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THE QUALITY IN THE PROCESS OF SELF-BUILDING: ANALYSIS OF THE MOST EFFECTIVE INFORMATION SYSTEMS FOR THE SELF-BUILDERS

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ABSTRACT

For some years now our research group deals with self-building, which is a subject that is particularly topical today. Its benefits are now known to everybody: the economy of expenditure, the response to the specific needs of users but also ethical reasons concerning ecology, respect for nature and the attention to the recycling and reuse of materials.
Working in this field we have been able to establish what the most common limits of the process are: the inadequacy of the legislation (especially in Italy) of the rules and regulations; the unpreparedness of the productive sector; the guarantee of acceptable levels of quality of what is built (training for auto-builders, process control, and security). Just this last point is dealt with in this study. It aims to identify what the most effective information systems are for the self-builders in order to assure the quality of the product (the building) and the process. The current means of spreading turned to self-builder often give only general information. This work aims to offer an analysis and evaluation of the effectiveness of different forms of communication in this sector (training courses, videos, textual printouts, graphic printouts, etc..) through which an easy, immediate and complete understanding of the setting of the project and the way in which it must be realized (use of materials, application techniques, phases of the work) can be guaranteed.

Key words: social housing, sustainability, information, materials, construction techniques

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Introduction

Self-building is a practice that is now widespread and a process of great interest because of the particular circumstances of the economic crisis we are going through. This process of self-management indeed minimizes the sequence of proxies (between customers, users, designers and firms) and therefore reduces the overall cost of the operation.

Precisely, the reasons that lead to taking an interest in the activities of self-building can be traced to:

- the increasing size of the so-called "gray band", which includes the growing part of the population that is no longer able to access adequate housing for their possibilities and needs [1];
- the progressive decline of production for public social-housing;
- the increase in construction costs (especially in the last 10 years);
- ethical reasons (many actions of self-building show a marked attention to the issue of ecology and respect for nature, providing for the recycling of materials, recycling of water resources, reducing energy consumption, using 0 km materials or, sometimes, natural materials such as straw and clay).

Analyzing the cases of self-building in foreign countries, the most significant experiences are found in the USA, England, Egypt, Algeria, Denmark, Norway and Ireland (where 25% of the building for residential purposes is self-built). However, the analysis of the case studies reveals some limitations that this practice still presents:

- in some countries, there is an objective inadequacy of the law and, consequently, there is a lack of knowledge of financing mechanisms and, in general of procedures. In Italy, for example, there is no specific legislation regarding self-building; some regions drafted laws (Piemonte, Lombardia, Veneto, Umbria and Emilia Romagna), but these proposals have not been made into legislation; [2]
- guarantee of acceptable quality levels in what is built (through the formation of self-builders, control of the process, safety in construction);
- guarantee of the full participation of the self-builders in the planning and construction process. An analysis of the Italian experiences, for example, has shown that especially in the case of the self-assisted (if an outside agency is committed to providing organizational-bureaucratic support for the home-builders: procedural assistance, economic and financial assistance, project assistance, technical and operational support to the effective execution of works) the management from the "top" of the whole process - "turnkey" model - expropriated the homebuilders from the necessary participation in the various steps of the process [3]. The administration of economic resources by a company with an independent financial management has made it very

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difficult for homebuilders to be aware or make decisions about the use of resources allocated to each individual yard. This, in many cases, has led to the interruption of the building activities.

The investigated experiences have also shown that in the situations of spontaneous self-building (in the absence of external assistance agency), if the homebuilders do not have real knowledge about construction of the objective to create in the design phase and also during the learning of building systems phase (courses, workshops, etc.), they show discouragement and lack of motivation during the execution phase, to the detriment of the success of the process.

In response to these limitations, this study aims to identify what the most effective information systems and training for homebuilders are in order to ensure the success of the process and the good quality of the construction.

Communication

The process of training / information of self-building is strongly influenced by the type of process that refers to:

- *Spontaneous self-building.* This is the case where individual people undertake the process of self-construction driven by the desire to build their own cheap house either individually or in cooperatives. In these cases, the people themselves are interested in finding the necessary skills, relying on professionals or attending training courses and workshops.
- *Assisted self-construction.* Sometimes, as mentioned above, the homebuilders, taking part in cooperatives, may be supported by an external organization that provides procedural and technical assistance. In these cases, these institutions provide information about bureaucratic procedures and organize training courses for the inhabitants.
- *Self-building for emergencies.* Another self-building case is that of emergency housing, as a result of natural disasters, which is required, not only for the inexpensiveness of the work but also for the speed of implementation. In these cases, the process does not start with a training program for homebuilders, but proceeds directly to the construction involving them during the construction phases.
- *Self-building in solidarity.* Another field of application is that of solidarity: many associations and groups of designers are interested in promoting the self-construction of buildings, residential or social, in the poorest countries. The aim is not only to respond to housing needs, but also to social ones; so the training phase is not just about teaching the work to be carried in the building yard, but also a time of participation and promotion of the initiative to ensure the involvement and endorsement by the inhabitants.

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- But what kind of information and training should be provided to self-builders?
- In the process on self-building, two different needs can be distinguished: information (linked to the knowledge of the bureaucratic procedures and the various options for the obtainment of funds, as well as different building solutions to choose for the home); and the training (linked to the knowledge of the construction process and its phases, in other words in the instructions for the "do it yourself").

Information

The information may be understood as the transmission of knowledge from one subject to another. In the case of self-building, information involves all activities aimed at providing knowledge for the management of the process of self-construction. More precisely, through information, inhabitants need to put themselves in a position to be familiar with the procedures (the bureaucratic process to follow, the necessary permits, access to financing, how to purchase the area, the project management of resources, guarantees, the total costs), but also should be able to know the materials and designs that they can choose for their home, as well as measures to build a environmentally efficient home, generating power, while reducing waste and electricity costs.

This kind of information (very important for spontaneous self-building) is present only in some situations. A positive example is given from the UK, an area where self-building is now developed in a structured way, which has already made specific websites in which this information is provided for the people that approach the theme of self-construction in order to understand whether and how to proceed. A completely negative example can be found in Italy, where, as mentioned before, there is no reference standard but there are no guidelines (there are only the regional draft laws, which was mentioned previously, but they have never been adopted). The discipline, therefore, presents many holes that need to be filled.

Training

The training is a more complex process and is aimed at the acquisition of skills. It can be understood as the educational process through which one transfers skills aimed at the understanding of the project, identification of operational steps, to the knowledge of the implementing rules, the identification, reduction and management of the risks involved in the performance and safety of the work carried out.

In this educational process, according to pedagogical theories [4], there are several teaching approaches that professionals can follow while instructing: they can simply dialectically expose the information and steps required through lectures or through the

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supply of manuals or drawings or movies, leaving self-builders/students in a passive role; or they can initiate interactive processes through practical lessons (which see students and teachers work side by side), possibly using interactive tools, such as video recordings that allow homebuilders to control the way they carry out the work and check for errors. The best approach is the second one, although it depends on the learning styles that characterize the group of learners: *visual style* is characterized by wanting to see what is to be learned through verbal language (technical standards) or a nonverbal one (drawings, photo and video) or mixed (manual); *auditory style* where one would rather hear what you have to learn; *kinesthetic style* in which one prefers to learn by acting. The studies about non-formal and informal learning [4], especially when they are done in a group of people, show that the key to learning is the intention of those who must learn and their participation in the group that shares that particular interest.

Etienne Wenger [5] translates this way of learning into communities of practice, which are groups of people who share knowledge, a worry or an interest in a particular subject. They establish mutual relations and develop a common approach to the conduct of their actions. So the process of learning must exist regardless of whether there are forms of programmed instruction; rather it must be modeled by the people, according to their needs and their interests. The need to involve learners means that if you start a process of teaching only orally, it is interesting not only to express abstract knowledge or procedures, but to tell real events that have implemented those directives, the problems that have occurred and their consequential solutions, making the phase of teaching similar to telling a story. The teaching style that puts learners in an active position and in interaction with professionals is ideal.

Little attention to the participation of learners means that they will never have full knowledge of what they need to learn, maintaining a disinterested attitude that will have an effect on their learning and overall outcome of the process. Experience from our team, during the processes of self-building for solidarity, showed that if the homebuilders follow the instructions precisely on how to build the building without knowing exactly what the result should be (event that can occur especially in the case of self-building for emergencies or for solidarity) fail to lead to absolute involvement and very often this has an impact on the result of the construction.

Participation in the learning process, but also in the design and construction, realizes the "sense of belonging to the process" and ensures that the homebuilders perceive the idea of working to build "their home" and not just a simple “housing”.

Undertaken Study

To test the effectiveness of different communication systems, a study was undertaken that was developed through the following steps:

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- *individuation of main systems of training.* The first stage involved the identification of the main training systems currently adopted in Italy and abroad;
- *data collection on case studies.* Interviews were conducted with firms and groups that deal with self-construction in order to find out about the solutions adopted and the limitations encountered during the training phase and execution;
- *comparative analysis of communication systems.* Based on the data collected and experience gained in the field, it was possible to carry out a comparison between the different systems;
- *application to model building.* At this point a study was undertaken on a series of building-types with different characteristics in terms of construction techniques, type of self-building (spontaneous, assisted, for emergency, for solidarity), type of user (age, level of education, level of knowledge of the process of self-construction);
- *checking of the limits of applicability.* For each of these buildings the administration of different types of training systems (text + image, text + photos, movies + verbal explanations, workshops) to different groups of people (age, level of basic knowledge) is considered.
- *comparison of the level of learning and the effectiveness of the training system adopted.* So, in each case, the most appropriate training system can be evaluated based on the level of learning found, but also the duration and cost of delivery of the training.

Investigated Case Studies

The interviews were conducted so as to identify the various methods adopted and the limitations encountered during the process, in order to understand the effectiveness of the communication system. Some experiences, that is considered more significant, are summarized below in the following table.

Table 1 : Interviews

Filo di paglia (Italy)	*Filo di paglia* is an Italian design studio that takes care of thinking, and build with sustainable materials, especially with straw. The study organizes, throughout the year, different training courses, called the school yard, open to students, professionals, entrepreneurs and building manufacturers and anyone who wants to have an experience of self-building with natural materials. Generally, the works of the structural parts and systems are designed and implemented by specialists. The school yard is organized with a duration of 4 working days and is structured with a theoretical part (which usually ends on the first day and it consists of lectures on general information about construction in wood and straw and safety on the yard) and a significant part of practice (which occupies the remaining days, and is represented by the construction of significant parts of a building, for example a wall with an opening, so that they teach participants how to make the ground connection of the construction, a closed wall, an opening, the attachment of the roof and finishing).

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Smart-local tierra (Spain)	*Smart-local tierra* is a platform organized and promoted by a couple of architects, Pilar Diez Rodriguez and Izaskun Villena Marcos (Spanish restoration specialists), to spread the practice of recovery of clay buildings. This is performed through workshops, opened to students, professionals and self-builders, which teach the techniques that are most suitable for building restoration, especially through the use of clay. When they turn to project designers, a process of participated planning starts that is realized with the construction or renovation of a building. The structural and plant project is always realized by a specialist, while the rest is done by customers, previously prepared by the workshop. In cases where the training was carried out in the yard, it uses illustrated manuals, videos and demonstrations.
Potton (UK)	*Potton* is a designing and building construction company that operates in the whole UK. It also operates as a service company for homebuilders. The assistance activity includes, in a first step, the funding application, the choosing and buying of the lot. Then the group involves the self-builder in the design phase, and then they accompany him into the building. All of this is done within the Self Build Academy, which is a seminar that consists of lectures concerning the information about the processes of self-building (finding the land, design, permits and financing), and workshops, which explains the performance the various processes, predominantly for buildings with timber support structures.
BAG (Italy)	The BAG (Beyond Architecture Group) firm has been involved in EVA, an eco, self-building village in Pescomaggiore (Abruzzo), which was built following the earthquake of 6th April 2009. The houses are made of straw with a wooden frame. The emergence, in this case, required the design choices that were intended for the ease and speed of execution, so the architectural project involved modular homes with wooden frames and plugging with straw bales. As often happens in cases of self-construction for emergencies, a preparation phase for self-builders was not planned, but they learned the construction technique during the yardwork with the aid of the designers and skilled workers. The group also addressed to self-building projects in non-emergency situations, in which case the preparation for self-builders was given at the workshops that are open to the public, in order to encourage this type of construction.
Progetto CASA (Italy-Guatemala)	*Mezzosangue Lab* is project coordinator of C.A.S.A. - Central America Sustainable Architecture - which aims to promote self-building in Guatemala for charitable purposes. Among the initiatives undertaken, there is a House of Crafts in the village Cerro La Granadilla that serves to welcome the young people of the village to teach them a job in order to achieve their economic independence. Construction of the house was performed by the villagers, designers and volunteers from Europe. The latter were prepared beforehand by participating in the construction of a prototype of the house during the workshop Low cost-low tech, held in Sibari (CS) in 2012, with the young student of Master "Housing-new ways of living" of the Faculty of Architecture in Rome 3 University. For the real project, the villagers were trained by designers and volunteers at the site. The only didactic action planned was the creation of graphics manuals describing the design and construction phases to attract and involve young people in the building too, distracting them from working in the factories of fireworks.

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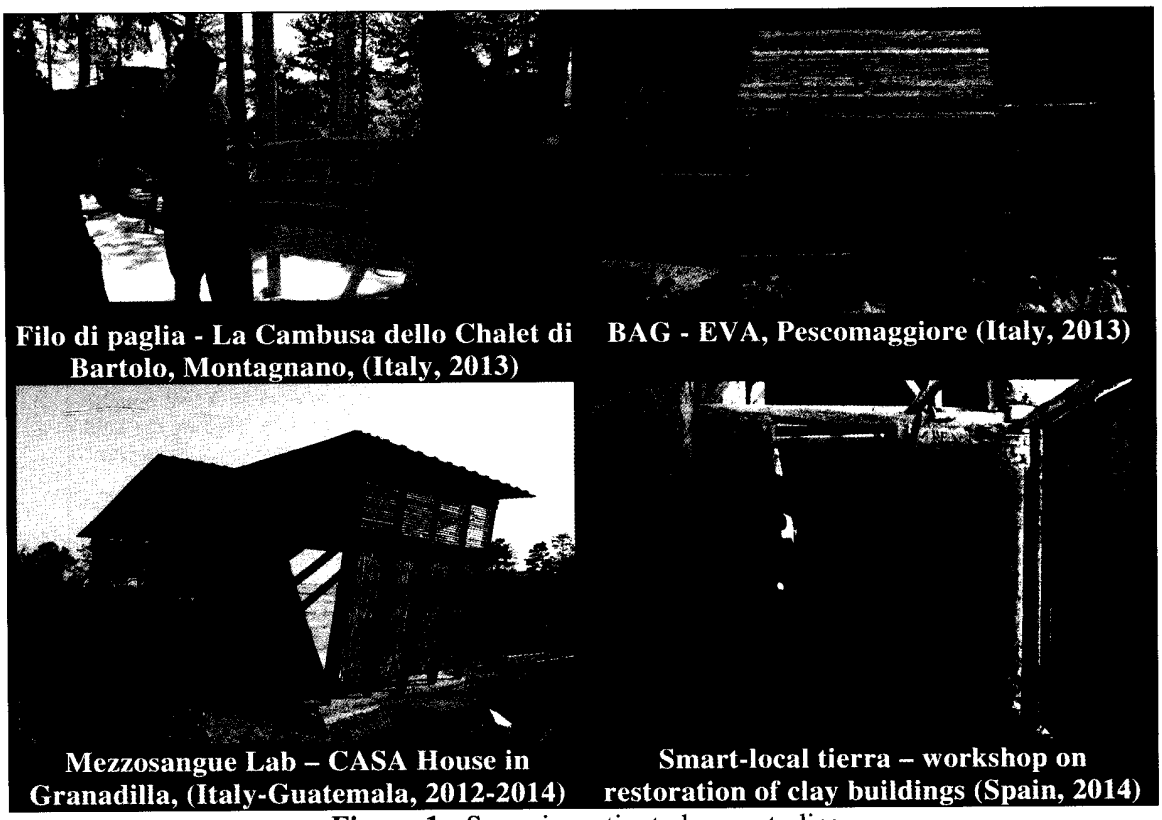

Figure 1 : Some investigated case studies

Obtained Results and Expected Results

The means of communication used in the processes of self-building, to educate people about the activities to be performed, may be different. The purpose of the training is the project, the information on the safety and organization of the site and an explanation of the construction phases of each job to be performed during construction. In the following table these systems are summarized and evaluated based on the following parameters that are significant for the choice to be made:

- *Ease of learning information*: the main purpose should be learning from the self-builder, and encouraging participants through a more understandable lecture;
- *Emphasis of interest:* the people must be involved for more effective teaching;
- *Ease of achievement of training:* courses are usually held directly by the designers and the time available is very limited, so it is important that they are achievable in a simple and fast way;
- *Economy:* the funds available to self-builders and associations or entities that

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support them are usually minimal, so it is better that the training phase is as cheap as possible.

The choice of the communication system depends on the type of self-building that is being achieved (spontaneous, assisted, for emergencies, complete), but also on the type of user with which we compare, as well as on the type of processing that must be undertaken (level of complexity and autonomy of self-builder to realize it).

KIND	DESCRIPTION			
Text paper	They are texts that contain a description of the construction phases of work expected from each project, without the aid of images. The advantage is that it can be achieved using operating manuals already available on the market, directly by the designer. The disadvantage is the possible difficulty of understanding on the part of unskilled workers due to the use of technical terminology and the absence of images and practical explanation. They are rarely used.			
	Ease of learning information	*Emphasis of interest*	*Ease of achievement of training*	*Economy*
	low	low	high	high
Graphic paper	They describe the various construction phases through simplifying images that can be photographs or drawings. The instructions to assemble the parts are correct. They can be used for easy operations but not for complex workings.			
	Ease of learning information	*Emphasis of interest*	*Ease of achievement of training*	*Economy*
	medium	medium	high	high
Text and graphic paper	Almost always, the papers that are produced are mixed, texts accompanied by photographs or drawings. The photographs are generally preferred to the drawings because they improve the understanding of the construction phases described, showing their realistic appearance. The disadvantage of this system is the need to work with a specialist company that performs demonstration of work to photograph the construction phases. Graphic images allow for immediate, intuitive understanding of the construction phases of the various works and directives on safety and organization of the yard, however, they require the creation by the designer with the help of graphic specialists. They can be useful in the case of self-building for emergencies because manual intervention can be prepared to be administered in case of need. That is what happened more than once in Italy for reconstructions after earthquakes.			
	Ease of learning information	*Emphasis of interest*	*Ease of achievement of training*	*Economy*
	medium	high	medium	high
Video	The realization can be guided by the same designer with the help of an enterprise, which allows for the recovery of the workers who perform the same work to be carried out by self-builders. They can be made ad hoc, or can be searched from existing video, which are consistent with the work expected. In this way, the jobs are explained and shown directly to self-builders, that can easily assimilate the various			

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	processes. They can also be displayed more than once. But there is no practical feedback and the absence of comparison with specialized workers.			
	Ease of learning information	*Emphasis of interest*	*Ease of achievement of training*	*Economy*
	high	high	low	low
Teaching-learning meetings	They can be organized by associations or by the designers. They consist of an oral explanation of the work to be performed as prescribed by the project, but they are often used to provide information about the safety and organization of the yard. The benefits are the low costs, easy and speed of organizational meetings. But among the disadvantages is the lack the practical aspect and the lack of feedback from listeners.			
	Ease of learning information	*Emphasis of interest*	*Ease of achievement of training*	*Economy*
	medium	medium	high	high
Training courses	Training courses are organized with the help of associations or designed in order to educate prospective homebuilders on the topics of security and organization of the yard and, specifically, the planned implementation of the project. This allows homebuilders to have both a theoretical and practical explanation. The advantage is to have an immediate feedback from the students, guiding them in an execution example. Obviously this requires higher costs related to the organization of the course and materials for the practical phase and the execution of an example. They are often organized in the form of workshops. Sometimes movies are shot during the workshops that enable learners to identify any errors made during the operations to sharpen their knowledge and skill.			
	Ease of learning information	*Emphasis of interest*	*Ease of achievement of training*	*Economy*
	high	high	low	medium

Compatible with the availability of time and costs, it can obviously think to use mixed systems of training.

All the considerations that have been achieved as a result of the survey conducted on the case studies are to test and compare with the results of the research conducted by our group in the "Laboratory Organization of the Yard." Buildings have already been identified and communication systems have been selected. During this time one does the administration of the training. What remains is to check the different levels of learning and therefore the effectiveness of the methods. According to availability of time and funds, one could resort to using mixed systems of training.

Conclusion

At the conclusion of the research conducted until today, we can summarize that the training for homebuilders is greatly affected by the type of process that is taking place (spontaneous, assisted, for emergencies, for solidarity).

The examples analyzed show that, in common practice, there is a close relationship

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between the kind of constructive solution investigated (wood, straw, clay, brick and block, reinforced masonry, structural insulated panels SIP, ICF-insulated concrete formwork, etc.) and the type of training provided. At this point we are awaiting confirmation from the results of current investigations in the laboratory design.

It is appropriate for each country to draw up a system of training of the procedure to be followed for self-building. It is equally appropriate that this procedure be widely disseminated as is the case in the UK.
It is appropriate for anyone who wishes to approach the theme of self-building to be informed, from an early stage, about cost (approximate) in relation to the technical solutions adopted and the size of the buildings. And this is because, too often today, the times of self-building greatly increase due to a lack of awareness of the order of magnitude of expenditure.

It is desirable for each type of technical solution to have manuals for self-building then, for each project, in training, they can be modified and adapted to the specific building. Our working group is operating towards this solution.

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