheless, the value it tends to reach is relatively low – about 0,25. This because the policy visibly works on only one of the factors which directly affect workers' motivation: the incentive.

Such circumstance is also verifiable by looking at the data about the overtime that does not appear influenced by the policy's effects and, therefore, remains stable at its maximum level – equal to 15 hours per worker per week – preventing workers from profiting by training. So, this policy overall responds to the need of productivity's increase but, on the other hand, still contributes to enlarge the burnout of workers over time. Furthermore, the sum of the costs of workers' overtime and incentives represents an unsustainable expenditure for public sector organizations that are called to respect all the budget fulfillments.

Then, as a remedy, such policy should include other measures that can deeply face not only the shortage of productivity but also the low level of motivation that public workers express. According to this logic, a rationalization of the workforce settings could be helpful especially if related to the workload inflow (Waldman, 1984): productivity in fact changes depending on the skills of each workers' category.

Thus, if public managers decide to increase the desired number of skilled workers, then the productivity will raise without negative impact on workforce - in terms of overtime and consequent costs – and on the budget of the organization. This second policy appears more respondent to the needs of public sector organizations, but it is often very complex for managers to change workforce configuration due to the rigidity and the resistance to change that historically characterized public sector organizations (Meier, 1975).

Furthermore, the model represents just a simplification of a real system and, due to this, it needs to be integrated with other factors and variables that largely depend on the specific institutional settings and phenomena which characterize different contexts and regions.

At present we just remark that the main limitations of the above model are the following:

- The workload consists in a number of projects all at the same difficulty level and its weekly inflow is constant over time. This circumstance is not considerable correspondent to reality and, due to this, further versions of the model should consider different kinds of projects on the basis of their complexity and a changing inflow.

- The workforce configuration just includes 3 categories of workers: skilled, medium-skilled and rookies. This is believed an adequate simplification but human resource settings are usually more articulated.

- The model allows that only one worker can accomplish a given project. In other words, at now team working is not considered by the model as a possibility.

5. Conclusion

This paper has tried to highlight the linkages and the cause-and-effect relationships between workers' productivity and their motivation in public sector organizations. In so doing, many factors have been included between them to explicate and understand such relations.

The development of this project has been conducted through a System Dynamics approach that has permitted to build a model structure in which those variables influence one another on the basis of linear and non-linear relations among them. Particularly, the model's simulations have revealed the importance of those factors – incentives, rewards, career promotions, burnout – which affect firstly workers' motivation and consequently their productivity over time. The model hereby discussed also emphasizes how each of them could contribute in increasing both motivation and productivity, and so in improving public sector organizations' performance towards communities.

Nevertheless, we are conscious that at present the model basically represents a first version improvable through further studies and empirical applications to real public bodies (e.g., case study analysis). It actually shows some limitations that mainly stem from the simplification of complex systems, such as public sector organizations. In particular, some assumptions are somehow considered still too far from the reality. However, the model hereby illustrated can adequately represent a 'platform' to be considered for further studies and research on the interesting topic about public workers' productivity and their motivation.

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