Miquel de Moragas and Miquel Botella, Editors

The Keys to Success

The social, sporting, economic and communications impact of Barcelona'92

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BARCELONA '92: STRATEGIES OF TECHNOLOGY

FERRAN PASTOR BERNADAS / JORDI LÓPEZ BENASAT[1]

1. INTRODUCTION

Few human activities in our day escape the use of information technologies. The Olympic Games are not an exception; on the contrary, the growing use and importance of technology is more notable than in other activities, for a number of reasons:

— the very evolution of the Olympic Games has turned them into the most watched spectacle in the world. Here the contribution of television and telecommunications has been decisive;

— the increase in its size to unexpected limits: number of federations, countries, athletes, competitions, spectators, television spectators and so on;

— the excellence and quality that the Olympic Games demand in all aspects, and their commercial implications, so that many world-wide enterprises wish to see their names associated with them. Technological enterprises are no exception, and indeed are the leaders in these types of strategies.

Another phenomenon that should be pointed to is the growing integration of different technologies that participate in the Games. From the first use of computers in Rome 1960 and Tokyo 1964 to give information of the results, to the present day, new functions have been added based upon computer support of telecommunications.

In the 1984 Olympic Games (Los Angeles and Sarajevo) the classic areas of functionality supplied by information technologies began to be designed:

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Jordi López Benasat. Telecommunications Engineer. Director of the Telecommunications and Electronics Division of the COOB '92. Director of the Centre for Information and Technological Operations (CIOT) during the Olympic Games.

1. Functions necessary for the Organizing Committee during the period of preparation and organization. Basically, these are related to telephone systems, the automization of offices, internal information, publications, security, reproductions, and so on.

2. Treatment of the results with many components and destinations, with the participation of all kinds of information technologies.

3. Information systems for the Olympic Family.

4. Logistical support systems for the Olympic Games, for accreditations, lodging, transportation, and so on.

5. Systems related to security.

6. Teams related to sound and the monitoring of images.

7. Private telecommunications, such as in the transmission of data, the CATV, radiocommunications, pagers, and so on.

8. Public Telecommunications.

These differentiated blocks have been basically the same in the Olympic Games of 1988 (Seoul and Calgary), and 1992 (Barcelona and Albertville).

Constructing this service complex, raising it to a maximum quality level and advancing in the integration of technologies, improving the experiences of former editions of the Olympic Games, was the challenge that Barcelona '92 faced.

2. The Candidature

In 1983 the Barcelona Olympic Office drafted a project that had as its goal the approval of the candidature of Barcelona by the Spanish Olympic Committe and the support of the Spanish central government.

The need was perceived to develop a project that would structure an adequate technological proposal for the organization of the Games while demonstrating the capacity of the city and of its citizens and enterprises to successfully confront so great a challenge.

The project was titled *Planificació de les necessitats Informàtiques i de Telecomunicacions per als Jocs Olímpics de 1992* (Planning of the Information and Telecommunication necessitites of the 1992 Olympic Games), also know as BIT '92 (*Barcelona Informàtica i Telecomunicacions 1992*). This project set out the goals and ends of the use of technology that would be maintained until 1992. It represented the collaboration of 50 people, and lasted a year, with 10,000 hours of work involved.

The work method of BIT '92 was structured into three phases:

— Analysis of necessities and requirements.

— Elaboration of strategies in relation to hardware, software, applications, communications, electronics, security, and television.

— Development of plans, where the respective projects were described.

Time has shown the importance and utility of BIT'92. Its incorporation in the Candidature Dossier gave solidity to the technical area. It allowed for a promotional campaign to make the candidature known, stimulate sponsorship of large enterprises and prepare the offers of the industry itself. BIT '92 was in general an instrument that increased trust in the possibilities of the Organizing Committee.

The forecasts of the size and number of projects necessary eight years beforehand were quite accurate, considering the rapid evolution of technological services. The strength of its content allowed for the inititation of the activities of the Technology Division of the COOB and the revision made at the end of 1987, as well as the selection of necessary projects, and the revision of the volumes of material, resources and the budget. Finally, a promotional campaign was started to initiate the long negotiations with the enterprises involved.

3. Programming phases

The various projects of the Technology Division, which included such varied disciplines as information technologies, telecommunications and electronics, responded to the same programming process, which can be schematically summarized in five large phases (see Table 1):

a) Planning
b) Development/Project
c) Installation
d) Preparation for Operation
e) Operation

3.1. *Planning: work strategies*

All of the organizational process, both in form and in dynamism, was based upon the application of strategic actions that would define the working philosophy of the Technology Division of the COOB '92.

TABLE 1. PROGRAMMING PHASES

	1988 1989 1990 1991 1992
Planning	IIIIIIIIIIIIIIIIIIIIIIIIIIIIII
Development/ Project	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII I I I I I I I I I I I
Installation	IIIII I I I I IIIIIIIIII
Operation preparation	IIIII I I I I I I I I I
Operation	I I I I I I I I I I I I I IIIIIIIIIIIIIII

A project with a fixed date

The project had to enter into service at an immovable fixed date, which meant that all of the developmental tasks, including installation and preparation, had to be ready in a margin of time that would avoid unneccessary risks. To confront this goal three basic criteria were defined:

a) conservative planning;
b) participation in binding tests;
c) priority of functionality.

Through conservative planning the idea was to have the technological systems that needed a certain degree of development ready a year before the Olympic Games, so as to have time to absorb any unforeseen delays, and also to be able to dedicate necessary time to the tasks of preparation of the operation.

Knowing that established planning is often not sufficient motivation if not accompanied by absolutely unavoidable committments for everyone involved, committments were made to participate in important tests that would take place in times coinciding with the terms of completion of the projects according to conservative planning.

Finally, a third criteria was the priority of functionality, included in each of the three planned versions of the technological projects, so that the first version would include the absolutely necessary functions, and the following versions would add other convenient functionalities.

Short duration

The second charcteristic of the service was its short duration, and thus, the impossibiltiy of correcting faults or, as is common in many cases, refining a system once put into operation. The organizational strategy established two actions:

d) operative evaluation;
e) simulations.

The life cycle of technological systems implies a development even after a cycle has ended and once laboratory tests and the first acceptance have been made. We have called this phase the operative evaluation, consisting in advancing the operation of the system with the simulation of the real application, through simulation tests and rehearsals that allow for those things lacking to be discovered, which only the operation itself can make evident.

Large volumes

Another characteristic of this technological service are the large volumes that it has to cover. This characteristic takes on much more force when related to the two we have analyzed until now, that is, the fixed date and the short duration. Added to the simulation tool, which we have already mentioned, the decision was made to apply two basic ideas in the installation process, in the preparation of the operation, and in the operation itself:

f) normalization;

g) the industrialization of certain processes.

Large volumes were needed to supply 28 sports competitions, which implied that many services had to give simultaneous information in many different venues. In a certain way this implied that after the development of a system it was necesary to make a «response» (often with small adaptations) for each of the territorial units where it was in operation. The normalization made the response much easier both in terms of design and in the assignment of the installation task, and the industrialization of the installation process itself. This normalization, guaranteeing the homogeneity necessary when dealing with such high volumes of application, also has positive repercussions in the operation: it allows one to make the operative procedures more uniform; it gives great flexibility in the assignment of human resources; it has many advantages for the training of personnel.

The other basic strategy that the large volumes gave rise to was the industrialization of processes, applied especially to installation tasks. The design efforts and the organization of the processes made over time, when time was still available, allowed to rapidly make actions that otherwise would go ove the time limits available. This could be applied, for example, to the set-up of the information teams and their preparation for the operation.

Criticality and visibility

Two characteristics, criticality and visibility, could have increased the negative consequences of poor functionality. Here, as well, strategies were developed that can be synthesized as follows :

h) use of proven technologies;

i) freezing of innovations;

j) redundancies in solutions;

k) emergency procedures.

The use of proven technologies that are at the same time up-to-date obliges one to chose carefully in each case. When a technology is introduced which due to its nature is still in a position to suffer regular innovations, it is very important to know how to decide how to freeze a version leaving aside advantages that a new version could bring, for there is always the risk of a lack of stability in its use.

It was also necessary to take other precautions to confront unforeseen circumstances, the most elemental of which was to have solutions prepared to be applied in case the procedure designed had any problem. Emergency procedures also had to be prepared so that given minimum functionality, the operation of the Olympic Games would not be stopped.

Training and preparation of users

A very typical characteristic of this great sporting event is the fact that it is practically impossible to prepare users previously in the majority of systems. On the one hand, a large part of the users were volunteers, and it was necessary to plan training that was not overly excessive based upon a previously-stated dedication to the Olympic Games. On the other hand, the second large group of users were members of the Olympic Family, for whom it is practically impossible to plan training due to their sheer numbers, arrival dates and the very logistic previous to the opening of the Games. For these reasons two norms were established:

l) user-friendly designs;

m) clear documentation.

When possible, touch screens were used to simplify the operation (as in the case of the commentators' system and the EPH). In other cases the advantages of PS/2 computer terminals were considered; playing with colours, design was able to facilitate dialogue. In all of these cases a strong help function aided use.

In all systems that had to be directly operated by the members of the Olympic Family, a numerous group of volunteers were trained to solve any doubts that could arise in spite of the friendly design and the operative documentation.

Estimate of requirements

The development of technological systems had to be carried out —or at least had to begin— without the direct participation of the final users. Many of them came on the

scene for the first time a few days before the Olympic Games opened, while others joined the organizational structure of the COOB '92 much later than the final date to begin the technological projects. This was quite important for the definition of the requirements which, contrary to what would have been ideal, had to be done in a speculative manner to be able to move forward.

There were two strategies to cover the risks derived from these unavoidable situations:

n) flexible applications;

o) operative evaluation.

The design of the applications and the tools used in the system were such that they allowed for flexibility in the change of some requirements (especially in reference to outlets) without great effort.

We have already mentioned the stage known as the operative evaluation, during which the systems were put into service well before the Olympic Games. This was an excellent moment to try to bring the final users as close as possible to the already designed operative system, since it was still possible to introduce changes that would not signify structural modification.

Subcontracting

The general norm in planning and organizing each aspect of the Olympic Project was to use as much subcontracting as possible in the development and finishing of projects, while always trying to attain a maximum Olympic committment from the enterprises assigned to each project. Furthermore, the projects allowed for the use of volunteers in a great part of the operations.

This position had many advantages. On the one hand it assured that the projects would be developed by enterprises with experience within each of the functional areas. On the other hand, the staff of the COOB '92 was reduced, which, given the logical disappearance of the Committee afterwards, would produce minimal distortion in the labour market. Another positive aspect allowed for the concentration of efforts of personnel in the initial planning of projects, dialogue with users when possible, control of development, and, finally and most critically, the preparation of the final operation.

Sponsorship

The choice of enterprises to carry out the projects was done according to the following criteria, besides traditional

considerations of cost, quality, and guarantees of fulfillment of due dates:

— experience and presence in Barcelona, needed especially in the final participation of the operation;

— a committment to the Olympic Games, seen in the form of sponsorship;

— the desire for corresponding visibility;

— the capacity of particpation in the operation.

Volunteers

The use of volunters lead to the assurance of being able to count on all necesary personnel, who showed the enthusiasm and good will that being a volunteer implied. This also meant a challenge for their choice and preparation.

The strategy defined to respond to all of these challenges was maintained in three areas of action:

p) specific criteria in the identification of volunteers;

q) specific training of volunteers;

r) integration of volunteers in the structure.

For the identification of volunteers, file cards were analyzed to find those with the best characteristics to work with technological systems. People with proven experience as directors or technicians were invited to cooperate to cover specialized positions, or unfilled positions after jobs were matched with the volunteer cards.

During the first semester of 1992, a process of specific training took place in the technological systems that each employee had to operate, as well as the integration of the operative structure where each person had to carry out their tasks.

Costs

Finally, as in all good organizations, logical budgetary limitations and limitations in human resources were taken into account. The cost of the Games' technology, with the exception of the areas of radio and television, reached 30,000 million pesetas, itemized into the large categories seen in Table 2.

It should be noted that more than 60% of this quantity was sponsored by enterprises within the commercial programs already mentioned. It is worth noting that the investment of Telefònica related to the Olympic Games was around 92,000 million pesetas. The 3,000 million invested in the preparation of the technology of the Olympic Games and its operation corresponded basically to the cost of human resources. There war also revenue in the sale of technological

assets once the Olympic Games had ended, to a value of 900 million pesetas.

TABLE 2. TECHNOLOGY BUDGET OF THE BARCELONA GAMES

Telecommunications	7,000 million pesetas
Electronics	3,500 million pesetas
Electronic Security	1,600 million pesetas
Hardware	5,500 million pesetas
Software	5,200 million pesetas
Services	4,200 million pesetas
Preparation cost of Olympic Games technology and its operation	3,000 million pesetas
Total	30,000 million pesetas

3.2. *Project Development*

The assignment of projects to enterprises was made at the end of 1988 so that the developmental phase for the majority of projects could begin in early 1989.

The organizational model applied was tailored to specialization, designating «leadership» of each project in function of its specific nature. This was also reflected in the organization chart, with hierarchical structures (project, system, division) included within the Information Systems, Telecommunications and Electronics Division (see Table 3).

The principal tasks to facilitate the step to the following phases were:

— Determine the number of terminal elements and their location (necessary for the installation phase).

— Determine necessary human resources.

— Prepare documentation for training and for users (necessary for the preparation of the operation).

In considering this phase of development/project and especially of the installation, it should be recalled that not all projects were equal.

In Table 4 the projects appear ordered by blocks from lesser to greater complexity, each of them affecting development and installation in a different way.

TABLE 3. DESIGNATION OF PROJECTS AND SERVICES

System		*Enterprises*	*System*	*Enterprises*
Internal Telephone	Network	Telefonica	Methodology of Project Control	
	Switchboards	Ericsson	Information Systems	
	Cable	Sintel	Central systems	
Public Networks		Telefonica	Central systems	IBM
Transmission Network		Ibermic/Telefonica	Local systems	IBM
Terminals	Telephones	Telefonica	Basic systems	IBM
	FAX	Ricoh	Technical support	IBM
	Videoconferences	Telefonica	Design of local networks	IBM
	Radio communications	Philips/Indelec	Simulation	IBM/UIB
	Walkie-talkies	Motorola	SW monitoring and control	IBM/Bidisa (Legent)/ /Selesa (Candle)
Radio Networks		Telefonica		
Spectrum control		DG Telecom.		
CATV	Credits	Jerrold/Televes	Software	
	Cables	Sintel	Business adminstration system (SIGE)	Calculation and management
	Televisions	Philips	Results system (SIR)	EDS
	Videos	Panasonic	Commentators System (CIS)	IBM

	Transmission Teams	Alcatel	and equipment system distribution of printed results (EPH's)	Xerox
Ground instruments		Seiko		
Scoreboards	Alfanumerics	Seiko	FO Information System (AMIC)	Eritel
	Sports	Baybor/Olimpex	Operative administration system (SIGO)	USE (SEMA Group, T&G)
Large Screens		Vidiwall/Philips Jumbotron/Sony		
Sound		Philips	Reproduction	Xerox
CCTV Sports		Panasonic	Publications centre	Xerox
Accreditations	Photography	Kodak	Archive documentation	Philips
Personal control access		Iecisa	Administration of spaces and design aid (CAD)	Disel
Material control access	Metal detectors	Kryptos/Garret	Management facilities	Sema Group
	X-Rays	Siemens	Local support to users and venues	Centrisa
CCTV security		ECV	Ophimatics (equipment and software)	Apple
Systems intrusion		Aisa	Olympic Games Promotion *Olímpia* data base	Compuservice CIDC

TABLE 4. SYSTEMS TYPOLOGY

Block	*Characteristics*	*Projects*
1	Distribution of standard equipment. Non-essential special installations (only electrical energy)	Photocopiers Pagers TV Screens Radio-telephony (closed group) Short-range Radio-telephony Mobile telephones
2	Distribution of standard equipment. Special installation needed (normally cables previous design)	Electronic security Conference rooms CATV CCTV Sports Telephones Ophimatics Sound Video conferences Accreditations photography
3	Systems development (hard and soft)	Results systems (SIR) Commentators systems (SICO) Information system (AMIC) Business Administration systems (SIGE) Ground instruments (Seiko) Scoreboards (Seiko) Results distribution system (EPH's)
4	Complex central services	Internal telephone Data telecommunications network Data processing centre Publications centre Private radio-telephony network Public networks

3.3. *Installation*

It was of great interest to have sufficient time to install and test all equipment and systems. Thus it was necessary to have the sports, residential, logistical and operative facilities available with maximun lead time. This was not always possible, either because the owners did not cede their spaces until the last minute, because they were still in the phase of construction or reform, or because the COOB had to pay for their use in function of the time they would be occupied.

The installation phase kept five elements in mind in planning:

— *Standard installation plan*
A common process was followed in all venues and syncronized with other projects, so that the mechanisms of modification and adaptation could be facilitated.

— *Decentralization of the facility*
Each facility had its own team, which would be responsible for the operation during the Games, though under the coordination of the *Centre d'Informació i Operacions de Tecnologia* (Information and Operational Technology Centre) (CIOT), which covered the phases of installation, operation, adaptation until the Paralympic Games and the final take down.
— *Associated Logistical Planning*
In parallel and in coordinated fashion, there were projects for the transportation and storage of material, accreditations, catering for personnel, internal security, and so on.
— *Acceptance Tests*
Systematic acceptance tests of the teams were carried out with maximum lead time to avoid problems.
— *Maintenance*
The maintenance plan had a double structure: one part (personnel and replacement material) in the venues, and another centralized part made up of expert personnel and reserve material with mobility to displace it to the venues or act in special cases, as in ceremonies.

3.4. *Preparation of the Operation*

In this phase the human structure that had to act during the Games was completed. The staff was widened in the Technology Services, with staff incorporated to the COOB for a period of less than six months, and the volunteers incorporated to round off their training.

This was a transitional phase where many of those in charge still did more than one task until obtaining a precise adjustment of the total human and technical structure. Furthermore, due to the delay in finishing the projects, there was little time to carry out this phase. The beginning of this phase was the result of a firm decision of the Direction of the organization to break off the temptation to continue perfecting projects until the last moment.

3.5. *Operation*

The calendar for systems based on information technologies was linked to the organizational functions which supported them. Thus the operationality of the overall group of systems was not done on the same day nor in the same

month. For a long period of time operative systems coexisted with others that were still being tested, which gave rise to problems when common resources were shared (the central computer, for example).

TABLE 5

HUMANS RESOURCES				
	Preparation		*Operation*	
Source	COOB'92 Staff	90	COOB'92 Staff	90
	Enterprises	575	Enterprises	2,530
	Total	665	Part-time	300
			Volunteers	2,600
			Total	5,520
Function	Direction	50	Direction	50
	Project Directors	50	Territorial Direction	300
	Technicians	500	Technicians	1,070
	Administrative Staff	65	Operating Staff	2,600
	Total	665	External Services (TE)	1,500
			Total	5,520

In any case, the weight of the operation fell in the beginning of July with the opening of the Olympic Village and the Main Press Centre. The end did not correspond to the last day of the Games. The majority of systems continued to be operative as long as the Olympic Family was in Barcelona.

The principal challenge of this phase was the great number of resources that had to enter into operation almost simultaneously. In all probability the Olympic Games moves more human resources and more advanced technological equipment in a short operation period than any other event in the world.

The new applied technologies in the Barcelona Games were as follows:

— CD-I for hymns
— Videofinish
— Integrated system for results
— Touch screen terminals for commentators
— Information systems for commentators
— EPH - Electronic Pigeon Holes

— Optical archive systems
— Integrated information systems -AMIC
— Pre-Games information system
— Massive fibre optics system
— Digital network of integrated services
— Digital network of data transmission
— Videotelephones
— GSM and GPS
— Image transmission for video-security
— Cable television system

The incorporation of volunteers was widespread and effective. For example, User Aid Centres were maintained which in some cases were open 24 hours, as with the International Radio and Television Centre.

From the CIOT all problems communicated by different venues were registered and kept under control, while the functioning of all systems was monitored one by one. Thus in the cases of results, security, the central computer, and so on, there was a duplicated control that ensured the efficiency of the service.

4. Final result

The final result for technolgical systems is positive if no «noise» is produced due to gaps or faults —that is, if the services go unnoticied. If any «noise» was produced, especially in the mass media, this was to praise the systems.

In all sincerity, this was the case of the Barcelona Games, where the basic technological systems went unnoticed in the best sense of the term, and those that were visible, such as those used by the Olympic Family, had unprecedented success in terms of use (in some cases three times that of Seoul, a great advance) and were highly praised.