Introduction

1. INFORMATION SCIENCE AND DEMOCRACY

E-learning, education at a distance using computer technology, plays a integral part in the democratic expansion of university education which, after the end of the Second World War, gathered momentum both in theory and practice in the USA, where, alongside the traditional – and for us extremely modern – possibility of choosing the place and the quality of one's own education, a choice made practicable by the great mobility of the student population, the universities began to address themselves to the less mobile section of the population, which was settled in less developed areas all over the country. This meant attempting to reach enormous numbers of people who both as a class and as individuals were socially, economically or culturally underprivileged, and who, as their mobility decreased, were forced to resort to lower and lower levels of secondary education, consisting, in the better cases, of Teaching Colleges and Junior Colleges. This mass of people was looking for some form of intermediate technical education or often was trying to regain levels of technical ability and culture that they had lost during years of unskilled labour or during military service in the vast armies that the US deployed at the end of the war. Also, there was a strong impetus to improve their technical skills on the part of individuals who, whatever their age, against the backdrop of the great wave of economic optimism that was a feature of the post-war years, were determined to climb the social ladder by acquiring the most up-to-date or exhaustive specialist skills. After a first stage marked by several if sporadic local initiatives, backed by the humanitarian spirit so typical of American society, the experts of the American University, foremost among them Clark Kerr[1], offered a coherent solution, as an ideal or rather an ideological and political response, to the problem of the variety of educational itineraries offered by the universities. Necessity and the novel experiments already underway gave them an excellent opportunity to think long and hard on the role and the meaning of a University in a mass society; in other words, in a society intricately and variously structured, in which, openly or latently, there existed an ever-growing demand for a form of education that the 'traditional' university system could not meet without undergoing a comprehensive and convincing reform. It was Clark Kerr in his famous book *The Uses of the University* in 1963 who put forward the idea that the university in its classic sense no longer existed. The time was right, perhaps, for such an idea. The debate on the role of the modern university in Britain and America had already lived through two cardinal moments: one halfway through the nineteenth century in the writings of John Henry Newman[2], and the other in the first half of the twentieth with Abraham Flexner[3].

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[1] Clark Kerr (1911-2003) was the first chancellor of the University of California, Berkeley, and the twelfth president of the University of California. He is regarded as the acknowledged expert on the American university in its transformations in the second half of the twentieth century, and the recognised master of all those who contributed to the changes in methods and applications and to the great increases in participation in education and improvements in university management in the USA.

[2] John Henry Newman (1801-1890) was a pre-eminent figure in British academic and religious circles in the nineteenth century. He was a teacher at Oxford. Ordained as an Anglican priest, his subsequent conversion to Catholicism was much commented on at the time.

[3] Abraham Flexner (1866-1959), physician and educator, founded the Institute for Advanced Study at Princeton.

In their ideas and works these two masters moved away from the idea of a University as a community of scholars dedicated to knowledge for its own sake – and thus favouring a non-specific education, that of undergraduates rather than graduates – towards a concept of the University as a place of instruction where high-level professionals, the embodiment of the ruling classes, would be trained by a specialised, scientific and technological educational system. Flexner, the American, was particularly absorbed with the sense of leadership that the University had to instil not only into the classes destined to govern the country, but also – and above all – into the entire society. "Universities must give to society not what society wants, but what it needs". This was the lynchpin of Flexner's teaching, and to this day certain great American universities hold true to his concept, or would like to. But in the fifties and sixties the world had changed and society was questioning their countries' leaderships, and thus also the university system, with the vehemence typical of mass behaviour and the passion of political urgency. Clark Kerr held his most responsible posts at the University of Berkeley and the University of California at the same time as the struggle for Civil Rights and of the Free Speech Movement, the anti-Vietnam War protests and the first wave of Baby Boom youth who were pounding on the doors of the universities to be let in to claim their right to higher education. Kerr, an economist with a clear sense of history and also of politics, like some prophet had already understood at the end of the fifties that the universities, as he put it, were 'at a junction of history'; anchored firmly in their past, they appeared to be floating uncertainly towards a future that was difficult to perceive. Today David Ward, president of the American Council on Education is right in saying that "every student and every head of university owes to Clark Kerr a great debt of gratitude – because it was his vision, courage and determination that led to the creation of the modern university and to the idea that every student, whatever their background, had the right to enter a university college". The new University, born in California, became a model and a 'realisable objective' for numerous American institutions of higher education; it was conceived of as a collection of communities: the community of the undergraduates and of the graduates; the community of the humanists, of the scientists and of the social scientists; the community of the purely professional faculties, of the non-aca-demic personnel, and of the administrators. This cluster of communities, of often conflicting interests, was supplemented by other communities outside the university, from that of the former students to that of the representatives of various levels of government, to the communities at a local level, groups of financiers, foundations, non-government organisations. At a time when political action on the part of the students was becoming the most powerful and dynamic aspect of university dialectics and against which all reforms had to be measured, even the mobile student communities began to play a full, if often fickle, part in the new University.

Certainly, one cannot compare the dynamic events taking place on American campuses in those crucial years with the upheavals happening in Italian universities in the same period. The social and ideological impetus towards the right of access to university was just as strong in Italy, if slightly behind the American experience, at the end of the sixties and throughout the seventies. What was lacking was a bold coherent idea of the energy of reform like that which in California - the true national laboratory of America – was involving teachers and thinkers, important university administrators and interested politicians. However, the new American university, whose influence extended to almost all levels of society, represented the most coherent and rapid response to changes in a society that was in no way comparable to Italian society, either from the socio-political or cultural point of view. In Italy no one was prepared to turn a time of intense crisis into an opportunity for increasing the genuine benefits that the University could bring to the entire country, as well as to its own system; in America the benefits amounted to impressive advances in research, a substantial improvement in the quality of life for a large section of society, greater efficiency in university institutions, a higher social status for members of the scientific community, leading to their increased influence on political decision-making, as well as – what could perhaps could have been easily achieved also in Italy – a higher level of service towards the public bodies and communities of the areas in which the universities were located. All this, however, was beyond the practical, or even cultural, capabilities of the scientific and political power holders in Italian universities, even the best of them. Yet long before the onset of the deep social upheavals that shook Italian universities

after 1968, when word and proof of the great programmatic advances gaining ground across the Atlantic reached Italy, it was immediately understood that the movement of ideas of which Clark Kerr was the chief, though not the only, instigator, included as their pivotal component the comprehension of the importance, for any reform to be successful, of the widest possible use of all the means of communication and information available at the time. Already in 1964, it was not uncommon to hear in the classrooms and debates in the Italian University strong appeals to the new experiences taking place in America, where "the University is on the move and branching out, multiplying its institutions at a local level, expanding them by adapting to the needs of the area, reaching even inside people's homes with its radio and TV programmes… one therefore begins to perceive that there exists a kind of *Invisible University*, which, using the idea Mumford adopted for the entire city, emerges wherever certain functions that require the physical presence of all the participants are replaced by functions that can be discharged by reproduction by mechanical means, electronic transmission and rapid distribution to anywhere on the planet… One is struck by the fact that perhaps a more modern University can blend into a more modern city just when it loses its firm outlines and the strict physical contiguity of its structures and begins to reflect in its own progress what is taking place territorially and technologically in the city as a whole. This new idea of a technologically evolved university, integrated into enormous areas where there is not only a multiplicity of possible choices but also of means of access and where competition, selection and specialisation, and also social density can reach a maximum, has been given in America a new name: the *Multiversity*."[4] The writer of this passage had in mind the lessons that Clark Kerr had given the year before as President of the University of California, in which, for his idea of a new university, he coined this expressive term, Multiversity; the writer could certainly deduce the importance and cultural roots of this intricate concept – the reference to Mumford shows this - but he could also accept it as an element that

was perfectly transferrable into the Italian context, especially, or entirely, as regarded the role played by new – or not so new – information technologies in the expression and fulfilment of the social and scientific objectives of the Multiversity.

This was still a long time before the spread of the personal computer, but there is nothing surprising in the fact that, in the above quote, along with 'reproduction by mechanical means' one could already talk of 'electronic transmission'. The computer revolution and its personalisation was already in the air. In October 1965, at the Bema Show in New York, what is considered to be the first ever Personal Computer, the Olivetti Programma 101, was unveiled; an incredible missed opportunity for Italian industry. We had to wait another ten years for the Altair 8800 (January 1975), twelve for the renowned Commodore Pet (January 1977). In that same year, however, the Apple II (June 1977 came on the market, which marked the turning point that the scientific and educational world was waiting for, and began the production of the first generation of PC's which lasted from 1977 to 1985, in other words until the evolution of electronics decisively moved in the direction which brought the performance of so called home computers close to that of professional workstations.

Already in December 1968, Douglas Englebart, an American researcher at the Stanford Research Institute, in a demonstration – later dubbed 'the Mother of all demonstrations' – held at the Fall Joint Computer Conference (FJCC) in the San Francisco Convention Center, had foreshadowed all the scientific and educational developments that would be stimulated by widespread use of computers. Putting into effect the research carried by his group – the Augmentation Research Center of SRI International – he constructed for the occasion a network of a thousand professional stations spread over a vast area, and put into effect – and practice – clearly and brilliantly what would have been a normal working day in front of a computer in the twenty-first century: introducing interactive texts, videoconfer-

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[4] Lucio Barbera, 'L'Architettura dei Campus universitari in America', lesson given during the course of Architectural Composition B in the academic year 1964-65 (course professor Ludovico Quaroni). Course Topic: 'A new University campus for Rome'.

encing, tele-conferences, e-mail, hypertext and the use of the mouse, of which he was the inventor. In other words he demonstrated the extraordinary potential of what he himself called NLS, or oNLine System.

Today in America it is virtually commonplace to express regret that the principles underlying the Multiversity, in the long run, and because of the spread of a large variety and different levels of universities, have led to a flagging of attention paid to a coherent basic intellectual education, and to an excessive misuse of specialisation and the fragmentation of knowledge. Undoubtedly the conflict of interest between those who are bent on working for the aims of research and those who believe in its commercialisation has created often serious distortions in direction both of research itself and of education. Additionally, competition within the galaxy of higher education has often ruined any conditions for collaboration or partnerships between universities. In fact, even those who believed that opening the doors and windows of the universities would lead to an increase in community spirit, are now complaining of the loss of any sense of academic community, whether humanistic or scientific. At any rate, as an inalienable part of our common heritage there remains the growing contribution made by information science to the effectiveness and efficiency of research, to the collaboration between great networks of participants, to the spread of knowledge and to the reliability of results. What we would like to say is that there remains information science's contribution to the democratisation of education, which was one of the original prophetic suppositions of the Multiversity. In practice, and not only in Europe, there is still much to be done, and above all, to debate. In fact, in view of recent experiences and partial disappointments, it seems more appropriate to thoroughly reconsider this mission that information science is supposed to be embarked upon; society, and not only American society, has undergone further changes. Just as the borders between classes and between the political parties that represented them have been removed, the idea that there is a clean division between those who can and those who cannot participate, directly and physically, in academic activity in educational establishments is no longer true; or at least it is no longer completely tenable. Apart from cases at either extremity of the scale – i.e. those people who devote themselves to their studies with all the

means, and time, at their command on the one hand, and those on the other who encounter serious obstacles to devoting themselves even partially – we are dealing with a demand for an education in which most people, during the time spent in university studies, at least in certain period, show only a partial willingness to move around and, shocking as it may seem, only a partial interest in the education on offer (either from reasons of work or because in many cases the opportunities for education that non-academic society offers, knowingly or unconsciously, are numerous, attractive and even advisable). It may be better, therefore, to think of the NLS mainly as a resource which is also only partially usable for educational purposes, to be integrated into, but not to replace, the activities carried out in the places specifically set aside for them.

There is however a second reason why we should reconsider the mission of information science in university education. The 'democratisation' of university entrance in the last few decades, even in Italy, has led to academic institutions taking on the character of mass educational establishments. All the educational organisations of the first and second level have been, and still are, subjected to great pressures; one need only look at the size some of the bigger universities have attained – for example, Rome Sapienza in forty years has grown from around thirty thousand students to around a hundred and fifty thousand. This vast increase in student numbers has not been accompanied by a proportional growth in the number of teachers, and when the student-teacher ratio has been maintained, the necessary quality of the teaching has suffered, for the simple reason that research, where teaching quality is created, has not been able to increase to the same extent as the teaching, either in terms of suitable personnel or in terms of financing. The institution of the university is nowadays very different, in the way it functions, from the university whose formal structure it still replicates. In any case, that unique and indispensible straightforward rapport between teachers and students that took place during lessons but above all in other complementary moments of university life, where students had access to their professors, where they could converse and collaborate, is not practicable or even feasible in the new mass university. We should, therefore, be designing and experimenting with new forms of teacher-student relations, where, for example, a large part of the basic

ideas could be taught electronically, personalised if possible, while the time for 'face-to-face interaction' between students and teachers could become the principal part of the educational process, taking place in un-mediated dialogue between the 'master' and the 'pupil'. We need to completely rethink the system of how the teaching is distributed, breaking it up into different stages; today it is in fixed hours of lessons and laboratory; we have to move on to more flexible, and above all more dependable, systems where the main burden of information is presented to the students on-line, while the physical presence of teachers and students together or their participation in laboratory work is reserved for the more important parts of the teaching programme where the teacher is irreplaceable. Naturally every discipline, every educational itinerary will have, as it does today, its own specific objectives, methods and difficulties that must be surmounted; but in general one can say that throughout the entire sector there is a real need for a commitment to a radical structural reform of the didactic system and the ways in which the students and teachers can participate in it. Of course, one presumes that a different function of on-line information will correspond to the three educational levels, from the three-year degree to the doctorate; at the first levels the e-learning can mostly replace traditional teaching, while at higher levels the computer tools will be increasingly used for advanced learning and proper research activities.

There is a third point worthy of consideration. The growth of universities has been paralleled by a multiplication of separate research and educational groups with their own specific qualities, attitudes, and 'philosophies' which has led to a thinning out of particularly brilliant scientific personalities, meagrely spread out as they are in a constellation of perhaps too many components. The capacity of the oNLine System to catalyse research and education on the web seems to point the way towards the development of the students' learning paths, especially of those at the second or third level, by the addition of shared experience between different centres and students with different training and different basic cultures, given the fact that the NLS by its very nature ignores national boundaries. This becomes particularly interesting in our case where peripheral centres are willing to connect up to the historical central group of institutions that makeup the Italian university system, by creating access to centres of higher educational quality, beginning with decentralised institutions. One can definitively maintain, therefore, that within a consciously reformed environment, the use of NLS as tool for sharing high-level educational experience, even in cases of on-line relations between groups belonging to universities possessing identical qualifications, can decisively increase the effectiveness of teaching and the overall quality of education.

The last point concerns the specific use of information science tools in the training of architects at the first, second and third levels. The introduction of these tools into architecture has revolutionised perhaps more than in any other sector the work methods not only of the students or of the researchers, but the entire international system of architecture. There is no need here to recall the radical transformation that the spread of computer tools has brought not only to the production methods of design, but also to the fusion of these design methods with the other technical and scientific documents that are an integral part of architectural production. Also, we need not dwell upon the new impetus to geometric, spatial and dynamic exploration that these new tools have exerted in architectural design. All this is well known and is the main reference point of our research. What I wish to point out is that, despite many experimental initiatives at a local, national and international level which are promising but often, if not always, disappointing or at least not capable of being applied on a significant scale, it can be maintained that the teaching and learning of architectural design cannot take place without a direct contact between teacher and student; in the case of architecture, in fact, it cannot take effect except in a relationship of 'master' and 'pupil'. Ludovico Quaroni often reminded all of us that one of architecture's peculiar features was that it could not be taught by means of an entirely scientific method. Intuition, the essential requirement in architecture, if it is not to be purely artistic expression, can undoubtedly avail itself of a detailed scientific knowledge of a specific design problem, but it cannot ripen except through a close direct relationship that is colloquial, dialectical, exemplary and even contentious, with current architectural thought, with a working architect who has been chosen, for his institutional role or for some transitory cultural affinity, as the master of design. Obviously we are not thinking of ei-

ther the renaissance 'artist's workshop' or the anonymous medieval schools, although they should be given some reconsideration, in our intimately internationalised, and thus in some ways medievalised, modern world, where the great collective organisations of architectural production have such power. However, the ripening of architectural intuition cannot be achieved through a lengthy, or what is worse, a totally exclusive series of instruments and artifices; we must convince ourselves that it involves a transmission of culture that has aspects that *cannot be entirely rationally analysed or transmitted* – once upon a time one would have said 'ineffable' in the original sense of the term.

Thus our research, even despite its apparent fragmentary appearance, firmly believes in the idea that information science tools and the oNLine System should be utilised in innumerable ways in the various independent stages of an architect's learning itinerary, but that they can never totally replace the maieutic aspect of master-pupil relations, even if the masters, due to the extraordinary capacities of computer science, can be themselves multiplied, since, even though distant in space, they can be visibly and audibly next to us in a shared environment, even interacting with our own designs. We ourselves are spectators with other students gathered from all over the world to share together the most precious and unique moments in our and their educational growth. Research into the most effective way of realising this 'Augmented Reality' as the Americans call it, is our most ambitious objective, along with a parallel investigation into all the other possible stages of teaching in which information science technologies can be used as a normal and potent tool for the training of an architect.

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