

CONSTRUCTION INDUSTRY, IS IT STILL POSSIBLE TO INNOVATE? THE CASE OF VISUAL MANAGEMENT APPLIED TO EXPO 2015

By Ivan Calimani

Behind “innovation” lies a long list of possible meanings and shades. In this paper, we will address the innovation theme from the point of view of a new methodology used for the planning and control of projects. Based on the case of Expo 2015, we present how the introduction and application of visual tools allow managing complexity in a clear, unique and simple way. Indeed, behind the lack of the information, communication complexity and the proliferation of custom schedules, we can find most of the common issues generating delays and cost overruns.

By looking to the construction sector in its broadest sense (including civil, building, industrial and plant engineering) we realize how this is a mature industry, where the innovation capability is increasingly difficult. In particular, following the long economic crisis, corporates are looking for innovative approaches bringing great benefits in short term and with low cost of investments. It seems to be an impossible dream... or maybe not!

Expo 2015 was one of the challenges met by Italy and many are still wondering how this "miracle" was possible. It must be admitted that the context was not the best:

- Fixed deadline with no possible delay;
- 1.5 billion spent in public works, which doubles adding the works of the 147 participating countries and private partners;
- 1300 days available from the beginning of work (average productivity of € 2 million / day);
- More than 500 stakeholders (countries, partners, institutions, etc ..) to be included in the activity, to be involved and kept informed on the progress;
- Peak of 10,000 workers at the construction site and hundreds of overlapping activities;
- A small project team respect to the size of the project

Therefore, it was important to be able to manage the whole program in a very streamlined way, without additional complexity and with communication tools easy to understand; most of our stakeholders in fact did not have a technical background behind.

Nevertheless, where to find the answer to our needs?

Certainly not in the classic *scheduling* tools; the Expo program contained more than 4,000 activities, difficult to read even for *planners*, almost impossible for a Commissioner of a participating country. So we started to think in a more visual and simplified way, by which one could "read" the progress of the project clearly and immediately while not having special

knowledge of project management. It was not easy to come up with a solution, but we approached in stages according to the process described here below.

STEP 1: WHAT-WHERE LINK

In order to get a clear overview of the project is also necessary to know where the activities will be located. In fact, just considering the time schedule, it is hard to relate the activities planned with the physical space where they take place. We need to move from an *activity-based* planning to a *location based* approach where activities based codes correspond to spaces and physical parts of the project.

For this reason, the breakdown of the project follows a spatial logic and it was introduced the concept of *Location Breakdown Structure (LBS)*. The LBS is a hierarchical representation of the *Location*, which allows classifying, aggregating and disaggregating the work in construction work areas according to production logic so compelling to think from the perspective of the site organization since the start of the project. The LBS provides the structure and *Location* become the container for all project data.

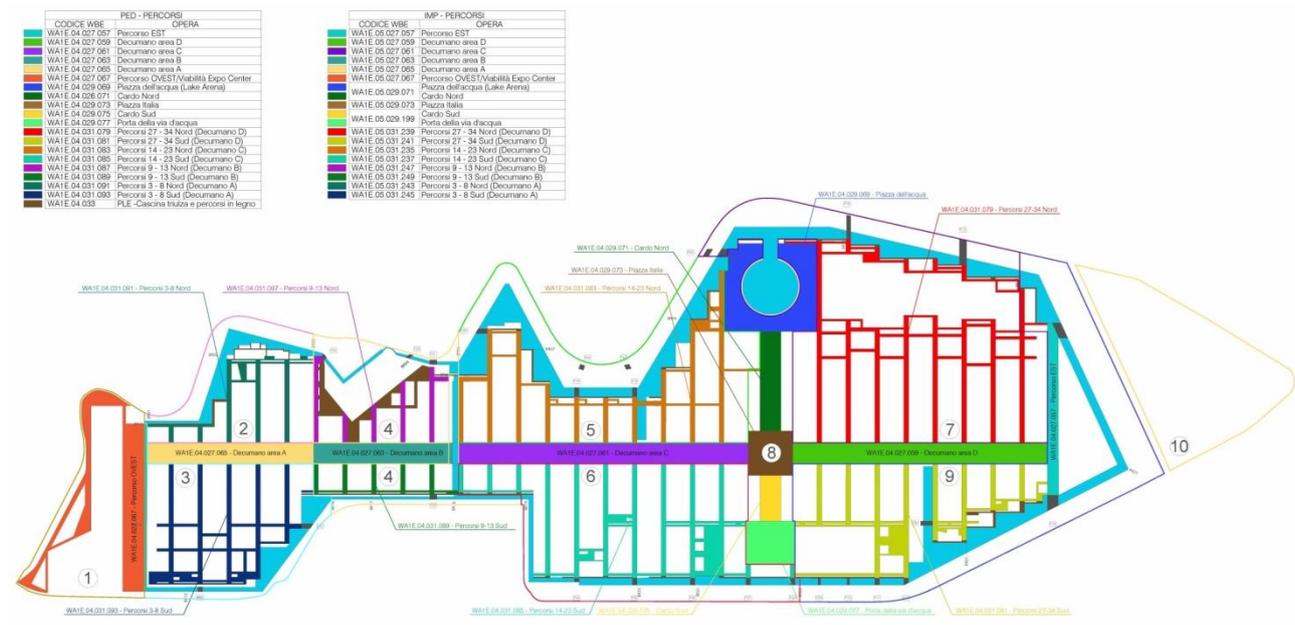


Figure 1: LBS Plan

STEP 2: WHERE-WHEN LINK

The Expo site was attended by more than 100 contracts at the same time, all strongly linked to each other. Only a *just in time* scheduling could have prevented cascading delays. In addition to strong planning of the whole *master program* it was necessary a focus on the links between the end of a work and the beginning of a new one, in particular during the start of the participating

countries pavilions. All these dependencies have been highlighted in about 40 tables representing the monthly progress phases. In each of the 10 areas in which the exhibition site was divided, activities were represented according to their progress status, highlighting with different colors and fills the type of activity (eg. underground or elevation works). Within a few boxes, ongoing retail activities were specified for a given month in the specific *location*, with the indication of the related *milestone* and activity code.

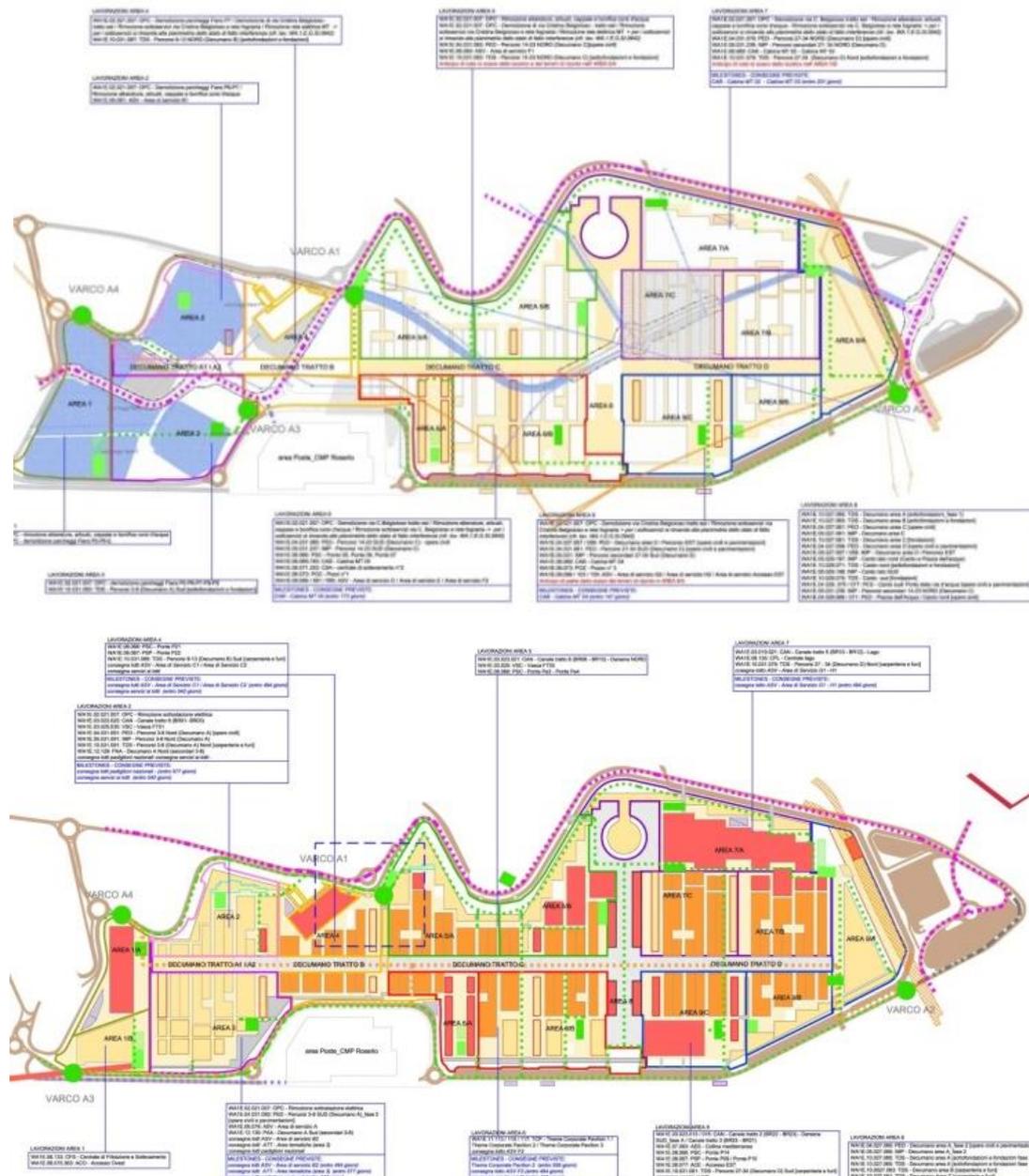


Figure 2: Phase Plans

STEP 3: WHEN-HOW LINK

Based on the above steps it was possible to achieve great results, even if some open points were still on the table: a monthly plan and a distribution of the information among too many boards did not allow an immediate understanding. A further step leading to an integrated tool including all the information and a daily schedule in one single point was required

The innovative idea was to use a Time-Location Diagram, usually applied on linear project, in a more complex environment so to have the flow of visual data in terms of time and place on one plan. The step into a bi-dimensional system was possible thank to the location interdependence logic of LBS. Indeed, at the first level we find not related Locations that make possible to start activities in any sequence or simultaneously. This structure enables a logical separation between part of the project that cannot have critical overlapping activities due to their physical distance.

Time-Location Diagram can communicate more information because of the way location related data is assigned to each individual task. The link between site and schedule information enables a quicker and deeper understanding of the construction plan. It nicely shows all visible activities along the construction site on a single drawing.

Time-Location Diagram combines both time and location in one powerful project management tool easy to understand:

- It shows a direct connection to the layout of the site, pointing out what is built at which place. Overleaping activities (clashes) can be easily detected.
- It shows the effect of contracts and other constraints in both time and location.
- It shows the philosophy of the project to management and the stakeholder in a clear and immediate fashion.

Activities in Time–Location Diagrams are displayed both along a time axis and along a distance axis according to their relative linear position. This allows showing not only the location of the activity but also the direction of progress and the progress rate. Activities can be presented as geometrical shapes showing the occupation of the work site over time such that conflicting access can be detected visually. Different types of activities are differentiated by color, fill pattern, line type, or special symbols.

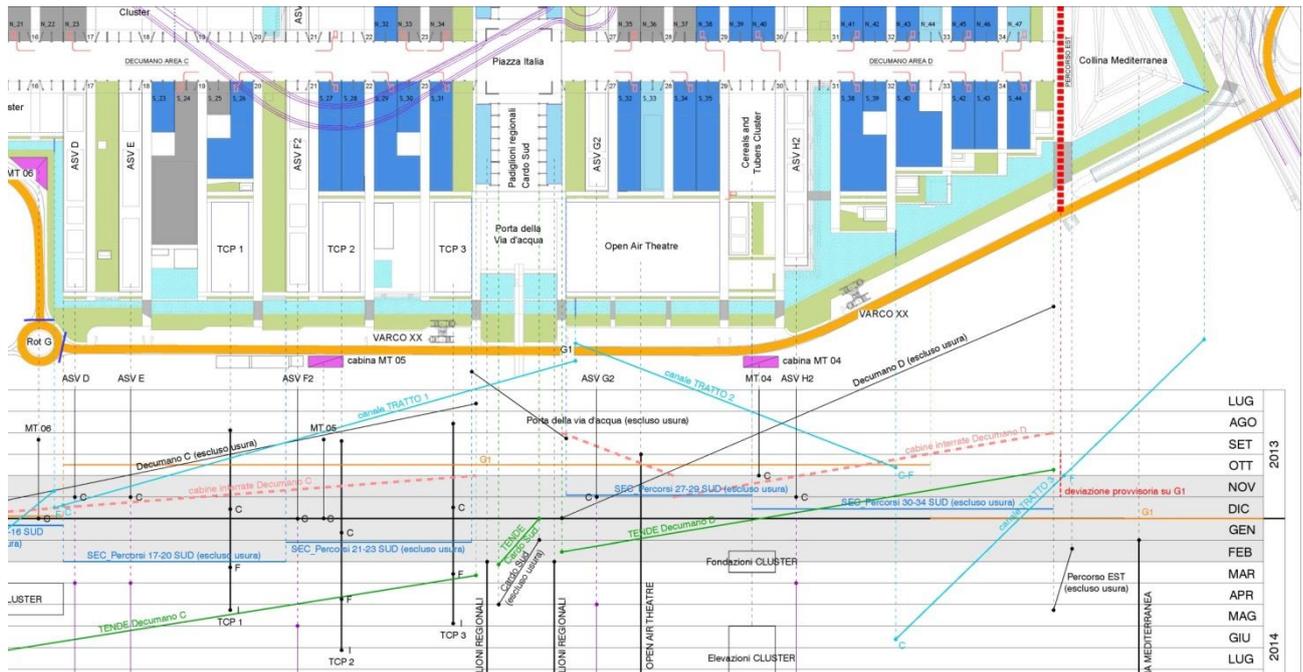


Figure 3: Time-Location Diagram Baseline

This tool is really useful in the control phase as well. At a certain report date, it is possible to update flowlines according to the actual site production rate. If a Task progress is less than planned, we have an immediate view of the impact of this event on the remaining plan. In this way it is possible to see at early stage potential critical situations (alarm dot) and to define a recovery action plan.

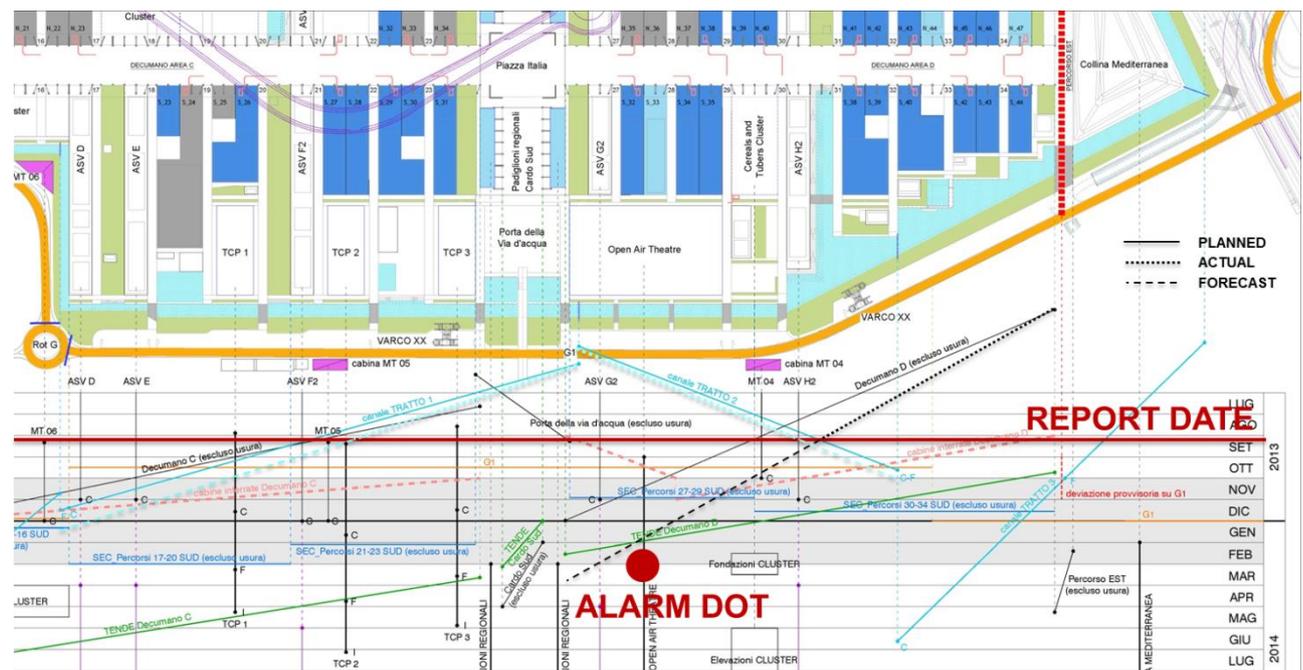


Figure 4: Time-Location Diagram, control phase

The core logics of Time-Location Diagram are based on the Line of Balance, a method to maximize the use of resources and to reduce the number of starts and stops reaching in this way a linear progress of the activities.

Production efficiency has been elusive in the construction industry and it has been difficult to implement the new production methodologies, which have been so successful in manufacturing industry. It is time to rethink the way we plan, manage and control construction. The construction industry has developed a suit of ad-hoc system, which either cannot integrate. The basic mechanisms by which we develop our cost models, measure our buildings and schedule our work, provide little help to manage the issue which are at the forefront of industry concerns these days – efficiency, speed and productivity.

As it should be clear, Visual Management is not just about to "visualize" the project data, but it is a different way to manage a project, bringing benefits on four key dimensions:

- Reduce time and costs
- Process optimization
- Improved communication (internal - external)
- Improved Health and Safety conditions for workers

The take away here is that Visual Management can become the right answer for different industries, out of the Expo context where it was born, while keeping its focus on delivering high added value to customers. In addition to what we have seen so far the low cost of implementation deserves to be mentioned; indeed, the methodology is based on simple tools providing immediate benefits where applied.

About the Author



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Ivan Calimani is a certified Project Manager with 10 years of experience that loves project management since his first encounter in London in 2007 whilst working on a complex Cultural Center project. In the last six years he worked for the successful completion of Expo Milano 2015; the largest project in Italy in the last 50 years! Within Design & Construction Division Ivan was Program Manager of over 30 projects managed by the organizer and coordinator of 80 pavilions built by National Countries and Corporates. He was also Program Manager for fulfillment of Smart City for Expo projects and Energy and Maintenance Manager during six months event.

Ivan got a master degree in Building Engineering and Architecture at Politecnico di Milano and he did a Master in Project Management at MIP Business School. The passion for Project Management gave him also the opportunity to join the International Project Management Association where he became president of the Young Crew section. In 2014 Ivan was awarded by IPMA in the Young Project Manager of the Year Award.

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