

Michela Poli ¹
Davide Cornolti
Silvia Pardini
Giorgio Iervasi

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HOW AND WHY TO IMPLEMENT A PERFORMANCE MANAGEMENT SYSTEM IN PUBLIC RESEARCH INSTITUTIONS: THE APPROACH AND THE EXPERIENCE OF A LARGE MULTIDISCIPLINARY ITALIAN CENTRE

Abstract: *The implementation of a Performance Management System is complex in public research institutions: the sector peculiarity, the presence of multiple stakeholders with different needs, the difficult identification of the performance indicators, the lack of specific skills, the shortage of resources and the need of flexibility are the principal reasons for this complexity.*

The purpose of the present report is to describe an exportable model for the implementation of a Performance Management System, built on Quality Management tool, able to improve the institutional performance, through processes of organizational evolution, based on the involvement of employees. This model has been applied in an Italian Research Institute.

The contribution of employees, with their professional and soft skills, and the commitment of the management, in the self-assessment of the organisation, are the key factors for the model implementation. This approach can help to solve the critical issues of implementing a performance management system.

Keywords: *Performance management, Performance measurement, Quality management, ISO 9001, Scientific research*

1. Introduction

Over the past years greatly attention has been paid to the measurement and improvement of performance in the Public Administration (PA). Europe has started to talk about performance management at different times: UK was the first in the 80's years and performance management has become the matter of interest also for the public sector

(Galli & Turrini, 2014; Pollitt, 1993). Analogous initiatives have been implemented in Germany with the “Neues Steuerungsmodell” and in France with the “Loi Organique relative aux Lois de Finances” (Bouckaert & Halligan, 2008; Kuhlmann, 2010).

With the New Public Management (NPM) reform (Hood, 1991; Hood, 1995) efforts have been made to renew and make more

¹ Corresponding author: Michela Poli
Email: michelap@ifc.cnr.it

efficient the PA. The NPM removes differences between public and private sector and shifts the emphasis to accountability in terms of results (Hood, 1995). This reform has introduced the performance management as modern government practice (Pollitt & Bouckaert, 2017).

Italy has focused its attention to performance management later than the rest of Europe (Galli, 2014). The difficulty on applying performance management in PA, and particularly in research field, can be summarized in the following items: 1) the public sector peculiarity, 2) the large number and type of stakeholders, 3) the difficulty in defining objectives and targets, 4) the lack of specific skills (Agostino et al., 2012; Arena et al., 2009; Arnaboldi & Azzone, 2010; Boland & Fowler, 2000; Campatelli et al., 2011).

The Italian National Council Research (CNR) has introduced a performance evaluation system. Nevertheless, the results of the CNR's organizational well-being questionnaire 2014 have shown that the level of personnel involvement in "performance" themes is still very low: in fact, 76% of employees do not know the Performance Plan (Ruggiero & Coratella, 2015).

The application of performance management models in public research is, however, very important because in recent years the government funds for research have been drastically reduced and public institutions have been necessarily forced to outside search resources for their activity. (Agostino et al., 2012; Lanati, 2010).

In addition, the need for accountability to the stakeholder in spending the funding drawn (Agostino et al., 2012; Bouckaert, 1993) requires full transparency in management.

As stated above, the public research institutions must be more competitive and transparent by optimizing management and necessarily by introducing new organizational models (Arnaboldi & Azzone, 2010).

A winning organizational strategy for performance improvement could include the staff involvement: in fact, the contribution of employees in a specific environment such as research is a strategic key for performance improvement and particular attention should be paid to worker satisfaction. In fact, a motivated staff greatly contributes to improving organisational performance (Burton et al., 2004; Kim, 2002; Oakland, 2011; Zelnik et al., 2012). Furthermore, professional growth, job satisfaction and motivation give special impulse to creativity (Berson & Linton, 2005; Dewett, 2007; Isaksen & Lauer, 2002; Ryan & Hurley, 2007; Sapienza 2005; Sundgren, Dimena, Gustafsson & Selart, 2005).

The purpose of the present report is to describe an exportable model for the implementation of a Performance Management System (PMS), built on Quality Management (QM) tool, able to improve the institutional performance, through processes of organizational evolution, based on the involvement of employees. This model has been applied in a Research Institute of the scientific network of the Italian CNR.

2. Methodology/approach

Performance management can be defined as a method used from an organization to set goals and to check progress toward achieving a general improve in performance. In wide terms, an organization is performing well when it is successfully achieving its objectives and effectively implements an appropriate strategy (Otley, 1999).

The concept of performance management is strictly linked to the concept of "performance measurement" defined as processes to quantify the efficiency and effectiveness of an action (Lebas, 1995; Neely et al., 2005).

Many models have been developed and, broadly speaking, it seems to be important to consider the context in which the organization operates and the identification of some key issues that appear relevant for many different

organizations. It is also important to consider that every organization is different from each other and the measurement system has to be suitable for the organization's reality (Chenhall & Langfieldsmith, 1998; Otley, 1999; Smith & Goddard, 2002).

Usually, the performance measurement frameworks are grouped into models that have a predominantly hierarchical orientation as Balanced Scorecards (BS) (Ahn, 2001; Neely et al., 2000; Wongrassamee et al., 2003; Azzone et al., 1991; Brignall et al., 1991; Kaplan & Norton, 1996; Keegan et al., 1989; Chytas et al., 2011; Kaplan, 2010) and in models that have a predominantly horizontal orientation like QM tools, such as ISO 9001 standard, Six Sigma, Malcolm Baldrige, EFQM model (Brown, 1996; EFQM Model, 2013; Lynch and Cross, 1991; Otley, 2003; Martínez-Costa and Martínez-Lorente, 2008; Psomas, Pantouvakis and Kafetzopoulos, 2013; Tomažević et al., 2017; Valmohammadi & Roshanzamir, 2015; Yunis et al., 2013).

QM models are important tools to improve organization's performance. In general, all QM models are based on the theoretical approach summarized by the Deming cycle: Plan, Do, Check and Act (PDCA) (Deming, 1994; Deming and Edwards, 1982).

According to that the four-step cycle includes: plan (definition of the strategy with identification of clear objective), do (translate goals into actions), check (evaluating the results), and action (back to plan for continuous improvement).

In general both in the BS and QM tools are evident the following fundamental building blocks:

- Formulation of the organization strategy,
- Identification of an assessment technique;
- Development of a suitable management accounting practice.

The choice of the performance assessment technique is a crucial step: the literature

analyses the different models (Neely et al., 2000; Otley, 2003) and suggests some recommendations for the performance measurement frameworks (Folan and Browne, 2005). Overall the literature agrees that the model to be used is tailored for the organizational needs.

A model, inspired to a QM tool, has been personalized for the Institute's performance management. The model has been built on the basis of a QM system already present that over the years has showed drawback in some aspects, particularly in the analysis of the context, in the standardization of activities and in the staffs' involvement (Poli et al., 2014).

Implementation and improvement of the QM has been possible thanks to the contribution of people who through "skill" and "awareness" represent the most valuable advantage of an organization (EN ISO 9001:2015).

3. The model

To manage a complex organization like a multidisciplinary research institute it is essential the implementation of a systematic and transparent approach. In fact, the achievement and consolidation of a strong competitive position depends on the processes and actions that are systematically implemented to continuously improve of the effectiveness and efficiency, taking into account also the needs and expectations of all stakeholders.

When project started, the Institute consisted of 186 people with a permanent contract including 98 researchers and technologists. The total number of people who attended the institute were about 500 unit including students and PhD students.

The institutional mission of an Italian public research institute includes:

- Research;
- Higher education;
- Third mission (knowledge transfer).

These can be considered the primary processes that contribute directly to the final output (products and services) and represent the Institutional Performance (IP) intended as competitiveness of the institute.

In order to realize final outputs it is necessary to develop support processes that represent the Organizational Performance (OP) intended as the ability of the internal organizational system to respond to the needs of stakeholders.

The objectives related to the IP are tied tightly to the organizational capability and therefore to the OP. The strategic objectives related to IP cannot be disconnected from those related to OP.

For the measurement of the performance in research centres specific advices are contained in the scientific paper “Developing

a performance measurement system for public research centres” (Agostino et al., 2012). This article indicates five performance dimensions: effectiveness, efficiency, impact, risk (linked with the uncertainty that characterised the research activities) and network (Azzone, 2008; Leitner & Warden, 2004) and the relative performance indicators.

Figure 1 describes the process-oriented model adopted in the Institute, where the inputs constitute the quantity of resources used in performing activities, the outputs constitute the results and the outcomes represent the long-time impact of the output on the community (Agostino et al., 2012; Brown and Svenson, 1998; Lettieri & Masella, 2009; Pollanen, 2005).

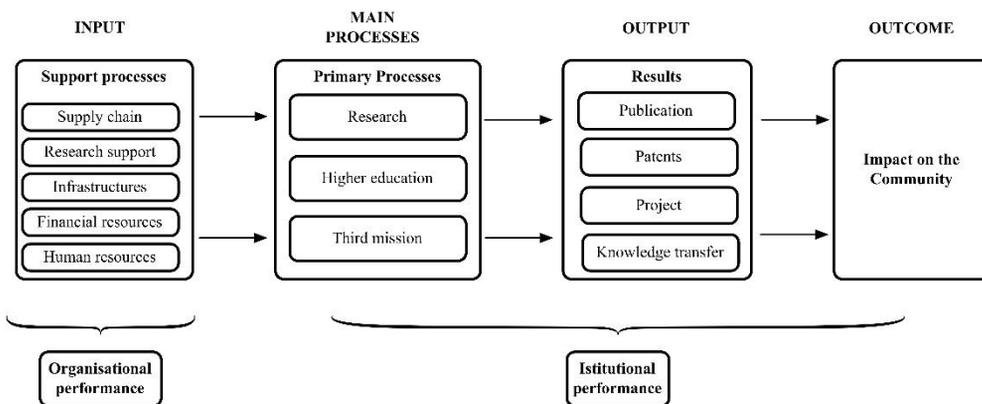


Figure 1. Process-oriented model adopted in the Institute

The proposed model is articulated in the following steps:

- 1) Definition of the strategy.
- 2) Analysis of the organizational system and process mapping.
- 3) Feedback procedure.

Step 1: Strategy definition

This phase includes the translation of the indications provided by the institutional mission into an understandable and communicable strategy with concrete

objectives for each of the identified strategic actions.

The knowledge of the external and internal context, in which an organization operates, is crucial to the formulation and planning of the strategy.

There are several methods that can be used to evaluate the context: for example all risk assessment techniques can be considered suitable for the purpose, but the SWOT analysis is perhaps the commonly used method that allows identifying Strengths,

Weaknesses, Opportunities and Threats. (Dyson, 2004; Ghazinoory et al., 2011; Hill and Westbrook, 1997; Houben et al., 1999; Panagiotou, 2003; Phadermrod et al., 2016).

The strategy definition has been established on the basis of the results of the SWOT analysis performed in order to have an assessment about the strong and weakness points of the Institute.

In the SWOT analysis for the IP the following topics have been taken into account:

- The CNR strategic steering and the Italian Ministry of Education guidelines;
- The economic situation of the context in which the Institute operates;
- The stakeholders' requirements;
- The available and potential partnerships.

The ability of the internal organizational system to respond to the stakeholders' requirements has been taken into account for the OP.

On the basis of SWOT results a strategic planning is built following these actions:

- 1) Definition of the strategy focused on the primary institutional activities and organizational activities.
- 2) Translation of the strategy into strategic actions.
- 3) Definition of strategic and operational objectives (related to measurable performance indicators), for each strategic action, congruent with the evidence of the context analysis.

Figure 2 shows the performance tree.

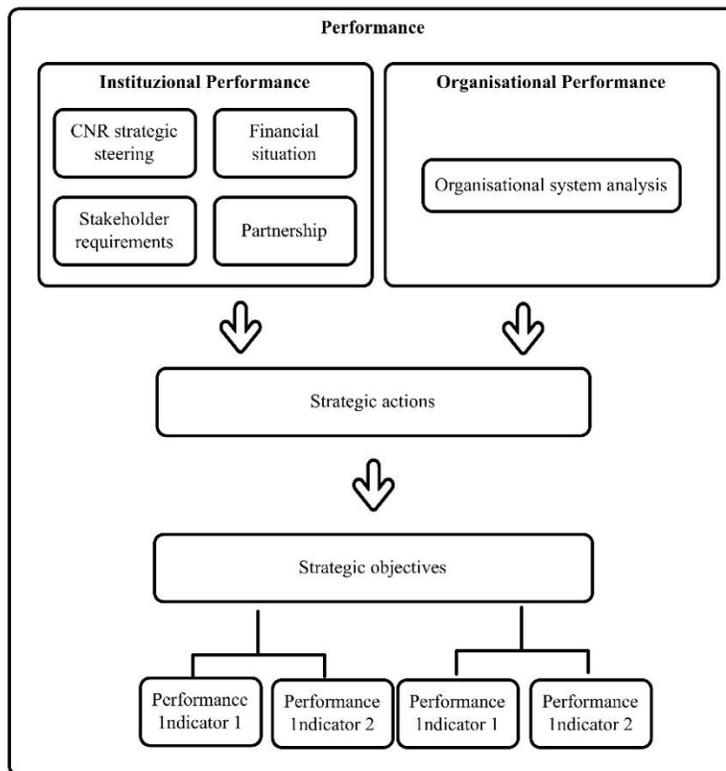


Figure 2. Performance tree

For each strategic action, one or more consistent and measurable strategic objectives have been identified; the degree of achievement being evaluated annually.

For the choice of the performance indicators the results of SWOT analysis, the indication provided by Agostino et al. (2012) and the by the Agenzia Nazionale di Valutazione del sistema Universitario e della Ricerca (ANVUR, 2015) indication have been taken into account.

The Strategic planning has been communicated to the stakeholders. An expert in communication who has suggested the following two steps provided the communication strategy: 1. The project has been presented first to all personnel and periodically 2. The progress of the project has been showed to community in dedicated meetings. Furthermore the dissemination of the results has been guaranteed through a page, in the institutional web site, dedicated to the project and a dedicated email for comments and suggestions.

Step 2: Analysis of the organizational-management system and process mapping

One of the most critical aspects identified during the SWOT analysis was the low efficiency of the organizational management system that is sometimes too slow to meet the stakeholders' requirements.

The Institute's management has identified the process mapping as one of the strategic action to improve OP and it has been decided to undertake a self-assessment process to analyse its organizational-management system.

The objective of the self-assessment process was the complete mapping of organizational and management processes and the description of the critical processes in Standard Operative Procedures (SOP) that have constituted the new QM system of the Institute.

A working group (WG) has carried out the self-assessment process; it was composed by workers representative of the different

compositions of the Institute, both in terms of specific skills (knowledge of the organization, specific skills about processes, etc.), than in terms of representativeness of the various components of the organization (eg, researchers, technicians and administrative employees).

The members of the WG have been chosen also on the basis of their soft skills (ability to communicate, flexibility, ability to work in group, analytical skills, management skills, ability to adapt to change etc.) and balanced by gender and age.

WG analysed the Institute's organizational system in terms of processes description, processes owners and relative improvement actions. Each process identified as critical has been analysed in terms of strengths and weaknesses.

At the end of the first, three-month long, period of analysis the WG has delivered a self-assessment report to the management.

The self-assessment of the organizational system, started with processes mapping, has been systematically continued with interviews to research support offices. The purpose was to standardize activities, identify responsibilities, draft SOP and flowcharts and optimize performance indicators. All processes have been mapped and their interactions were represented by cross-functional diagrams process map.

Each SOP, in addition to the flow chart, uniquely identifies the interaction between processes, the responsibilities, normative references, tasks, and average response times are identified.

Step 3: Feedback procedure

During the entire process of implementation a feedback procedure has been activate to get an immediate check of the results and to monitor the outcomes of the decisions and the actions taken.

The following items have guaranteed the feedback:

- Staff can contact the project

- manager for suggestions and clarifications through a dedicated e-mail;
- Personnel perception about the project has been collected through interviews;
- Opportunity to report to the WG any non-conformities and disagreements;
- Periodic internal audits are carried out to monitor the progress of the project, the application of the new SOP and the implementation of the improvement actions;
- Periodically, the management analyses the achievement of the objectives and intervenes, if necessary, to ensure the level of planned performance;

- A questionnaire to evaluate the effectiveness of what has been implemented was prepared and will be administered to the staff.

4. Results

The first important result of the project is the formalization of the strategy in the “Strategic Plan” and its sharing with all stakeholders. The “Strategic Plan” indicates the way to go on to achieve concrete goals reducing the risk of uncoordinated decisions.

The SWOT analysis before and mapping processes thereafter has allowed the knowledge of the strengths and weaknesses of the Institute.

Figure 3 shows the Swot analysis results.

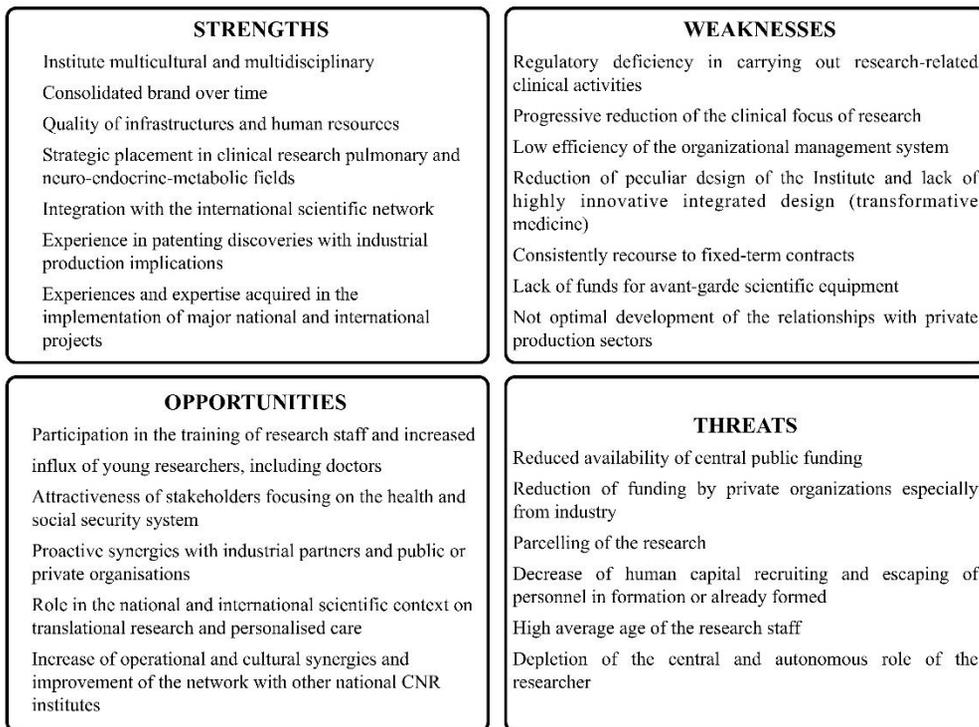


Figure 3. Swot analysis results

In “Strategic Plan” 26 performance indicators were initially identified: 21 for the IP measurement and 5 for OP. During mapping

of the processes, other specific indicators for individual activities have been identified.

Appendix 1 shows the strategic actions, the strategic objectives and the indicators identified for: a) research, b) higher education and c) third mission.

Appendix 2 shows the strategic actions, the strategic objectives and the indicators identified for OP.

WG during its activity has highlighted and analysed 77 processes, for each of them a process owner has been identified; each activity linked to the process has been described and, when necessary, improvement actions has been identified. Furthermore 44 improvement actions classified in order of priority were identified; 8 of these had high impact on OP.

A self-assessment report was submitted to the management for the evaluation: the management decided to address immediately the 8 priority improvement actions that were all implemented in the first year.

Internal communication is one of the critical issues recognised by the WG. For the first time, an "Internal Communication Plan" has been prepared with the aim to improve communication in the Institute. The plan includes bi-monthly meetings.

Another criticism was the overlapping responsibilities and activities between research support offices. The first step was the definition of responsibilities in the distribution of activities. The clear definition of the responsibilities has improved transparency in process management.

The outputs of the personnel interviews have been the standardization of the activities in SOPs and flow charts, which constitute the new documentary system of the Institute.

The systematic process of evaluating the effectiveness of the actions taken has allowed the identification of further strategic areas of improvement with a resulting optimization, rationalization and refinement of organizational processes and reduction in wastes.

The participation of the employees, requested during all phases of the project, has facilitated the sharing of the objectives and the staff involvement in the process of improvement.

On the other hand the project journey has been often difficult and the project has generated mixed feelings in staff. Figure 4 shows the three principal feelings of the researchers.

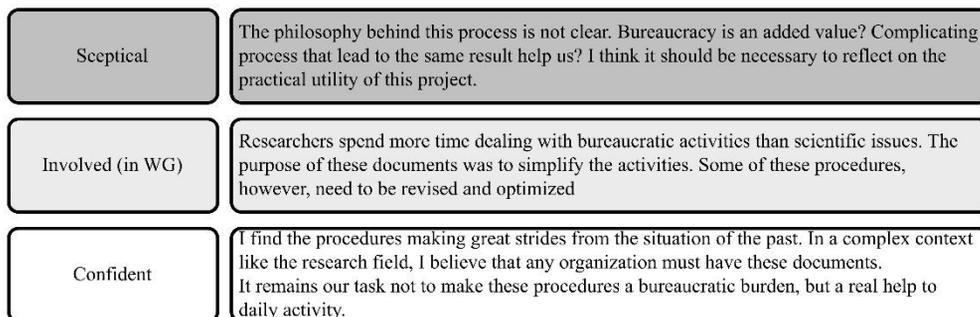


Figure 4. The three principal feelings of the researchers

5. Conclusions

The implementation of a PMS is a complex challenge in PA and this is even harder in research institutions. The public sector peculiarity, the presence of multiple stakeholders with different needs, the difficult

in the identification of the performance indicators, the lack of specific skills in addition to the shortage of the resources and the need of flexibility typical in research are the reason for this complexity.

Over the years, in our institute we looked for a solution to improve the performance management and to standardize the activities. The model chosen previously, based on ISO 9001:2008, had shown drawback in some aspects, particularly in the analysis of the

context, in the standardization of activities and in the staffs' involvement.

The table 1 shows the comparison between the critical issues of ISO 9001:2008 model previously adopted and solution proposed in our model.

Table 1. Comparison between ISO 9001:2008 and proposed model

Criticality of the old model based on EN ISO 9001:2008	New Performance Management proposed model
A context analysis was not formalized for defining the objectives. Strategy and Quality policy was scarcely known by stakeholder.	The strategic plan was built on SWOT analysis results. The strategic plan contains information about strategy, policy, planning, goals, and indicators. Information are more understandable and accessible to the stakeholders. Organizational evaluation is possible by monitoring objectives.
The sops for the standardization of activities have been wrote only on the basis of personnel interviews	The establishment of the WG allows for the participation of the staff in the process mapping, standardization and monitoring. Sharing information ensures continuous feedback over implemented actions.
Human resources were scarcely involved in the QM system.	Human resources have been involved in all three phases of the project It is difficult to identify reward systems for PA but by the awarding of responsibilities and access to professional growth, tools provided in our model, staff loyalty has been improved.

The introduction of risk management methods for the assessment of the context, the systematic evaluation of the performance indicators and of the effectiveness of the actions taken permits a decision-making process based on real data. The periodic management review and analyses of the performance indicators led the continuous improvement.

In addition, the standardization of the activities enhances the need of transparency in management and accountability required by stakeholders.

The standardization of the activities in SOPs leads to a general optimization, resulting in a reduction in wastes and human error, making the institution more competitive.

Other important advantages are related to the personnel management. Staff involvement

implies an increase in awareness and motivation with the strengthening the sense of belonging. The improvement of internal communication helps the Institute to move to the desired direction.

During the brainstorming of the WG, the reluctance of the staff related to skepticism, fear of the increase of bureaucracy and change and has been addressed and resolved.

An important limitation is the reluctance of the researchers toward the individual evaluation: it is amazing that the majority of public research scientific institutes, at least in Italy, within which by definition measurement represents the basic operational hallmark, do not utilize the same "quantitative" approach in managing and following-up their performance ability.

Another important limitation is the difficulty in the identification of reward systems based upon merit criteria in PA. Awarding of responsibilities and access to professional growth paths are tools provided in our model.

In conclusion, the implementation of our model allowed: 1) the knowledge of the peculiarity of the Institute with the identification of strengths and weaknesses, 2) the stakeholders' identification (industry, student, institutions, employees, scientific community and community) and its requirements' definition, 3) a clear strategy definition that reduces the risk of uncoordinated decisions and permits to identify specific objective and indicators 4) the acquisition of new skills that may be lacking in a public research institute.

Our experience has shown that the contribution of employees and the strong

commitment of the leadership are needed to overcome the resistance encountered during the process implementation. The commitment of the management and the contribution of people, with their professional and soft skills, in the WG activities have made possible the implementation of PMS personalized model.

The project is still on-going; the outcomes must be evaluated in a longer time and the journey of the continuous improvement never ends.

Measurement of the results is important but also measurement of their impact on the community is even more important because the real mission of the CNR is "Create value through knowledge generated by the Research", therefore, the assessment of impact indicators is essential in the near future.

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Michela Poli

National Research Council
Institute of Clinical
Physiology,
Via Moruzzi 1, Pisa 56124
Italy
michelap@ifc.cnr.it

Davide Cornolti

National Research Council
Institute of Clinical
Physiology,
Via Moruzzi 1, Pisa 56124
Italy
davide.cornolti@ifc.cnr.it

Silvia Pardini

National Research Council
Institute of Clinical
Physiology,
Via Moruzzi 1, Pisa 56124
Italy
spardini@ifc.cnr.it

Giorgio Iervasi

National Research Council
Institute of Clinical
Physiology,
Via Moruzzi 1, Pisa 56124
Italy
iervasi@ifc.cnr.it

Appendix:

Appendix 1. Strategic actions, strategic objectives and indicators identified for: a) research, b) higher education and c) third mission

Institutional Performance		Research	Higher education	Third mission
Effectiveness (Quality and amount of the output)	Strategic action Development and enhancement of the multidisciplinary and translational research with 3 priority targets: a) quality of life; B) health state maintenance; C) personalised care	Strategic Objective 1: Improvement of the scientific production indicators Indicator 1: Number of scientific publications Indicator 2: Impact factor Indicator 3: H Index Indicator 1: Number of funded grants attracted	Strategic action Enhancement of the offer of high education	Strategic action Enhancement of the patent, spinoff patrimony and promotion of the diffusion of knowledge in the territory
	Strategic Objective 1: Improvement of the scientific production indicators Strategic Objective 2: Improvement of the ability to attract external funds	Strategic Objective 1: Increment of the training offer Indicator 1: Number of post docs and PhD attracted Indicator 2: Number of satisfied students vs total number	Strategic Objective 1: Increment of the number of patents Strategic Objective 2: Increment of the number of spin off Strategic Objective 3: Public engagement	Indicator 1: Number of patents Indicator 1: Number of spin off Indicator 1: Number of schools collaborations Indicator 2: Number of technical consultancy reports
	Strategic Objective 1: Improvement of the Institute's research reputation Strategic Objective 1: Improvement of the scientific cooperation with national and international institutions	Strategic Objective 1: Improvement of the Institute's education reputation Strategic Objective 1: Increment of the cooperation with high education institutions	Strategic Objective 1: Improvement of the Institute's social reputation Strategic Objective 1: Strengthen and expand the network with territorial institutions	Indicator 1: Number of guests attracted per year Indicator 2: Outreach Indicator 1: Number of active agreements with industry Indicator 2: Number of active agreements with institutions
Risk (Quality and amount of the resource)	Indicator 1: Number of positions in advisory boards or faculties Indicator 2: Number of invitations for lectures Indicator 1: Number of joint publications Indicator 2: IP of joint publications Indicator 3: Number of joint projects Indicator 4: Number of foreign researchers attracted Indicator 5: Number of Active Collaborations	Indicator 1: Number of students attracted Strategic Objective 1: Increment of the cooperation with high education institutions	Indicator 1: Number of Active Collaborations	
Network (Ability and effect to team work)	Strategic Objective 1: Improvement of the Institute's research reputation Strategic Objective 1: Improvement of the scientific cooperation with national and international institutions	Strategic Objective 1: Increment of the cooperation with high education institutions	Indicator 1: Number of Active Collaborations	

Appendix 2. Strategic actions, strategic objectives and indicators identified for OP

Organisational Performance	
Governance	Research support
<p>Strategic action Knowledge the system through a self-analysis process and promoting the performance cycle as an operating tool for improvement</p>	<p>Strategic action Improvement of the quality of services in terms of efficiency and effectiveness</p>
<p>Strategic Objective 1: Implementation of the self-evaluation process and completing the process mapping</p>	<p>Strategic Objective 1: Development of ad hoc indicators for the institute's services</p>
<p>Indicator 1: Number of processes evaluated on the total of processes</p>	<p>Indicator 1: Number of indicators identified and implemented</p>
<p>Indicator 2: Number of standardised processes on total processes</p>	<p>Indicator 1: Number of "research trip" handled vs procedure total number</p>
<p>Strategic Objective 1: Reduction of the wastes and resources optimisation</p>	<p>Indicator 2: Number of orders handled vs orders total number</p>
<p>Indicator 1: Cost of a scientific publication</p>	<p>Indicator 3: Number of finalised agreement handled vs procedure total number</p>
<p>Indicator 2: External vs internal budget</p>	<p>Indicator 4: Number of procedure of personnel recruitment handled vs procedure total number</p>
<p>Efficiency (Ability to transform input in output)</p>	
<p>Strategic Objective 1: Improvement of the revenue from the Institute's results</p>	
<p>Indicator 1: Number of revenue from patents</p>	
<p>Indicator 2: Number of revenue from spin off</p>	
<p>Indicator 3: Number of revenue from Technology transfer</p>	
<p>Strategic Objective 1: Development of the managerial capability of the researchers</p>	
<p>Indicator 1: Number of specific training courses attended</p>	
<p>Strategic Objective 2: Enhancement of the merits and attraction of the best young people</p>	
<p>Indicator 1: Number of young recruited people</p>	
<p>Impact (outcome at long-time)</p>	
<p>Risk (Quality and amount of the resource)</p>	