The Opificio delle Pietre Dure in Florence: excellence in spite of mediocrity

Alessandro, Narduzzo and Luca, Zan

Free University of Bozen-Bolzano, University of Bologna

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Alessandro Narduzzo
Free University of Bozen-Bolzano

narduz@unibz.it

Luca Zan
University of Bologna

luca.zan@unibo.it

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Abstract

The *Opificio delle Pietre Dure* in Florence (Masonry Workshop) is of ancient lineage, dating back to the *Botteghe Granducali* set up in 1588 by the Medici Grand Duke Ferdinand I. For the first three centuries it worked in the production of stones, as its name suggests. In the 1880's, after the Unification of Italy, it was turned into a restoration workshop (a discipline, at that time, just emerging), specializing at first in stone materials, then eventually becoming a state institute. After the 1966 flood in Florence, when most of the masterpieces stored in museums, libraries and churches were damaged, the Opificio played a fundamental role organizing around a single institution most of the Florentine laboratories active in restoring the artistic works and other complementary competencies. Facing the emergence was an extraordinary learning opportunity for the Opificio and this experience deeply marked the subsequent evolution of this organization. Given the uniqueness of the damage and the huge amount of work that had to be done without delays, tradition and experimentation were mixed together by taking advantage of both craftsmanship skills in art restoration and complementary scientific competencies.

After the emergency, the Opificio strengthened his stance and consolidated its international reputation in art restoration. Human resource management is the most vulnerable issue, since recruiting and careers depend on centralized procedures and decisions taken by the Italian Ministry of Cultural Heritage. As a consequence of these strong external constraints, the Opificio cannot fully benefit from its potential and the typical process of knowledge replication and transfer are easily compromised: some special activities, for instance, are performed by aged restorers working alone, without any apprentices. In other cases young apprentices that are trained at the Opificio encounter great difficulties to be hired and they may be involved in the project only on a temporary basis.

Our study investigates the historical development of the Opificio with regard to the evolution of the institutional environment under a strategic change perspective. The inconsistency between the nature of its "task" and the set of inflexible rules deriving from the institutional setting (i.e. a branch of the Ministry) is one of the most critical issues characterizing this organization.

Besides, we explore in a detailed manner everyday life activities around restoration projects. Innovation, development of practices, and capabilities are analyzed through a series of incidents aimed at revealing how the Opificio succeed in storing and replicating its unique capabilities. Because a large part of technical and organizational capabilities are context dependent and expressed in a tacit form, it is critical to analyze the everyday activity in an extensive way and rely our conclusions on direct observations. On the one hand, art restoration is supposed to be strongly based on tradition and experience; on the other hand, each project is unique and different from the previous one and it rises new problems and it leaves room for innovation and experimentation.

What is striking about the Opificio is such a contradiction between its excellence in core competencies (art restoration) and the daily struggle with procedures and constraints posed by the administrative life. Making sense of organizational survival rises some intriguing issues in the interplay between processes at different levels. Looking at the micro processes that we observed in the everyday activity suggests to explore different interpretations of the coupling between superior reputation and administrative mediocrity that we provide and compare in the paper.

1. Historical background: from the 1966 flood to the present situation

1.1. Antecedents

The *Opificio delle Pietre Dure* (the Masonry Workshop) in Florence is of ancient lineage, dating back to the *Botteghe Granducali* set up in 1588 by the Medici Grand Duke Ferdinand I. For the first three centuries it worked in the production of stones, as its name suggests. With the Unification of Italy, the Opificio tried to keep its production activity afloat, however the costs were unfortunately prohibitive. Therefore, during 1880-1890, it was turned into a restoration workshop (at that time a discipline just emerging), specializing at first in stone materials, then eventually becoming a state institute.

The object of our studies, however, is to examine the recent development of the Opificio, as reorganized by Law no 44 of 1975, which under a single institution unified some of the organizations in Florence particularly active in restoring the artistic works damaged by the flood of 1966.

The reorganization was one of the first acts of the newly-formed Ministry and it included a series of urgent measures. The few lines in article 11 outline some of the basic features of the new Opificio: specialization in restoration activity; the institutional form of *Soprintendenza* (i.e. the local branch of the Ministry of Cultural Heritage); and the didactic function (i.e. the teaching of restoration which began in 1978).[1]

The antecedents of this decision are to be found (and here we draw on Paolucci, 1986: 135-152) in the special context of Florence after the flood and the peculiarity of the effect of a political decision that was taken: that of accepting the aid and assistance granted by the international community to cope with the threat of irreversible damage being done to the artistic heritage, while at the same time keeping all the works of art in the city.

The aim of this decision was to maintain a degree of homogeneity in methods and interventions. The consequences – somehow unintended – were also organizational: for many years Florence and its laboratories were transformed into one giant workshop. Florence became a melting pot of

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[1] "The Medici's old 'Opificio delle Pietre Dure', as institute specialized in the restoration of works of art across the whole of Italy, is headed by a soprintendente art historian and answers directly to the 'Direzione generale antichità e belle arti'. The teaching of restoration is competitive at the Opificio, in particular that which is relative to the commissioned old works of art and minor works, in coordination with the 'Central Institute of Restoring'" (L 44/1975, art. 11). This characterization was recently confirmed with the founding decree of the new "Ministero per i beni e le attività culturali", DL 368, 20.10.98, art. 9, that in fact compares the schools of higher education and studies of the ICR, OPD, and the Central institute for the pathology of the book.

experiences, unique in the world for the quality and quantity of the challenges given by the effects of the flood, mud and oil on frescoes, wooden pictures, statues, etc. The situation also prompted the development of avant-garde skills: "The rapid growth the laboratory saw in the 1970s in terms of size and working skills as well as methodological and scientific know-how would be a consequence of that crucial period when Florence drew upon all the best names from the world of restoration" (Paolucci, 1986: 136. See also the special insert in the *Giornale dell'Arte* celebrating the 30th anniversary of the flood, November 1996).

Once the exceptional period of the first early months and years had gone by, an idea to unify all the different organizations working on the restoration of Florence's artistic and cultural heritage into a single structure began to take shape. This came about particularly through the merging of the workshop of the Soprintendenza of the Cultural Heritage and the Opificio, even though the incorporation of other organizations and small workshops was also placed on the agenda. This resulted in an open call for application, the aim of which was to obtain, on a definite basis, the resources, which until that date had been used on an emergency basis only (National Research Institute, University, etc).

1.2 The original "Business Idea"

The key figure in promoting this idea of unification seems to have been the then director of the workshop of the Florence Superintendent, Umberto Baldini, who would later take over the running of the new Opificio. Nevertheless, the whole structure was strongly influenced by the initial imprinting, in which it was already possible to find the key ingredients of the logic behind the organization and its "business idea" (Normann, 1979, understood here in the widened sense of the logic underlying the behavior and structure of an organization)**.** These key ingredients include: a) the practice of restoration, b) the “privileged relationship with science” (in the words of Paolucci), and c) the crucial role of the school in the development and dissemination of technical-scientific knowledge (given the lack of any legal framework on the matter, and especially the lack of any professional order concerning access to the restoration profession).

“The Opificio developed as an institution along three major lines of activity which later melted into one: first we find the idea of operativeness, the hands-on approach, that has always distinguished this institution from other similar institutions not only in Italy but also in the rest of Europe. Our restorers, especially those belonging to previous generations, came from a tradition of craftsmanship and did not have all the training which today’s restorers obtain from the school. They did, however, have a special sensibility both towards the restoration work and the tragic event of the

flood. Secondly, we find a close tie developed between the scientific part of the restoration and the rest of the actual work, beginning with the opening of the laboratory, which immediately started cooperating closely with the operative side, and consequently the skills learnt in the workshop have always had a concreteness about them. Last but not least, much attention has been paid to the educational aspects, to transmit and hand over to the students (the restorers of the future) what has been learned through working experience, research, and all the restoration work from a scientific point of view" (interview with Mr. Matteini, Director of the Opificio Scientific Laboratory, 26.2.98).

It is possible to trace the distinguishing features of the new Opificio in the synergies that have emerged between the restoration practices, research, and teaching. On top of this, we find a high degree of specialization in a number of areas, made possible by the merging of a series of previously stand-alone bodies, each with their respective specialist knowledge, and the cultivation of a range of skills in the "minor arts" (goldsmith work, marquetry and engraving – on both woodcuts and hard stones) that other sectors do not possess (Paolozzi Strozzi, 1986, 115).

Today the Opificio is composed of ten restoration workshops that can be classified according to the actual material that the work of art is made of (pictures, frescoes, mosaics, masonry, bronzes and firearms, paper, textiles, tapestries, terracotta and jewelry). The different workshops are located in three sites: the historical site of the Opificio in via Alfani, the Fortezza da Basso, and the Palazzo Vecchio.

It is virtually impossible to mention all the works for which this organization has received recognition over recent years. Some important exhibitions and shows organized in the period under discussion also bear witness to just how much has been achieved: from the Conference on restoration held in 1976, to the work on the Medici exhibitions of 1980, to the organization of the exhibition "Metodo e Scienza" (Methods and Science) in 1982, describing the interplay between restoration work and the scientific methodologies of the Opificio. All this can be seen in the catalogues of the respective exhibitions as well as in the first "theoretical" publications (Baldini, 1981, who illustrates the method of abstraction and chromatic selection which, as Paolucci has pointed out, 1986, p.211, constitutes another distinguishing feature of the Florentine restoration school).

Moreover, the review *OPD Restauro* and the various publications edited by the Opificio represent a key ingredient in the strategic-organizational plan pursued by the institution, and are an additional element of integration among work, research, and teaching.

1.3 The current development patterns

A general idea of the specificity of this organization has been given in the previous paragraphs. Nevertheless it is worthwhile taking a look at the main guidelines of the development strategy in recent years, a plan which retains the basic characteristics of the business idea outlined above, and whose main aim can be summarized up as "maintaining the positions (of excellence) acquired". In addition to the practical instructions on restoration issued by the management of the Opificio from year to year (in agreement with the staff), there are a number of strategic guidelines that can be summatized up as follows:

- the reopening of the Opificio museum in 1995 which attracted 11,250 visitors in its second year;
- the restoration and functional upgrade of the sites (the headquarters, the Fortezza and the Museum), which called for a total overhaul of the structures involved;
- the reorganization of teaching activities, including the replacement of professors who retire, with external personnel and the introduction of 4-year employment contracts as stated by the law of September 1997;
- the development of a consultancy role, in whicht the Institute does work for other organizations and other local branches of the Ministry all over Italy (this role has grown in recent years to represent an important part of managers' time);
- the development of a similar line of work abroad.

But beyond these minor changes the real challenge is the attempt (and the imperative) to "change nothing" that involves the distinctive features of this organization, i.e. the mechanisms that produce and reproduce technical-specialist knowledge. The changes that are imposed or self imposed, seem rather to involve to a greater extent the management structure and operating systems that do not regard the core activity (e.g. administrative-managerial), and the danger are implicated in such a way that they do not interfere with the capacity to reproduce distinctive knowledge and skills.

1.4 The governance structure

If the above represents the heart of the organization - its key distinctive features - then an important element is the institutional setting of the Opificio. In this aspect the Opificio is organized in accordance with the structure of other territorial branches of the Ministry (*Soprintendenze*), even if it as a matter of fact lacks territorial competence (which is usually the cave in other Soprintendenze).

This has a number of important implications for our present purposes, such as bringing the Opificio under direct Ministerial control with financial and human resources being allocated by the Ministry and managed by the central administration.

The relationship the Opificio has with its environment is somewhat anomalous and results in work for which no payment is received. The role of the Opificio is to contribute to the safeguard of the country's artistic heritage, and this contribution is made on the basis of the human and financial resources provided by the State, through the itemization of expenditure in the financial statement, and in the ways we shall examine in more detail later on.

At this stage it will suffice to outline the typical procedure undertaken by the Opificio when the organization is asked to do a particular job. Requests to carry out intervention work come from different sources such as the Soprintendenze, local State administration, and private or church organizations. Depending on the technical problems of the restoration, the skills the Opificio can call upon, and the experience it can acquire through the job, the Opificio decides if it wishes to accept the commission – without imposing any further conditions ("if it interests us from the artistic and technical point of view") – or turn it down.

The acceptance or refusal of the work commissioned, as well as the actual work, are a question of substantive and professional considerations since there doesn't seem to be anything that prevents the Opificio from finding itself mudded up with work. Moreover, the actual cost of the work at hand is a completely irrelevant issue and the Opificio doesn't even bother to calculate expenses (in either direct or staff costs). Determining how long the work takes, and the degree of "customer satisfaction", seems to be irrelevant throughout the process, which is guided purely by historical-esthetical and technical considerations.

The above is not meant to be a criticism guided by preconceptions, but quite simply a description of some of the ways in which this organization works – ways which are not always easy to understand from a management point of view. An understanding of how the Opificio interacts with the environment also requires a direct understanding of the complex structure of this knowledge-intensive organization.

2. Work practices between tradition and innovation

2.1 Organization of the restoration work

Art restoration is one of the Opificio's main activities and directly involves art historians with specific qualifications, restorers from the various workshops, pupils from the school and, in some cases, restorers that are recruited from outside the organization for specific jobs. To describe the restoration work and how it is organized within the Opificio is not an easy task for a number of reasons: first of all, there is no well defined product or production process; secondly there is no clear division of labor, even if highly specialized tasks often arise; and finally, there is no standard and compelling schedule for completing work. What emerges from prolonged observation is that there is a whole series of activities that involves a wide range of people and that needs to be planned and constantly coordinated.

Important differences exist between the various laboratories in the way they organize and carry out work. This is partly the result of the actual number of restorers on the job and hence the size of the work, partly the result of the specific characteristics of the works of art and the materials they are made of. Indeed, the restoration work is not always done in the Opificio's workshops; paintings are more often than not taken to the workshops while frescoes are normally restored in situ.

In order for us to be able to give a better idea of the overall working picture, we thought it might be useful to describe the different operative phases in a restoration project; looking first at a slightly more generic and abstract case and then at some of the details of a particular job which has lasted over five years and which is about to be completed.

a) Typical phases of an order

The first phase, which precedes and preludes an order, is the actual selection of the work of art which may be signaled out directly by the possessor or be indicated by the Opificio. Once a work of art has been identified, on-site inspection ensues to assess the state of repair of the piece, the type of intervention needed and the urgency of the measures. If the work is selected it is included in the working program for the following year and the process of finding the funds necessary gets under way with a request for funding from the Italian Ministry of Cultural Heritage. Very often the Opificio offers to transport the work of art to the workshops and to dismantle the work, an operation which is often critical since any error could lead to serious damage.

When the work of art arrives at the Institute (and this may be up to a year after the initial inspection), the person in charge of the relevant division assigns the job to one or more restorers and

a plan of action is drawn up. Thus begins a first detailed assessment of the type of intervention needed and the measures needed to solve the problems that will likely be met with during the restoration. These decisions do not merely depend on the state of repair of the work of art but are also informed by a critical reading of the work and its values. On the back of these findings and the state of preservation, preliminary investigations and laboratory analyses (chemical, spectroscopic, photographic) are carried out which provide a more complete picture of the situation and furnish information on the materials originally used and the reasons for the disrepair.

b) The complexity of restoration work: the example of the Virgin Coronation by Lorenzo Monaco

To reach a better understanding of some of the aspects that characterize the organization of a restoration work, let us turn to the case of a particular order – Virgin Coronation (*Incoronazione della Vergine*) by Lorenzo Monaco, owned by the Uffizi Gallery in Florence. The restoration work on this wood panel painting began in 1993 and lasted a good five years on account of problems that only became apparent during the actual restoration. The panel first arrived at the Opificio for woodworm treatment but as the work proceeded other problems soon came to light. The restorer overseeing the work noticed that some of the colors were becoming warped and a decision was made to do the necessary fixing and preservation work immediately. However, at this point it became clear that there were other problems regarding the state of repair of the work (the excerpts reported in this section come from a recorded conversation with Patrizia Riitano, during a field observation that took place on March 3, 1998): "...there was also some warping, blistering and rippling on the paint film, especially of the whites, that was particularly visible in the light. What's more, closer examination revealed glossy non homogeneous areas where the colors were much darker and which seemed to have been added at a later stage to attenuate the light of the picture." Chemical analysis of the patina revealed it had a glue base, raising the suspicion that the patina itself was lifting and flaking the paint. A decision was thus made to clean the painting so as to remove the patina which was soon found to be on the thin side. As the cleaning went ahead, it became clear that the painting was well preserved, even if the restorer pointed out that: "the color tones seemed to have been changed to the extent that some of them seemed to be darkened, others not; it was therefore necessary to intervene and put everything back to rights. For example, the blue of the cloak and of the heavenly face seemed completely different: the former had been darkened while the latter had never been touched".

In order to restore the work to its original condition, preserving as far as possible the original paint and getting rid of the yellow patina, a series of different treatments had to be applied to different

parts of the picture. First the colors of the painting were fixed, then an attempt was made to clean parts of the picture and to examine the nature and causes of the flaking.

The wooden support was then stuccoed and the painting was cleaned and restored, especially those parts that had been removed during previous restoration work. The fact that other works of art from the same period were present at the Opificio at the time made it possible to carry out a study on the painting techniques and materials used for the colors (see Aldrovandi et al., 1996).

The restoration, however, also posed other problems which were of particular importance from a theoretical point of view. The painting presented not just marginal lacunae, but a large lacuna in the center too, where an angel had previously been drawn. In of restoration work carried out during the last century (as the documents show in the wake of considerable debate), the lacuna had been plugged with the figure of an angel painted in gold against a neutral background. This intervention made it harder to find a solution: a treatment of the lacuna with a neutral material - the solution usually preferred by the Opificio in cases of this kind - would have been in harmony with the original work but would have been aesthetically unsuitable given the position and size of the lacuna. Furthermore, the restoration work carried out in the nineteenth century in its own way deserved to be preserved given its innovativeness for the times. Various alternatives were taken into consideration and weighed against the theoretical principles that should inform restoration work (see the principles expressed by Brandi in the Restoration Charter of 1972) - the whole debate involving various people of different positions: the management of the institute, art historians, and the management of the Uffizi. In the end, a decision was taken to draw a new angel on a separate, mobile support in order to cover the lacuna and, at the same time, to preserve the previous restoration work. It is unlikely that such a solution would have been considered in the past and signals a repositioning and new interpretation on restoration. Indeed, this choice would seem to run counter to the restoration rules that have become accepted over the last 30 years, but in point of fact the opposite is true: the restoration work is reversible, it preserves traces of the previous work and, above all, it improves the actual impact of the work of art which would otherwise have suffered from the 19th century solution. In the National Gallery in London there is a picture by Lorenzo Monaco which dates from the same period as the *Virgin Coronation* where we see an angel similar to the one that needed to be reconstructed in the picture under question and which indicates that the decision to draw the angel *ex-novo* was justified.

The actual decision to go ahead and draw the angel posed a series of problems that needed to be addressed and which concerned the shape of the angel, the technique to be used, the support on which the angel was to be drawn and how to fix it on the panel.

"Besides the drawing itself, the problem was how to construct a support suitable for the new drawing and how to anchor it to the wood panel that moves. The material for the support was chosen after a series of attempts that lasted over several months. Eventually an epoxy resin was chosen and treated with a layer of Dacron. This support was then anchored to the panel. Generally speaking, even though the support is inert it stops it moving when it is glued to the panel. In more detail, the decision to preserve the angel drawn in the 1870 restoration posed a technical problem linked to the question of just how to anchor the panel on which I was going to draw the new angel. Obviously the idea of drilling a hole in the panel was not taken into consideration and we thought about using a magnet. However, even this solution seemed too intrusive since it would have left a layer on the outer surface unless the magnets were placed underneath which would have ruined the previous restoration. In the end, we decided to glue the panel with a special material. This research also involved other restorers at the Opificio, including outside consultants. At first the materials already used in the restoration were considered, even if for different uses. Trials were carried out with a rubber made by 3M widely used by another restorer at the Opificio for sealing purposes. It was a silicon-based viscous material. Between one trial and another, time was taken to observe just how the materials behaved even if there is always the possibility of surprises over the years. This constitutes research work that cannot be seen by the eye but which nonetheless has been done".

On the subject of research into the use of materials – one of the more interesting issues in restoration – more will be said later. What is worthwhile pointing out here is that the actual drawing of the angel was one of the striking features of the restoration work: "matching colors, redoing a bit of a picture, are all things you learn at restoration school; creating something from scratch on the other hand is very unusual, so much so that at first the Uffizi Museum director jokingly asked me: "do you feel up to doing this?"

A computer was also used to draw the angel to see if it was possible to get a perspective from the other angel's point of view. The results however were unconvincing and the restorers decided to opt for a solution that fitted the tone of the rest of the work. In this part of the work, cooperation with the scientific laboratory was a great help since it allowed the operators to date the materials, identify the artistic technique, and carry out analysis of the support and optical analysis of the pigments which resulted in detection of lapis lazuli. Analysis of traces of material on the painting confirmed reports from other sources that during the last war the work of art had been used as a canteen table. What's more, at the bottom of the panel was a *predella*, i.e. an opening which X-rays showed to be original. A study of other works from the same period seemed to show that it was a fairly common practice to create secret openings that could be used to keep reliquaries in. It is likely that with all

the moving around the original door-flap was lost and the opening was subsequently enlarged to house a tabernacle.

During the study phase, research into the documentation on the work of art was stepped up and a photograph from 1953-54 was found, showing the painting with a neo-gothic frame, since then disappeared, complete with cats, hats and spires. Further research showed it had been removed in 1956, probably with the aim of restoring it all to its original state. The three hats of the frame were found in the Uffizi storerooms "completely covered by brown temper paint". A computer was used to see what the overall effect would be of reconstructing the frame, but to do so from scratch, even with the help of the 1950's photo, would have been too arduous a task. The restorers at the Opificio decided, therefore, to try to dig out the rest of the original material from the Uffizi storerooms and a small research team complete with overalls and torches was set up. The operation was a success and almost all the bits and pieces were recovered. During restoration work on the frame, it was discovered that some of the parts were originals from the fifteenth century - another reason to press ahead with restoration of the frame.

After some five years the work is almost finished and all that needs to be completed is the restoration of the frame, a fairly arduous task. The gilding is somewhat uneven because of the patchiness of previous interventions and the history of the various parts; some of them lay in the storeroom for a long time, others were exposed to light and the colors darkened as a result. While all the pieces need to be cleaned and the frame given a sense of wholeness, each part must be examined in its own right since, as is often the case with works of art, there are different kinds of dirt and it is not always possible to apply the same treatment everywhere, "especially if you come across bean soup spilt somewhere".

c) Top skills for tackling singular cases routinely

The example of the restoration of Lorenzo Monaco's ”The Coronation of the Virgin” gives an idea of all the different kinds of research, experimentation and collaborative work that go into a restoration. Though we have attempted a description of the various phases that punctuate such work, such a description can only hint at the complexity of the job which only comes fully to light when we look at the specific problems that unexpectedly arise in each single case. There are also organizational problems regarding the management of the Opificio: programming work, coordinating assignments and using resources takes time and means that the restorers are often inactive for long periods of time with the result that they often fill their time by turning to other jobs assigned to them.

The example of the restoration of Lorenzo Monaco's “The Coronation of the Virgin” also points out other features of the Opificio, especially the different skills the institution has at its disposal and its attitude towards experimentation and innovation. The Opificio has amassed a great deal of experience over the centuries and to the point that no single work of restoration is completely new or different to work done in the past: it is interesting to note that during our period of on-site observation, the restorers often tried to explain the work they were involved in by referring to other jobs that had been done, pointing out the similarities and differences.
One of the more intractable problems facing top class organizations is that of getting trapped within one’s own skills, something which often results in these skills being reproduced, adapted and reworked even where they are unsuitable. Its massive wealth of experience might have led the Opificio down this road, replicating consolidated practices shaped over the years by tradition. And yet, as the example we saw shows, a dominant feature of the Opficio is the trade off between tradition and innovation, between general rules and application. The restoration of the Virgin coronation provided an opportunity to discuss the application and interpretation of the theoretical principles of restoration, to cooperate and interact with other international institutions, to experiment with and compare new methods and instruments of restoration such as the computer, used for carrying out simulations. The openness to experimentation and innovation is one of the key ingredients of the Opificio's success; art historians, restorers and students are all keenly aware of this, even if not all of them agree on the individual choices made.
What is it that keeps the Opificio from becoming a prisoner of its own internationally recognized top-class skills? How can an interest in research and innovation be created and maintained over time? In order to answer these questions, the following paragraph will look at the different types of research work and innovation marking everyday practice at the Opificio delle Pietre Dure.

2.2 Tradition, research and innovation: the interplay of skills

a) Three capabilities at play

The everyday restoration work carried out at the Opificio involves the interplay of three completely different kinds of professional knowledge and skills: technical (restorers), scientific (technicians of the Opificio's scientific laboratory) and historical-critical (shedding light on the work itself and the intervention).

The technical ability of the restorers themselves is undoubtedly the most visible aspect of restoration work. However, as we saw in the description of the restoration of Lorenzo Monaco's Virgin Coronation, the work of the restorers is made easier by the assistance offered by the scientific laboratory; for example, photographic, radiographic and spectroscopic analysis can provide important information on the history of a work of art, the intentions of the artist, any subsequent reworking or modifications and previous restoration work. Microphotography and micro-biopsy can provide information on the structure of materials and the state of repair of the work, information that is crucial to the actual restoration, for example the choice of solvents to be used for cleaning. The close and natural tie between restoration techniques and scientific research can be seen in a whole series of situations, for example that of cleaning. Cleaning is one of the most critical parts of restoration work because of its permanency: what is removed is removed forever. It therefore comes as no surprise that a lot of work goes into finding the right solvents and techniques for cleaning, work which involves a good deal of cooperation between the restorers and the technicians from the scientific laboratory. In the case of the square relieves on the "Doors of Paradise" by Lorenzo Ghiberti, the original materials (bronze and gold) had been exposed to oxidation, erosion and atmospheric pollution; chemical analysis of the materials made it possible to identify the kind of treatment best suited for cleaning the work of art (see Matteini and Moles in Baldini 1982: 181-184).

Finally, there is the third component – the history of the work of art. In Italy this aspect has historically been given particular weight, so much so that it is always an art historian who is in charge of restoration. This typically Italian approach which, as we shall see, is also reflected in the Opificio's organizational structure, is aimed at ensuring that restoration is not just a technical operation but is also informed by a critical reading of the work and an evaluation of which particular restoration theory should be adopted as point of reference for the case at hand. Restoration is often a compromise between the desire to eliminate the causes and effects of degradation, the desire to restore the work to its former glory, and what can actually be done or achieved. The restoration theory so far adopted by the Opficio dates back to the debate that took place in the 1940-50s, inspired to a large part by people like Cesare Brandi and Umberto Baldini whose own work combined technical and manual skills with the ability to critically read a work of art. These theoretical principles are premised on complete respect for the original work with a disciplined and rigorously attentive approach to each phase of the job at hand. Non-intrusive techniques of analysis, diagnosis and intervention are tried and tested with a predilection for non-permanent solutions that can be easily recognized as the product of restoration work and not part of the original. Restoration should not cancel out time and restore the work to its original state but

should rather try to counter the causes of decay and help conservation. Sometimes one of the causes of disrepair is previous restoration work, the removal of which poses a serious problem since it is far from easy to understand just how that work has modified the original material.
The time we spent at the Opificio and the interviews we carried out there showed how all these different skills are not simply integrated in an abstract fashion but rather fostered through daily restoration work. The everyday problems met with in working on particular cases provide an opportunity for discussing, studying and experimenting with new solutions, and restorers, technicians and art historians are all perfectly aware of this. Naturally enough, the discussions can lead to conflicting positions and differing points of view but the whole procedure of this is seen as a must by those involved.

b) Integration of skills in everyday practice

One of the most common situations where discussion stimulates experimentation with innovative solutions occurs when consolidated practices do not seem suited to the case at hand. Such a situation questions the theory of restoration and is reason enough for experimenting with a different approach. Let us consider for example the decision to draw the angel in Lorenzo Monaco's Virgin Coronation: the restorers opted for an apparently heretical solution yet one which was justified by the very principle of respect for the work of art in a case where, in other circumstances, the lacuna might have been preserved.
The problems that arise in specific cases can sometimes cast doubt on consolidated and long accepted principles of restoration theory and suggest alternative solutions. This is, for example, what happened with the restoration of the gilded parts in the frame. In Umberto Baldini's way of seeing things, the gilded parts should have been restored without any use of gold so as to avoid any possible contamination of the original work. The chromatic effect of gold is to be obtained with a series of light brushstrokes of the three colors that make it up: red, yellow and green. This technique, known as chromatic selection, has the advantage of reproducing the chromatic effect of gold from afar while it allows the viewer up close to distinguish the original from the restoration. The problem is that this technique only works if the lighting is perfect; to look at the picture from a slight angle is all it takes to notice the different light diffraction of the gold and the selection, the result being that there are opaque patches in the middle on a reflecting surface. On some frames and on surfaces where a lot of gilding has been used, alternative solutions have been tried which better reproduce the characteristic diffraction of gold. In an early experiment, the chromatic mix of red, yellow and green was enriched with gold applied by brush; when this solution also proved

unsatisfactory, a thin foil of gold was laid on the surface and the colors where then applied to this using a paintbrush.

In other cases it transpires that after discussion between restorers, technicians and art historians on particular problems, traditionally accepted solutions are used simply because they reflect consolidated practice. Solvents and emulsifiers were for example for a long time used for cleaning, but in the long run they turned out to be highly toxic for the restorer and harmful for the work of art they were being used on. The search for solutions that could be used in cases that regularly crop up in restoration work involved the chemical analysis of the paste traditionally used as a base for solvents “cocktail” widely used in restoration; this scientific analysis highlighted all the different limits and benefits of these products with the result that some of them were banned and others introduced.

The interplay between different types of skills can be looked at from another useful angle, analyzing the relationship between general knowledge, acquired both practically and abstractly, and the individual case. This approach is crucial given that the restorers themselves and the students at the school are aware of the value of experience, practice and acquired knowledge. At the same time there exists a widespread conviction that each restoration is a case unto itself and that already tried solutions cannot simply be applied across the board. Part of a restorer's know-how consists of rules describing (or prescribing) how things are done, what products are used, how to apply them, etc. But besides the rules, another important part of skills, non-codified and uncodifiable, concerns what we might call tacit knowledge picked up during previous restoration work. The participation, even when marginal, of the pupils of the school and of young restorers working side by side with more experienced ones, is one of the ways know-how and skills are learnt and passed on in the organization. Actually being present in the workshop and taking part, albeit marginally, in the everyday activities is crucial to developing the proper sensitivity, experience and mastery. These two forms of (tacit and codified) knowledge work off one another; indeed, one of the results of skills being constantly integrated is the transformation of tacit knowledge into codified knowledge. As in the example of the paste there are traditional recipes for base preparations that are adapted to particular cases on the basis of experience. Chemical analysis of the composition of recipes and the effects of such preparations on works of art, however, cast doubt on the effectiveness of some of the restorers' know-how; consolidated practices, fine-tuned over years of experience or passed on by teachers and colleagues, have produced side effects deleterious to the work.

In everyday practice, integration of technical, scientific and historical skills is particularly marked in research and experimental work, both in the short term in the form of adaptations and micro-innovations and in the longer term in the form of systemic changes wrought by the introduction of

some wide-rang project. Typically, in these processes of adaptation, solutions tried and tested elsewhere are taken up and then combined with other solutions that have never been tested before. Research often involves a whole range of people, most of them (but not all) from the Opificio. From this point of view, a distinguishing feature of the Opificio is its ability to innovate. Whenever the innovations lead to the development of a particular product, as might be the case with the development of new artifacts or new diagnostic techniques, they are often made use of outside the Opificio too. There are many channels for dissemination such as the Opificio's review, *OPD Restauro*, former pupils who keep in touch with the institute, conferences, exhibitions on restoration, and cooperative projects with other institutes.

c) Innovation and adaptation

Restoration sees the use of materials and substances that have originally been designed for other purposes and which are adapted for a different use, either because there are no specific products on the market for such a specialized niche or because products are too expensive to develop and can be easily adapted. Opening the "tools drawer" one therefore often comes across very familiar objects like toothbrushes, nail cleaners, cotton swabs, sponges, paint brushes, sprays and tooth-picks. One then discovers that each of these was not merely chosen at random but only after a good deal of testing, with word of mouth doing the rest. All of this poses a problem when materials need reordering since "to the warehouseman all the cotton he receives is the same whereas for us one kind of cotton is all right but another leaves threads." To clean stone sculptures restorers use cotton swabs for applying the solvent these cotton swabs which they construct themselves using bits of wood from food skewers with small balls of cotton wrapped around one end. When the cotton is dirty, the restorer does not throw it all away but instead dips the stick into a glass bottle through holes made in the top with nails so that when it is pulled back out the cotton catches on the sharp edges of the holes and stays inside the bottle. The operation may be done once every minute if the surface is especially dirty and the whole thing is fast, easy and allows the worker to remain focused on the job at hand.

The brushes used are not specially designed products for restoration but normal brushes with a few modifications. In particular the solvents used in restoration can dissolve the paint on the wooden handle of the brush and this paint might then drip onto the work. With this in mind, the restorers have led construct a protective "skirt" that is placed around the handle to catch the solvent when it drops down.

Examples like the ones above are legion but what perhaps needs to be underlined is the attention paid in research and experimentation to finding new solutions, even with regard to the small things.

Besides all this however it is worthwhile mentioning at least a couple of examples of more complex research and innovation destined to affect restoration work inside and outside the Opificio. The first of these examples concerns radiography using large-scale X-ray plates, the second concerns experimentation and development of new support systems for panel paintings. As will become clear in the course of our discussion, the process of research and development is fuelled by technological imbalances caused by previous innovations (Rosenberg, 1987: 126). Complex technologies generate from within them pressures that stimulate further research in particular directions. Indeed, innovations go beyond merely finding a solution to the original problem and, if they are to be exploited to the full, presuppose the resolution of any new imbalances. Consequently, the technically skilled staff is always focused on solving problems that are of clear practical importance (Rosenberg, 1987: 136). Technological imbalances and their resolution therefore constitute the engine of technological innovation. In the examples given in these pages, the mechanisms for solving the problems caused by technological imbalances are not always the same; in some cases it is the adaption of solutions that already exist elsewhere that is of the essence, while in other cases it is experimentation and trial and error that are the key. However, aside from certain differences that will inevitably occur in individual cases, it is possible, following Rosenberg's lead, to identify patterns that characterize innovation.

d) Innovation, evolution and experimentation

The special attention paid to research and innovation is a characteristic trait of everyday activity at the Opificio. In some cases the innovation consists basically of adopting and adapting techniques, tools and solutions that have already been tried and tested. Using the laser for cleaning purposes is for instance an example of the adoption of an instrument that was originally designed for other ends; and the same is true of spectrographic techniques (e.g. infrared, diffused and fluorescent light), tested and introduced into the Opificio in the 1970s. The introduction and testing of the laser at the Opificio is an interesting example of this type of research. This was a two-way project with the regional government of Tuscany which over three years developed a laser that could be used for restoration purposes. At first a series of features and requirements for using the tool in restoration work was drawn up, and this was followed by a selection of the actual equipment available on the market. Then a specially designed laser was used in the restoration of Donatello's Pulpit of the Duomo in Prato. The work was done partly by one of the Opificio's restorers and partly by a former pupil of the school now working in his own laboratory in Florence with a laser given to him by the institute.

In other cases the research aims at improving techniques and materials, such as solvents, already in use in restoration work. Another particularly interesting example concerns research into and innovations on the field of solutions for restoring panels and wooden canvass supports. In the last 15 years, innovative techniques for restoring wooden supports have been tested at the Opificio. These techniques constitute an improvement on consolidated practices, fine-tuned in the course of subsequent applications and enriched through comparison with other experiences[2]. In other words this kind of research and innovation well illustrates the dual nature of the skills we referred to: it accumulates and is enriched by individual experiences and yet each new job is a case unto itself with a series of problems that call for solutions that draw on past experience (for further reference, see Castelli 1987; Castelli and Ciatti 1989, Ciappi and Ciatti 1990).

Wooden panels are obtained by boards which are tied together by crosspieces that are supposed to lock the various parts and prevent further deformation. The crosspieces have been constructed in different ways depending on the historical period and methods of the day. Up until the 1980s the crosspieces used by the Opificio had a trapezoidal section and were set orthogonally to the panel; they were fastened to supports screwed onto the panels and forming a sort of rail inside which the crosspieces could run and adapt themselves to changes in environmental conditions without placing stress on the panel. This method, still used by most restorers in Italy, only partially resolves the problems of wood warping and presents two major limitations: it cannot be regulated over time and acts exclusively on the horizontal axis so that if the panel warps vertically the whole system is blocked. In 1986 the restorers at the Opificio began to test alternative systems, designing and constructing supports that ensured a greater flexibility. The restorers developed a method in which the crosspiece was fastened to the panel with brass and wooden supports. This allowed a screw-regulated spring to regulate the pressure exerted on the canvass at different points and be changed. Over time, this method was perfected and new materials (e.g. Teflon) were taken into use with a double-headed result: less trauma to the object compared with the traditional solutions and the possibility to fine tune over time.

Experimentation with the new materials and the experience garnered with this type of solution led to further developments which resulted in the complete removal of the crosspieces which were replaced by a frame fitted to the shape of the work and fixed to the panel with the same kind of system. This method was successfully used in the restoration of some paintings on very thin panels that were badly degraded and suffered from woodworm. In these cases, the crosspieces on their own

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[2] With regard to these issues and the importance of experience exchange, see the proceedings of the workshop "Art restoration on dipinti su tavola: problems and experiences" organized in Florence on December 18, 1992 and published on OPD Restauro, N. 5 1993.

were no longer enough since the original carrying structure of the panels was compromised. The method was used, for example, on a gothic-style polyptych where the fitted frame became the carrying structure which supported the weight of the work of art. The frame was fastened to the work via a system that ensured easy running and flexibility.
Over the years, a system of complete innovation, drawing on the experience of work done was put into use. One of the problems this new system posed related to the measuring of the forces the crosspieces exerted on the panels. Systematic studies of these forces have never been performed, neither in Italy nor elsewhere, and the actual degree of the crosspiece flexibility has always been left to the restorer's judgment. In the last two years, one of the pupils at the school has looked into the issue and made it the subject of his thesis.

e) Technological imbalances and innovation: the case of large-size X-rays

Radiography has increasingly been used in restoration work in recent years. The widespread use of X-rays has in part been due to the fact that the technique is non-invasive and has no harmful effects on the work of art, but above all it has been due to the fact that it provides crucial information on the materials originally used, the technique employed, the state of repair of the work and the existence or non-existence of previous restoration work (Aldrovandi and Ciappi, 1992:25-40). It is an analytical method that helps one read the work of art and identify the best way of restoring it. As early as in the 1960s the Opificio had the right equipment in place to perform X-rays: a radiation source, a camera and a dark room. The X-rays traditionally used are the same as those used for medical purposes: 30cm x 40cm, i.e. much smaller than most paintings. Previously this meant that restorers were forced to X-ray different parts of a painting and then piece them all together, and the outcome was often unsatisfactory. With the increasing use of radiography, the limits of the traditional system (the small format size of the X-ray, the laboriousness of fitting together the X-rays and the lack of any one single perspective point) proved it unsatisfactory and prompted experimentation of alternative methods.
A retrospective analysis will help us highlight the key moments in this process of innovation and raise a few points for discussion:

- the traditional method (piecing together a number of small single X-rays) presented
- a whole series of problems and the solutions originally attempted tended to address single issues (e.g. the lack of any one single perspective point, manually fitting together many small X-rays, etc);
- the know-how garnered from failed attempts was put to good use in arriving at the definitive system: for instance, remote-control techniques and the use of vacuum in attaching the

plates to the painting were both developed in tests that were later abandoned but today are part and parcel of the techniques in use;

- the development of certain innovations posed new problems which in turn created new technological imbalances that needed to be addressed: for instance, the use of large-size plates led the restorers to devise a system for the manual development of X-rays too big to be developed by machines;
- as the new system was gradually being developed many physical artifacts, such as tools and components, were designed and perfected through a process of trial and error: for instance, to resolve the problem of developing large-size X-rays, the restorers built instruments that could not be found on the market, such as bags for the reagents and containers for the film;
- the innovations introduced to make large-format X-rays possible eventually affected the whole process of developing and conserving film, the whole procedure being gradually rethought and modified.

The job of coming up with a new method for developing large-size X-rays took years of work and is still not complete. During our period of observation at the Opificio the imbalance prompting research and innovation on the part of the restorers regarded the transportability of the system. Today the restorers can do X-rays outside the laboratories but the whole procedure is conditioned by the fact that the canisters containing the film must be fitted in the dark. In recent years, the canister has been the object of study and innovation. A first exemplar was built using the original cardboard packaging; a second used a shower like the ones used in the building industry, lined internally with fine velvet, as with photographic film rolls. A third was then made in wood, after the risk of any irradiation had been ruled out. A new method is currently being developed that will allow the film to be transferred from the canister into its container in broad daylight, thus doing away with the need for a dark room.

The whole process of research and experimentation that went into the development of a new method for developing large-size X-rays is a good abstract example of Rosenberg's theory. Faced with technological imbalances resulting from the gross inefficiency of the traditional method for developing X-rays, the restorers at the Opificio turned their attention to the resolving of a specific problem. The solution to this problem in turn generated new imbalances which became the focus of attention for subsequent research and development. This vicious circle was repeated several times over and has still not run its course: the restorers are still working on perfecting their innovation.

2.3. The School and relations with the outside world

The school of restoration is one of the jewels in the Opificio's crown and, together with the other important restoration school led by Istituto Centrale per il Restauro (ICR) in Rome, it is undoubtedly the most prestigious training course for those planning a career in restoration.
A whole series of factors collude in making the school prestigious and much sought after, as observation of the students in the labs and on the work sites makes perfectly clear. First and foremost there is the professionalism and experience of the teachers, in particular the restorers who steer the students through their courses. From the very start, the pupils spend much of their time in the workshops under the guidance of the restorers. In this way they soon become familiar with the various techniques of the sector they are specializing in and, inside a few years, have already acquired a wealth of experience and know-how by observing the restorers at work and helping them out.
For the Opificio, the restoration school is not simply another activity but represents a real resource. The school not only provides an opportunity for handing on skills that have been honed at the Institute, it is also a chance to identify, select and recruit restorers that can be co-opted for outside projects.
The disciplined and critical approach to restoration, with its focus on experimentation and innovation, goes beyond the walls of the Opificio and the restoration and publishing work done there; through the school, it is reproduced and passed on as everyday practice, as skills that will mature in the course of the students' careers. In other words, the laboratories of the school recreate those conditions for learning that for centuries, since the Middle Ages, have informed the job of restoration.
The Opificio's relations with the outside world are extremely varied and have a particular impact on work at the Institute and problems regarding the shortage of personnel: requests for information about the school, laboratories and restoration work, consulting work, training programs for interns, exhibitions and conferences, opportunities for cooperation in research projects and restoration work in Italy and abroad.
Technical-consulting work is particularly important and onerous and the Opificio's technicians are called on for their professional opinion and advice on restoration work by those in charge of monuments and museums across Italy. The amount of consulting work, including that abroad, has mounted in recent years (Caravaggio in Malta, Funeral monument of San Francisco Saverio in Goa in India, Madonna with child by Masolino in the Bremen museum).
The Opificio promotes and participates in research projects at a wide range of universities, museums and institutes involved in restoration work at home and abroad. Recently, the Opificio

joined a national scheme through an accord with the Ministry for the University and Scientific and Technological Research and the Ministry of Cultural Heritage that will raise 75 million euro in research funds and which will also involve its local units in specific projects. Over the last years the Opificio has been working with some of the Italian universities on research study schemes and has joined other international centers, e.g. the Stockholm Museum in Sweden, different museums in Germany, the Mount Athos Cultural Center for Byzantine Studies in Greece, and papyrus studies in Egypt.

In recent years a number of important conventions have also been signed including that with the Quirinale, setting up a laboratory for the restoration of the Quirinale's tapestries (1996); that with the Archeological Institute of the University of Florence, enabling an exchange of experience and teachers (1997); that with the National Optical Institute at the University of Florence, regarding the installation of scientific equipment at the Opificio; that with Assoindustria, an accord within the framework of the more general agreement between the government and the Employers Association on cultural heritage (1998).

An important part of the Opificio's external relations is bringing its work to the attention of the public through publication in the journal, participation in international conferences and the organization of high-profile exhibitions such as "Metodo e Scienze" in 1982, and "Raffaello e Altri. I restauri dell'Opificio" in 1990. The Opificio's journal, OPD Restauro, is a yearly publication presenting some of the main restoration work of the year from a technical point of view, in this way disseminating the experience garnered in the laboratories and the new methods tried and tested.

3. Inflexible management

Having examined the mechanisms underlying the production of idiosyncratic knowledge in this organization, it is now time to look at the managerial aspects of the Opificio both from a human-resources and a financial-resources point of view.

3.1 Organization and human resources

The analysis of human resources points out certain elements that are crucial to the understanding of the processes behind the Opificio's development.

The organizational structure (see Figure 7.1) of the Opificio is in fact extremely "flat", the core consists of the actual restorers, backed up by the technical staff from the climatology laboratories,

and the chemical and photographic laboratories. Next to this core we find the staff needed to run the museum, administrative personnel, and curator and security-service staff.

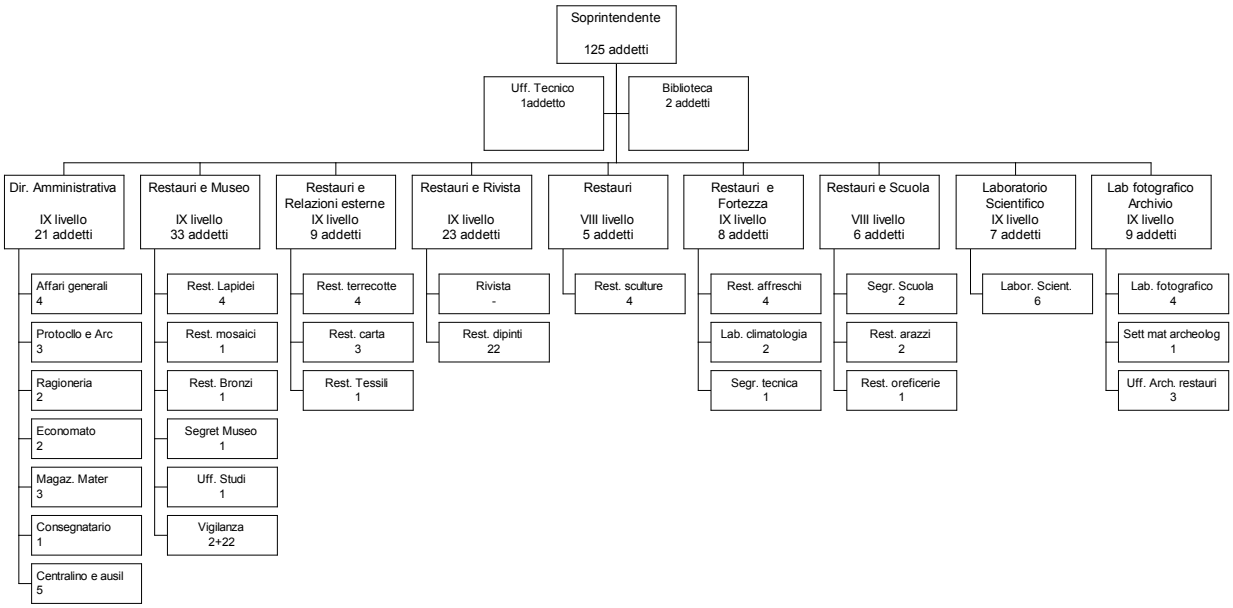

Figure 7.1 OPD organization chart.

In light of the various specializations covered by the Opificio, the number of categories the restorers are divided into (stone-like materials, mosaics, bronzes, terracotta, paper, textiles, paintings, sculpture, frescoes, tapestries, jewelry, archeological material) is striking. All the categories report to six art historians and an archeologist who, in turn, report directly (together with those in charge of the chemical laboratory and the administrative director) to the Soprintendente.

The high degree the restorers' of specialization raises a critical problem regarding the fact that there is not much spill over between one sector and another. From this point of view, the bias towards the painting-restoration sector is easy to understand, given the importance of this kind of work to the Florentine art scene, and art scenes elsewhere (this also represents a sort of "historical heritage" that the laboratory brought along when it was transformed into the Opificio). At the same time there is only one employee in most of the other areas (mosaics, textiles, jewelry, bronzes, archeological material -and certain other sectors are only slightly better off), often close to retirement age, and as a result these departments risk losing skills and practical (and often tacit) knowledge accumulated over years of practice.

All of this is quite surprising, especially if we also consider the creeping bias towards personnel not directly involved in restoration work: out of a total staff of 125, only 75 are classified as "technical-specialist" staff, compared to 21 working in administration and as many as 24 wardens (the actual number is not easy to pin down because of the ambiguous job titles provided by the Ministry, with

idiosyncratic meanings which are almost impossible to translate). Given the particular nature of the Opificio and the skilled personnel its work calls for a comparative analysis is superfluous. Once again, we can glimpse at the signs of an impoverishment of human resources, with skilled staff being gradually lost as the number of less skilled workers grows. The core staff of restorers, technicians, assistants and specialized workers has been cut by 20 units out of a total of 100 units over the last 10 years. The overall situation hides an even worse state of affairs in some of the specialized sectors which have been literally emptied (for instance, there are three people working in the lapidary sector where there was once seven).

The management of human resources is the most difficult challenge that can face an organization like the Opificio; it presents a challenge even greater than that of funding. Recruitment is in the hands of the Ministry and follows set procedures: for the higher-ranking positions, candidates must "sweat" their way through the shifting sands of "concorsi nazionali" (national examinations)[6], while all the other jobs are still subject to ministerial approval following an ad-hoc law (the Ministry has not filled all the positions, and have hired only 125 people for the 134 positions). There is a clear contradiction: on the one hand the hiring of non-crucial staff (15 people in 1984 under law 423/84 regarding the recruitment of personnel for the former *Ente Nazionale Lavoro Ciechi* for blind workers; and 6 people in the period 1981-85 under law 482/68 regarding handicapped workers); these do not even weigh on the budget of the Soprintendenza; on the other hand, the mere replacement of personnel in the key renovation positions is extremely problematic, given the time needed for new apprentices to learn the skills required.

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6 The well known inefficiency of the state in managing the public procurement examinations in this regard takes on even more incredible proportions. At the time of writing this paper – September 1998 – a nation-wide procurement exam was under way for assistant restorers (VI qualification) which it is worthwhile describing:

- The 1993 Minister Ronchey set an exam for 270 positions as restorer to meet the full staffing requirements of the " Direzione Generale Beni Artistici e Archeologici", both for the national institutes and for the local offices.
- The relevant decree for the eight categories – one for each specialization – was dated 1.12.95 but would be published only in the official newspaper no 71 on 12.9.97 and no 72 on 16.9.97, thus already implying a considerable delay.
- The examination was already seriously compromised at this point both in regard to the numbers (by now reduced to 50 positions) and in regard to the resources for the "Direzione Generale Archivistici e Bibliotecari" (Archives and Library Management). The same attribution of the various instances is evidently lacking on the part of the initial ration of the stabilized systemization of the sector of the restoration of the artistic goods; the Opificio would be assigned eight positions (initially just three but this number was negotiated with a good deal of effort), that would all the same be consented to maintain the positions of around ten.
- After the written tests, the exam committee had to suspend operations in September 1998 because, absurdly, the funds to pay the committee members had dried up (something which could obviously be remedied), wasting a further 2-3 months of time.
- Even if it were possible to finish the exams expeditiously, it was impossible to press ahead with the actual hiring since the new personnel budget for the coming year did not provide for it.

The analysis of the limitations in the management of human resources in an organization such as the Opificio reflects the limitations underlined in similar research: the system of incentives, the level of salaries, etc. In addition to these aspects, still extremely important, what is really needed is the introduction of a strong system of outsourcing. For instance, when a restoration work is commissioned, the technical/artistic supervision could remain in the hands of the Opificio, while the actual restoration work could be carried out by an external restorer (perhaps an alumnus of the Opificio). The costs of the restoration work and of the "workshop" could then be covered by whomever has commissioned the work. Such a direct solution is not possible for two reasons: first of all, the Opificio cannot receive payments from third parties; secondly, it would in any case not be able to directly hire employees (since these would need to be paid through the funds received for the restoration work).

The economic rational behind the service externalization just described does not take into account the negative consequences that it produces from the operational point of view: it weakens the accumulation of idiosyncratic masonry competence that are typically transferred and reproduced within an organization through mechanisms of apprenticeship.

3.2. Financial *resources*

As is often the case in the public sector and especially in the state-run museums in Italy, an economic/financial analysis of the resources actually allocated cannot be carried out without first identifying the various ways in which the variables considered above can be represented. Our analysis of resources actually allocated will be followed by an analysis of the request-allocation relationship, that aims at facilitating an understanding of the Ministry's priority order regarding the projects and funding applications presented by the Opificio.

a) Accounting practices and economic representation

The documents needed to carry out a financial analysis of the OPD are extremely fragmentary, since the Soprintendenza is an administrative body directly under the Ministry with no financial statement of its own. Therefore, there is not even an income statement, to base the analysis on as the Opificio has no revenues of its own (except for the proceeds from the so-called Ronchey Law for museums, that are generated through from the bookshop and similar). Regarding expenses, personnel costs are not worked out in any analytical way, and the same happens with the other Soprintendenze (where the personnel costs of single institutions are classified as Ministry personnel costs). The only documents which can be used in for a financial analysis are thus the documents

relating to the Opificio's official requests for funding from the Ministry, and those attesting the amounts the Ministry has allocated to the Opificio from its overall budget. As for other Soprintendenze, auditing the accounts means looking further up the command chain, i.e. at the Ministerial level, and checking original documents and balance sheets for items and orders. We have already discussed the limits of such a procedure in previous research work, including a paper on the innovations of the experimental Soprintendenza in Pompeii, here we will focus on other aspects of particular relevance to the OPD.

The whole ministerial budget plan is fairly irrelevant for an organization such as the Opificio, and makes even less sense for the Opficio than it does for the other Soprintendenze. The budget itself is, in fact, a very aggregated plan, designed rather to give an idea of the Ministry's overall financial position than the position of single institutions. The whole process of requesting and allocating funds revolves around a few very aggregated items with the usual drawback that once funds have been allocated to single items, they cannot be transferred from one item to another (since this would be a misappropriation of funds).

Besides the heterogeneous nature of the various items, the accounts do not give any meaningful breakdown of operative processes and expenses but simply lists, in numerical order, the expense items. So, for example, the information on restoration work is spread across single entries in the different items (2035 and 8005, 2102, 8103) without any attempt at giving subtotals; and again, there is no attempt to draw any distinction between the different aspects of activities and resources for current expenses and development.

Figure 7.2: Financial resources: Allocations 1990-98 (in Italian Lire x million)

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**Σ**
2034	365,0	380,0	400,0	415,0	548,3	700,0	630,0	600,0	520,0	4.558,3
2047	30,0	40,0	40,0	44,0	44,0	70,0	70,0	70,0	70,0	478,0
2035 others	178,3	45,4	67,0	57,0	100,0	90,0	203,5	260,0	160,0	1.161,2
total overheads	573,3	465,4	507,0	516,0	692,3	860,0	903,5	930,0	750,0	6.197,5
(2035 + 8005) restoration	180,5	199,6	234,0	241,0	347,0	463,5	450,0	920,0	320,0	3.355,6
2102	10,5	203,5	231,0	434,5	434,5	450,0	700,0	600,0	600,0	3.664,0
8103			300,0		450,0			150,0	300,0	1.200,0
total restoration	191,0	403,1	765,0	675,5	1.231,5	913,5	1.150,0	1.670,0	1.220,0	8.219,6
2035 teach.and research	25,0	125,0	135,0	140,0	275,0	225,0	190,5	150,0	165,0	1.430,5
2035 machinery		80,0	50,0	488,0	199,1	150,0	100,0	283,0	465,9	1.816,0
total direct activity	216,0	608,1	950,0	1.303,5	1.705,6	1.288,5	1.440,5	2.103,0	1.850,9	11.466,1
Σ core business	789,3	1.073,5	1.457,0	1.819,5	2.397,9	2.148,5	2.344,0	3.033,0	2.600,9	17.663,6
8005 other	500,0	500,0	1.300,0	400,0	1.800,0	2.130,0	1.650,0	700,0	1.140,2	10.120,2
8019			20,5	16,4	142,6	45,0	350,0	300,0	500,0	1.374,5
total development	500,0	500,0	1.320,5	416,4	1.942,6	2.175,0	2.000,0	1.000,0	1.640,2	11.494,7
Total	**1.289,3**	**1.573,5**	**2.777,5**	**2.235,9**	**4.340,5**	**4.323,5**	**4.344,0**	**4.033,0**	**4.241,1**	**29.158,3**

From an administrative point of view, the year 1996 marked a turning point in the attempts to address the meaninglessness of this type of accounting procedures. Aside from the repositioning of certain key items (the restoration of state property) and the request for greater detail (for instance,

item 2034 is financed globally, without any further distinction, which gives the Opificio's management a slightly higher freedom of action), the real innovation regards the actual ways of requesting and allocating restoration funding.

Figure 7.3: Financial resources: Requests 1990-98 (in Italian Lire x million)										
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**Σ**
2034	476,2	532,2	600,0	948,5	993,3	765,0	770,0	950,0	960,0	6.995,2
2047	70,0	85,0	85,0	80,0	85,0	85,0	100,0	150,0	150,0	890,0
2035 others	188,3	340,4	85,0	194,2	105,0	90,0	203,5	260,0	230,0	1.696,4
total overheads	734,5	957,6	770,0	1.222,7	1.183,3	940,0	1.073,5	1.360,0	1.340,0	9.581,6
(2035 + 8005) restoration	450,2	455,5	538,0	625,0	375,5	464,5	657,4	900,0	890,0	5.356,1
2102	438,0	623,0	769,0	1.059,5	1.004,5	1.004,5	1.004,5	1.250,0	1.225,0	8.378,0
8103					450,0			300,0	665,0	1.415,0
total restoration	888,2	1.078,5	1.307,0	1.684,5	1.830,0	1.469,0	1.661,9	2.450,0	2.780,0	15.149,1
2035 teach.and research	110,0	298,0	327,0	355,0	275,0	550,0	390,0	350,0	605,0	3.260,0
2035 machinery		50,0	50,0	595,5	221,1	182,0	254,0	283,0	465,9	2.101,5
total direct activity	998,2	1.426,5	1.684,0	2.635,0	2.326,1	2.201,0	2.305,9	3.083,0	3.850,9	20.510,6
Σ core business	1.732,7	2.384,1	2.454,0	3.857,7	3.509,4	3.141,0	3.379,4	4.443,0	5.190,9	30.092,2
8005 other	1.000,0	2.000,0	1.200,0	1.320,0	3.100,0	2.632,2	3.100,0	3.200,0	4.410,2	21.962,4
8019				16,4	442,6	45,0	350,0	450,0	550,0	1.854,0
total development	1.000,0	2.000,0	1.200,0	1.336,4	3.542,6	2.677,2	3.450,0	3.650,0	4.960,2	23.816,4
Total	**2.732,7**	**4.384,1**	**3.654,0**	**5.194,1**	**7.052,0**	**5.818,2**	**6.829,4**	**8.093,0**	**10.151,1**	**53.908,6**

Until 1996, the Opificio used to examine the requests it received for work across the country, selecting those requests it considered interesting and urgent. It would then draw up a list of the restoration work identified and chosen by the different specialist laboratories with an estimate of direct costs (materials, outside work, etc). The meaningfulness and reliability of this was somewhat dubious – it was a procedure aimed to satisfy the requests of the center, rather than a procedure

Figure 7.4: Financial resources: Allocation over Requests 1990-98 (%)										
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**Av.**
2034	76,6	71,4	66,7	43,8	55,2	91,5	81,8	63,2	54,2	65,2
2047	42,9	47,1	47,1	55,0	51,8	82,4	70,0	46,7	46,7	53,7
2035 others	94,7	13,3	78,8	29,4	95,2	100,0	100,0	100,0	69,6	68,5
total overheads	78,1	48,6	65,8	42,2	58,5	91,5	84,2	68,4	56,0	64,7
(2035 + 8005) restoration	40,1	43,8	43,5	38,6	92,4	99,8	68,5	102,2	36,0	62,7
2102	2,4	32,7	30,0	41,0	43,3	44,8	69,7	48,0	49,0	43,7
8103					100,0			50,0	45,1	84,8
total restoration	21,5	37,4	58,5	40,1	67,3	62,2	69,2	68,2	43,9	54,3
2035 teach.and research	22,7	41,9	41,3	39,4	100,0	40,9	48,8	42,9	27,3	43,9
2035 machinery		160,0	100,0	81,9	90,0	82,4	39,4	100,0	100,0	86,4
total direct activity	21,6	42,6	56,4	49,5	73,3	58,5	62,5	68,2	48,1	55,9
Σ core business	45,6	45,0	59,4	47,2	68,3	68,4	69,4	68,3	50,1	58,7
8005 other	50,0	25,0	108,3	30,3	58,1	80,9	53,2	21,9	25,9	46,1
8019				100,0	32,2	100,0	100,0	66,7	90,9	74,1
total development	50,0	25,0	110,0	31,2	54,8	81,2	58,0	27,4	33,1	48,3
	47,2	**35,9**	**76,0**	**43,0**	**61,5**	**74,3**	**63,6**	**49,8**	**41,8**	**54,1**

aimed at guiding the operations of the Opificio, moreover the funds from the Ministry were assigned on a single project basis. The procedure raised two basic problems. On the one hand the bulk of the projects involved a great amount of administrative work in the form of cost quantification, also due to the high fragmentation of activities (a lot of small restoration jobs as well as a few big ones; the actual number is around 140-150 projects per year, most of them costing an average of only 6-10 million lire in the period 1990-1995).

On the other hand, the whole procedure was very stiff because once the projects had been financed, there was no room for any unexpected developments (a slowdown in the work did not free up any resources which had been allocated to that particular project, and at the same time there was no room to satisfy extra requirements for other projects. For these reasons, two new measures were introduced in 1996. Resources are now allocated for urgent and unforeseen work (on state and non-state-owned property) and funds for restoration work are no longer requested and assigned on the basis of a detailed analytical report; instead there is a historical-artistic and a technical-descriptive report which gives a more meaningful idea of the guidelines and main interventions accomplished in the renovation activity for the year.

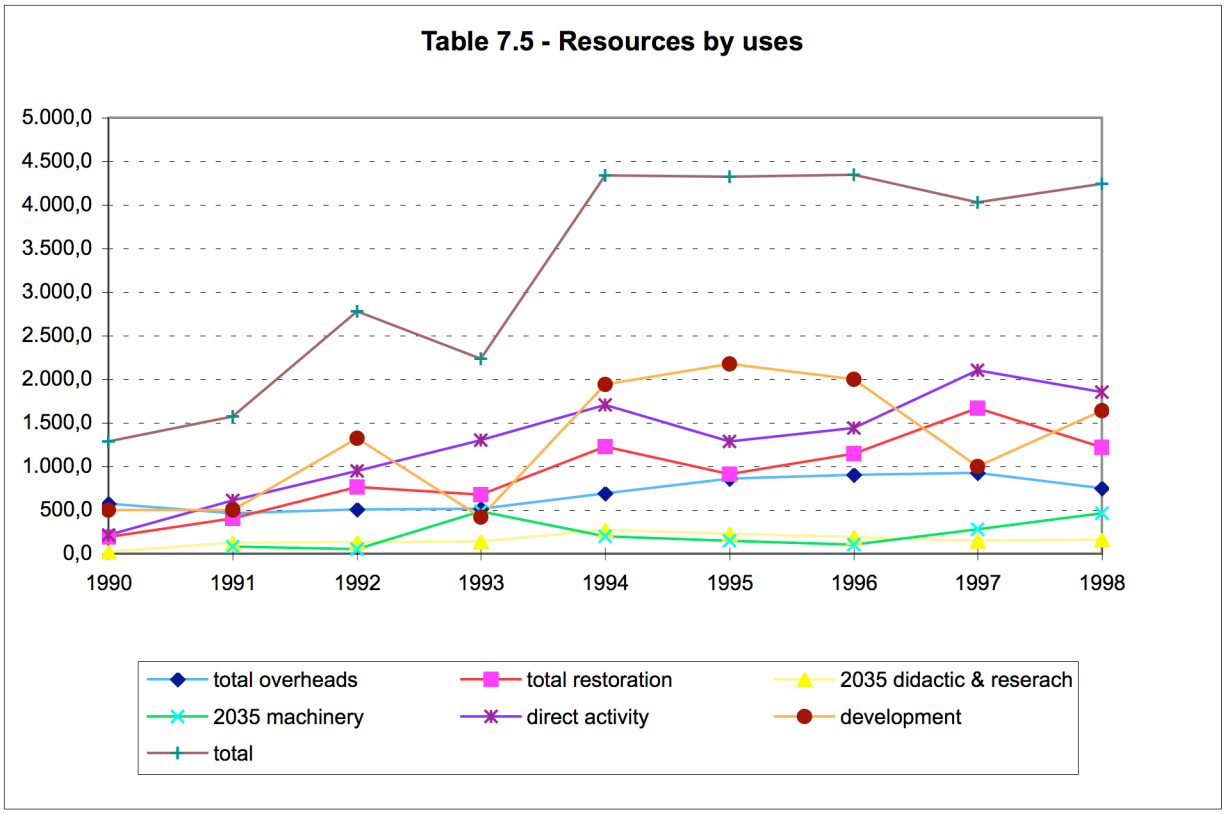
If these developments can be seen as a positive simplification of bureaucratic procedures, giving the Soprintendente greater freedom of action, it should also be noted that for the outside observer there is now far less information available due to the absence of an alternative accounting procedure. In fact, since 1996 no details are available on the number of actual projects and potential restoration. From an internal point of view too, the lack of information of this kind – with procedures, times, details and information structure to be chosen internally –hardly makes the process of allocating resources to the various restoration projects more efficient.

In any case, the logic underlying the procedures for allocation of Ministry funds hardly allows for any sophisticated approach. In 1997, for example, having already sharply cut the amount of allocations in proportion to requests, the Ministry in March decided to transfer only part of the resources (48 percent of the was given in 1996), and it disposed the remaining funds only at the end of October under the condition that they had to be used before the end of the year or else they would be lost. The result was a lot of horse trading between the different project leaders, to ensure that resources would be available for everyday expenses ("I'll give you a bit of my 8005 since I don't need it all for this project providing you give me a bit of your 2035").

Still, the main limit of this procedure (which applies to accounting procedures before and after 1996) is the total lack of any form of measurement of labor, both in terms of time and in terms of costs. This peculiarity of the programming processes in organizations such as the Opificio, is closely tied to the institutional nature of the Soprintendenza. It is impossible, in fact, to know the actual labor costs of a particular project, since the overall labor costs of the Soprintendenza are unknown to the extent that the personnel cost is charged directly to the Ministry; work times and costs do not need to be calculated since the job is done on the basis of substantive criteria (the historical-artistic value of the work) and with internal resources without any sort of contribution from whoever commissions a restoration work. The absence of crucial information of this kind makes any attempt at improving productive efficiency virtually impossible.

b) Resources allocated

Turning to the funds actually allocated in the period 1990-98, Figure 7.5 clearly shows the trend: sustained growth until 1994 (in four years allocations are tripled) and then the trend surprisingly flattens out after 1994. This growth is only partially linked to the number of restoration jobs done, and the overall number is explained also by other items (i.e. it is not just a matter of quantitative growth, it is also a process in which the actual nature of the costs in play is modified).



In more detail, the accessory costs (summed up under items 2035 and 8005, not including the cost of labor) of restoring state-owned property range from about 180 million lire in the early period to about 460 million lire in the last few years, excluding the peak in 1997 (at the time of the study we do not know if 1997 was an exceptional year on account of extraordinary allocations or if 1998 momentarily interrupted a phase of expansion). Restoration work on non-state property (item 2102) also grew from an initially low level (10-200 million lire) to 450 million, and then to 600 million a year. On top of this, the funds spent on special projects (item 8103) need to be taken into account. These illuminate the Ministry's preference for large (and visible) projects, over the large number of smaller jobs done at the Opificio. Overall, the trend is positive, growing from an initial 200-400 million to 1,200-1,400 million, with a peak of 1,600 million. It is important to notice how, in the

period under consideration (taking into account the large amounts spent on the Battistero funded under item 8103), resources spent on non-state property (4,764 million lire) are far greater than resources spent on state property (3,357 million lire).
This shows the evident contradiction of the work of the Opficio being treated as a "gift" given to other public bodies which do not pay for the restoration work, even with considerable budget problems this creates for the Opficio. The Opficio not receiving any kind of payment for the restoration works cannot be justified simply through the idea of a public body that takes care of public property, given that more than half of the restoration works are carried out on non-state property.
Figure 7.5 highlights the substantial amounts spent on so-called accessories expenditures in relation to the direct everyday running costs of restoration (as well as the massive 1.1 billion lire outlays for the Baptistery project):

- there has been a very sharp growth in the sums spent on equipment, both in absolute terms and in terms of variation, with a total of 1.7 billion lire spent in the last four years, most of it on new technology;
- a good deal of renovation work hsd been done on the offices and headquarters (in particular the Fortezza da Basso) totaling 10.3 billion lire;
- a considerable amount (about 1.1 billion lire) has been spent on the Opificio Museum, which reopened in 1995;
- there has been a slowdown in the money spent on teaching activities at the OPD school (indeed, because of the freeze in funds in 1996 it was not possible to enroll new pupils that year).

What can be pinpointed is a trend towards outsourcing - the various fixed costs increase proportionally (as if they were variable) – contrary to what might be expected: a dilution of the costs by virtue of their very nature. Such a state of affairs is due to the peculiarities of the growth of the Opificio, partly connected to the extraordinary nature of the work done on the Fortezza (spread over the years to respond to the availability of ministerial resources so that what is technically a fixed cost becomes a variable one); partly to the research and teaching activity (school, museum and review) which complements the actual restoration work, as explained in the section on the business idea of the OPD. The slower growth of expenses tied to actual restoration work is certainly odd and represents an interesting subject for research (where the relevant information is available). There could, in fact, be various reasons for this phenomenon: the stagnating demand for restoration work; quite simply the unavailability of ministerial funds for these items; the lack of resources and

man-hours on the part of the Opificio, which would reduce its ability to spend on its core business. All of these reasons might also be linked to a process of outsourcing, i.e. a party interested in the restoration of some kind of property or work of art might directly supply the materials and workforce (former pupils of the school), leaving merely the management of the project in the hands of the Opificio. This last situation would not raise problems from a substantial point of view – formally, the same procedures and rules would be respected – but from a management point of view this would result in the loss of activity in the Opifico's accountability.

c) Requests and allocation of funds as a measure of ministerial bias

Those who know the Ministry's funding matters know that between requests and allocations there are always substantial cuts. With regard to the Opificio, an analysis of the request-allocation trend for the period under observation highlights a few specific points. At an aggregated level, the situation at the beginning of the period was very critical with an acceptance rate of 47 percent in 1990 - accompanied by almost folkloric-type aspects if it were not for the seriousness of the previous questions[9] - followed by a positive trend until 1995, with acceptance rates returning to 60 percent or 50 percent in the last two years. The aggregated picture, however, hides important internal differences which deserve to be considered if the aim is to point out the Ministry's bias in allocating resources in a period when allocations as we have previously seen trended upwards. Especially concerning actual restoration work, the following aspects can be observed:

- An improvement in the acceptance rates for restoration work on state-owned property (under items 2035 and 8005) from about 40 percent in the period 1990-93 to 70-90 percent as of 1994, followed however by a sharp drop (to 36 percent) in 1998 (once again, it is still too early to determine whether 1998 was an "unfortunate" year or whether it marks the beginning of an inversion of the trend); for the period as a whole, the average acceptance rate was 64.7 percent.
- Requests for restoration work on non-state property (chapter 2102) grew faster than those for state-owned property, though acceptance rates remained at unsatisfactory levels: the rose from 30-40 percent in the early years to 40-50 percent in the second phase, with a one-off high in 1996; overall, the average rate for the period has been around 44 percent.

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[9] For example in 1990, as regards telephone expenses, the Soprintendente, faced with a request for 70 million lire and an allocation for 30 million lire in June of the same year, had to reiterate the need for additional funding if the institute was to continue operating. Again, it verges on the sublime to read, in a document such as the 1996-98 3-year plan, a statement phrased as follows: "As indicated in the other items regarding running costs (item 2034), telephone expenses (item 2047), postal expenses (item 2066), car expenses (item 1067) represent what the institute actually needs to provide the logistical and organizational support for the above-mentioned activities. Their funding is therefore crucial to the extent that it in turn allows work to be done in other sectors."

- The substantial funds dispensed under item 8103 show a particular attention paid by the Ministry to "large-scale" projects with high levels of visibility and prestige (as much as 1.2 trillion of the 1.4 trillion lire requested were granted, a rate of 84.8 percent) once again, with a prospective concentrated on the whole, this may appear as a positive development, but as a matter of fact this situation shows that the Ministry is unable to understand the Opificio's everyday activity. This everyday activity consists of a number of small-size restorations of little appeal, which nevertheless represent the core activity, and which receive a much more selective treatment.
- It is worth noting that such an analysis is particularly significant for an organization like the Opificio: the extent to which the institution is able to satisfy the demand for restoration work (at least those projects considered interesting enough to be included in operating plans) reflects the effectiveness of the institute itself, its "social role". This aspect is particularly interesting given the lack of other performance indicators for the OPD. From this point of view, the data for the period under examination is hardly encouraging – of the total number of restorations there is an overall acceptance rate of 54 percent –indicating opportunities lost and needs not met. And all of this, it should be noted, happens outside the responsibility of the management in view of the nature of the allocation processes in question, to such an extent that one might talk of ineffectiveness caused by others.

The analysis offers further elements of interest if we examine the relationship between allocations and requests referred to other items:

- General expenses show an alternating trend with relatively high initial acceptance rates, which then drop dramatically in the last two years, to such an extent that the Soprintendente was led to say that this was "the item which presents the greatest number of problems from an operational point of view".
- Expenses linked to teaching-scientific activity seem to point to constant a misunderstanding on the part of the Ministry, with annual acceptance rates of around 40 percent (except for 1994), which resulted in serious operational problems in the period under consideration (e.g. the failure to book work in 1996 because of the shortage of funds; or again the limited number of projects taken on in 1998, which resulted in the request for additional funds in the same year).
- An opposite trend for equipment costs, with very high acceptance rates in percentage terms (86 percent in the period), and even an extremely marked movement in absolute values.

- Renovation projects (item 8005, excluding restorations) appear to have relatively low acceptance rates (46 percent) but here the data are misleading. As a matter of fact, the financial commitment is high in absolute terms: as much as 10 billion lire allocated against requests for 21.9 billion, probably due to the effects of self reinforcement and inflation (if the amount requested for one year is not met, the same amount is requested again the following year). In general, however, the big restoration projects are accepted and funded even if the actual time frame is lengthened.
- Finally, the high acceptance rates for (and absolute values of) work falling under item 8019, especially regarding renovation work and renovation of the museum reopened in 1995, show once again the strong bias to structural work and a particular attention towards the museum's activity even if an organisation such as the Opificio has other priorities and the distinctive elements.
- On one hand the examination of the acceptance rates for work under the different items shows how the Ministry satisfied the strong demand for funds to cover development projects and finance the costly renovation work on the various offices and funds for the subsequent investments in equipment which are the basis of the Opificio's success. On the other hand the Ministry has not satisfied the requests regarding the school, probably due to them not having fully understood the routines involved in non-extraordinary restoration work.

4. Conclusions

In the preceding pages we have tried to describe the development of a top rank organization which has won prestige and recognition throughout the world, all of which has been achieved one might say, notwithstanding its institutional framework which seems to ignore, if not act as a draw back towards, the complex mechanisms involved in building the skills and knowledge which this kind of work demands.

The genesis of the development itself of the (new) Opificio is very much an emerging unplanned one. It has however taken full advantage of the incredible mix of experience, enthusiasm and cooperation, so well described by Paolucci (1986) and, thanks to the role played by certain key figures (beginning with Umberto Baldini who founded the new institute in 1975), it has gradually taken on the basic characteristics (scientific-didactic; operative-research) described above. The actual performance of the organization is as difficult to assess as the value of the art treasures and the heritage it has helped restore, though it really must be seen as being in the same order of greatness.

The Opificio is today in a somewhat vulnerable position, with its fate not being in its own hands but, unfortunately, in those of the Ministry. The Opificio has managed to maintain its excellent standards despite everything (badly paid workers, understaffing, a bureaucratic decision-making process- see for instance Bonsanti, 1997); it has also been able to deal with internal relationships which still remain non-problematic, thanks also to a strong professional commitment by its staff. The crucial issue today however is how to reproduce this specialist knowledge at a time when the number of staff members involved in classical restoration work is rapidly decreasing. It is interesting to note that Baldini himself complained of a similar state of affairs just a few years after the Opificio was refounded[10] – a crisis which today again is replaying itself even if financial needs are covered more thoroughly.

From this point of view, there are three aspects of state intervention (and the role of the Ministry in particular) which are striking, especially since they appear contradictory. The first aspect is, the character of exceptionality, with an incredible capacity to move in emergency situations such as the 1966 flood, but also when a single exceptional effort is required (the restoration of the door of the Baptistery). In open contrast we find the misunderstanding of the problems and the needs concerning everyday activity: the current operations of the institution, the choices regarding human resources, the cut in minor restorations and operating costs**,** which nevertheless constitute the core activities of the Opificio.

The second aspect is, the schizophrenia of the state intervention and the bias in investments. If, as we have seen, structural investments (the laboratory, the Fortezza, the Museum) have received a generous treatment over the years, the same cannot be said for investments in the school, in the direct restoration costs and, to an even greater extent, in human resources, especially high-skilled personnel. The risk that this generates is that of building a beautiful but empty container, a sort of cathedral in the desert. The same has been underlined by the Soprintendenza itself which claims that

[10] "Baldini's concerns regarded above all practical problems: the inadequacy of the structures, the shortage of financial resources, the basic insensitivity of the city towards the future of the Institute... Indeed, problems were coming to the fore which had largely to do with difficulties existing at the very foundation of the new Opificio. The autonomy of the laboratory had been fixed by decree, justified certainly by the history of Florentine restoration and inevitable because of the circumstances, but rushed nonetheless and incomplete, without any precise rules... One was coming to the realization, in other words, that the extraordinary treasure chest of tradition and experience of the old laboratory and the new Opificio had been poured into a frail structure, put together in improvised and precarious fashion... Despite the prestigious statements and the notoriety it enjoys both in Italy and abroad, the Institute is still unable to express its potential to the full. And all - it is worth remembering - because of a basic legal indeterminacy and a chronic shortage of financial resources and political attention" (Paolucci, 1986, 216).

the personnel is "in danger of extinction" (Bonsanti, 1997)[11]. The reasons for such behavior are not easy to determine but may include:

- The Ministry's "veneration of objects" – the professional bias of a body which deals mainly with museums rather than organizations such as the Opificio, whose functions are very different and which have a radically different working profile.
- The lack of management knowledge at ministerial level in terms of strategic management of human resources and skills notwithstanding the objections of certain authoritative figures (from Baldini onwards) does not allow a focus on the development of intangible assets.
- The obsession with containing and reducing personnel costs, a consideration which often appears, among decision-makers, to be a-priori, if not ideological, with very little attention being paid to the actual peculiarities of the situation. The result is inevitably a solution that does not address the need to maintain, develop and share the know-how of this organization. In this case in fact, the objective of finding a short-term cost flexibility creates a risk not only of failing to generate improvements (not considering what other solutions, e.g. allowing internal operations through direct contributions,) could mean, but also of interfering with the mechanisms and processes of skill and knowledge accumulation in a dangerous way. In business jargon the high human-assets specificity would cause transaction costs that were larger than any possible short-term cost savings.

The third aspect to note is the highly asymmetrical way in which the Opificio is forced to deal with economic resources, in a period when public spending is being sharply cut and the demand for value for money is instead constantly increasing. The Opificio continues (and is forced) to operate within a logic whereby restoration work is done without there being any payment from whoever commissions the work (almost as if it were a "fire brigade service of the arts" which does not charge for the call or for the intervention). This is the case even when the client recognizes the higher value of the competencies of the Opificio and is prepared to pay. Still, if the State is decidedly generous as regards the potential revenues of the Opificio (in effect, foregoing them), it is less generous with regard to the costs side where the shortage of overall resources leads to situations – such as the freeze in hiring – which can have dangerous consequences for the very existence of the organization.

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[11] "… you may notice also in this location that the potentiality of the structure and the branches, starting from the end of the work-in-progress, is superior to that of the current personnel in service that, as you may note, is decidedly meager. An increase in personnel, already solicited many times, could consent a greater use of those potentialities and the follow-up of greater results" (Report of the three-year plan, 1996-1998).

During our interviews the Soprintendente firmly reiterated: "If you ask me what is my main problem, I can tell you it is not money but staffing, and in particular the impossibility of hiring" (interview, 31.10.97).

Certainly a different institutional framework would help change the playing field; even without any naïve claims for complete financial self-sufficiency, more flexible and functional conditions could certainly be created. This would allow the Opificio not only to make use of third-party funding and contractual payment for work done but it would also allow a degree of autonomy in managing key resources like personnel. This in turn would provide an incentive to raise financial resources and maintain levels of professional reputation, which also attracts financial resources. It would also force management – much more than is the case today – to identify priorities and make choices, e.g. regarding the work that can be done in a particular period; the duration and, perhaps, the cost of projects as well as staffing. If the Opificio were accountable for all the costs and the Soprintendente was delegated real power to manage resources, then there would probably be someone, somewhere, who at some time or other would inquire as to whether what was needed for those sectors in danger of extinction was a chauffeur, a caretaker, or a restorer, and whether Or if, for example the museum really needs to function as it does today, or whether it is possible to find other less expensive ways, leading perhaps to a reallocation of resources to the core activity.

In any case, it would be possible to overcome the present situation where the human resources needed are not assigned while the personnel not needed is provided. This situation generates costs which, all the same, are not charged to the Soprintendenza.

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