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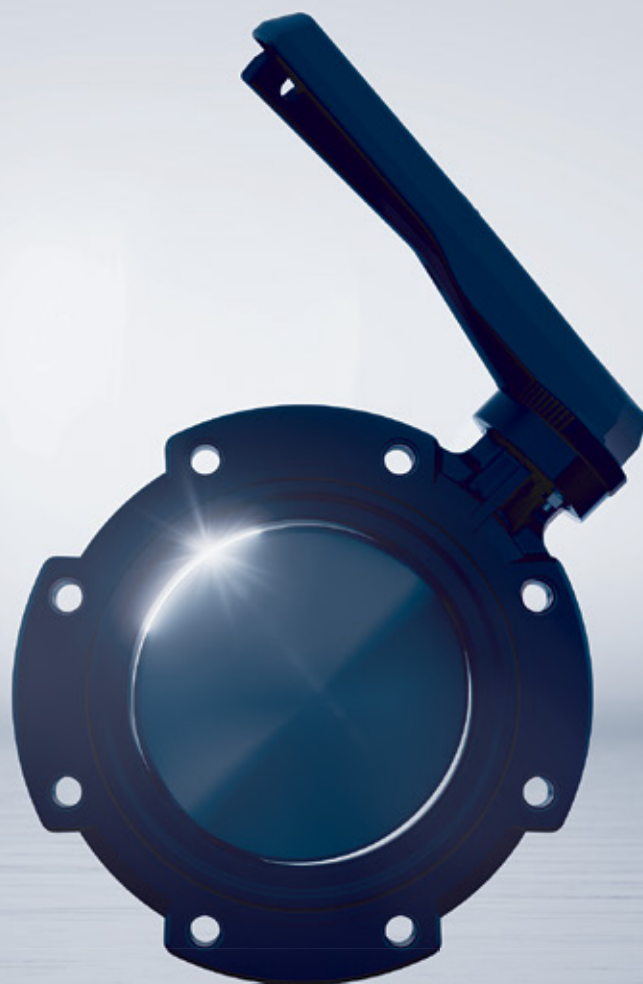
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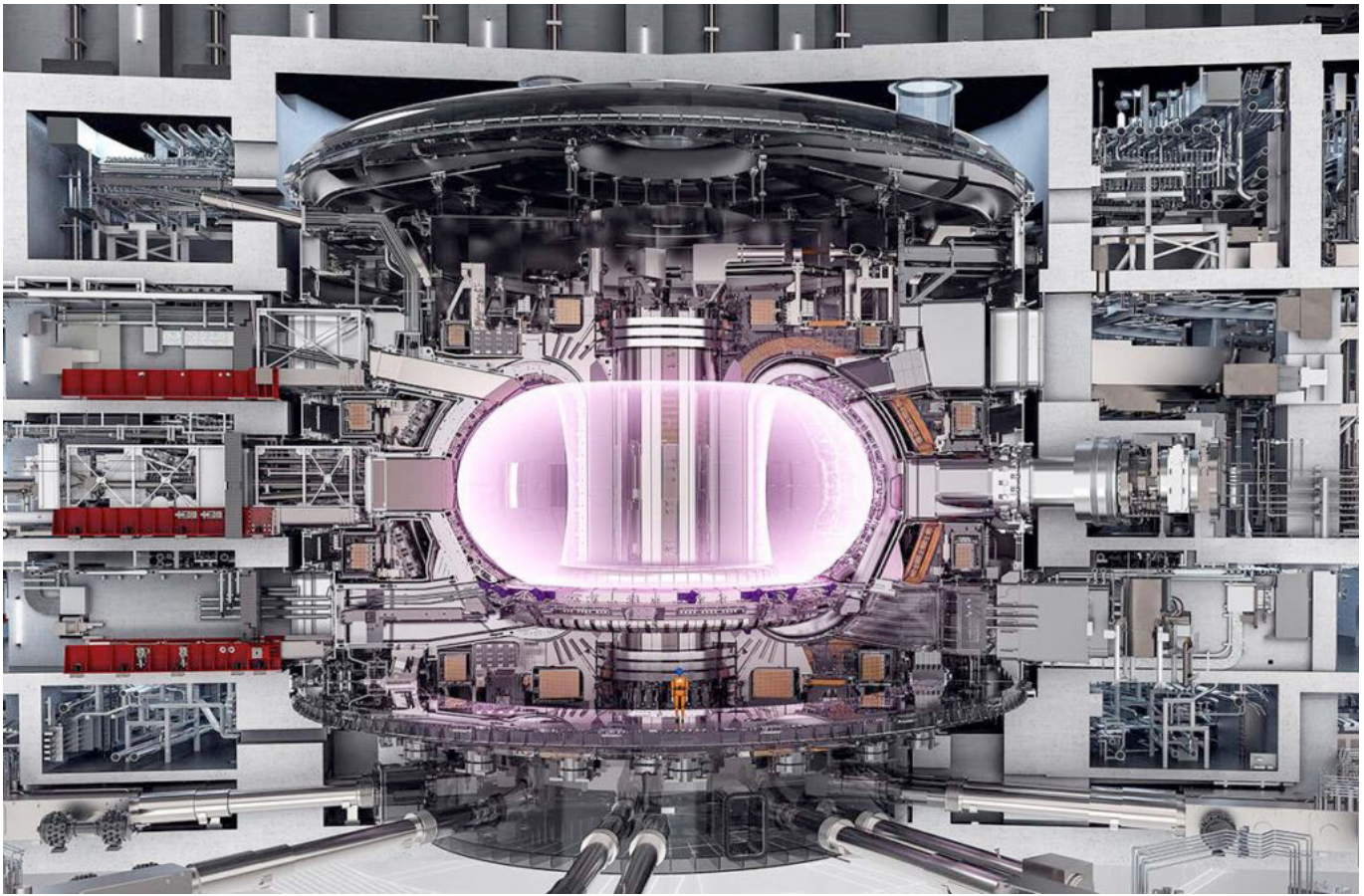
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Project acceleration: approaches, risks and practices *(part 1)*



ITER Project - Source: <https://www.futuroprossimo.it/2024/07/il-progetto-iter-slitta-il-sogno-della-fusione-e-morto-si-e-no/>

An investigation into the approaches and their effectiveness by Companies where projects represent their core businesses, or a relevant part of it, in dealing with unforeseen occurrences with some negative impacts

Antonio Calabrese, Associate Professor of Industrial Plant Management and Industrial Plants, Politecnico di Milano School of Management

The management of a project has often to deal with some unforeseen occurrences that have some negative impacts in terms of value of the project, capability to face uncertainty, completion time and overall budget, reputation of the organization, relationship with stakeholders, competitiveness and sustainability. It can be supposed that more experienced project

managers could add even further potential impacts.

One of the main pains for a project manager is to deal with some delay in progressing, with the consequent necessity to set some countermeasures so to accelerate the remaining part of the project. For this reason, it could be valuable to investigate what are the approaches the companies where projects represent their core business, or a relevant part of it, can apply and their effectiveness. This research aims, after an initial review of the typical approaches and their expected impact and inherent risks, to shed some light on the most frequently adopted practices and the real benefits they were able to give to the

project progress. The first part of the paper outlines critically the pillars of the problem (context, methods, risks), whilst the second part is based on a survey joined by 50 project managers and other roles involved in managing projects, operating in companies of different industries.

1. Overview of project acceleration

The nature of the acceleration may be traced back to the delays that arise during the different project's phases – initiation, planning, execution and closing – or traced back to new opportunities which involve the acceleration of already initiated projects, being these the main two reasons for projects' acceleration.

The project schedule compression means to apply methods and techniques in order to shorten the project duration, namely "fast-tracking" and "crashing". It aims at preserving the existing project scope, differently from what happens with another option for project acceleration, that is the reduction of the project scope. Let's take a critical look.

1.1 Fast-tracking

The fast-tracking approach for project schedule compression is a schedule compression technique in which activities or phases normally done in sequence are performed in parallel for at least a portion of their duration (*PMBOK Guide, 6th Edition, 2017*). It means that some activities are worked on simultaneously, instead of waiting for each task to be completed separately, coherently with the type of relationships between activities (finish-to-start, start-to-start, finish-to-finish, start-to-finish).

When dealing with fast-tracking, the type of depen-

dency among tasks leads to some differences in terms of risks and the highest risk of applying overlapping, corresponds to the "dependent activities", i.e. when an activity has to wait for some information from another activity.

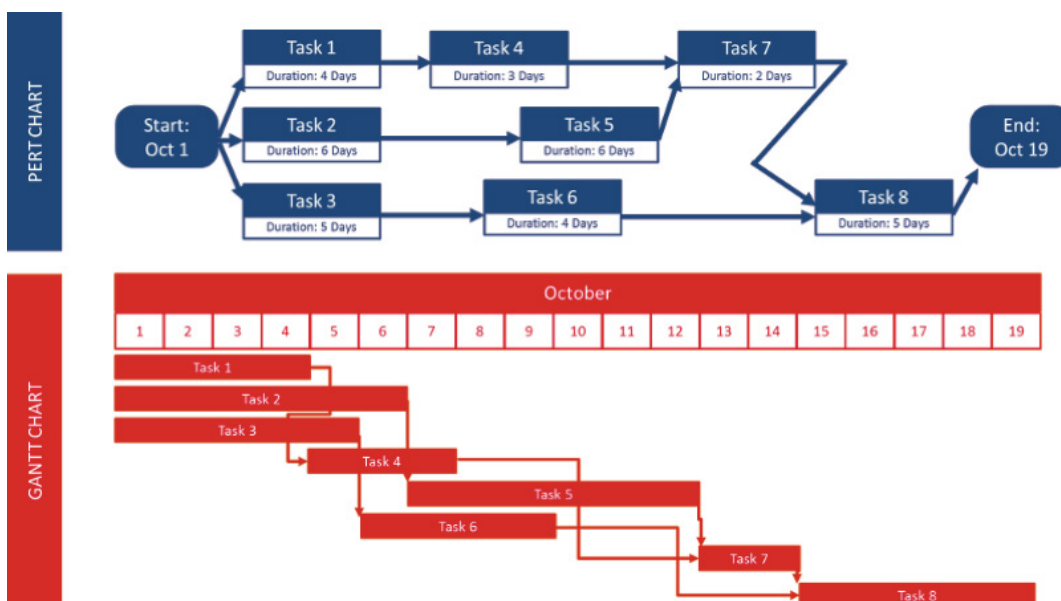
In case of "independent activities", i.e. when no information is required from other activities, the risk of generating rework if those activities are overlapped, is reduced and fast-tracking can be applied to any extent, the only limitation being in terms of available resources.

For semi-dependent and interdependent activities, respectively activities that require only partial information from another activity in order to start and activities that need two-way information exchange until they are completed, in the first case a degree of flexibility exists for the application of fast-tracking (they behave like dependent activities as a certain level of risk does exist), whilst in the second case they need overlapping so to be able to exchange information and make progress. Therefore, the risk associated to this kind of activities is associated to the chance of reworking and delays and overlapping should not be considered an extra risk, but a must (*R. Dehgan, J. Y. Ruwanpura, 2011*).

It may happen, however, that the final information of the predecessor will differ from the preliminary or intermediate information, leading personnel to adjustments and extra-work which means an increased duration of the successor task compared to its normal completion time.

It is a fairly common experience in project management to have activities whose execution is delayed compared to what was planned. This condition determines the need to define and apply an acceleration plan in order to bring the project progress back within the desired terms

Example of PERT chart and its connected Gantt chart



Source: <https://blog.netronic.com/what-is-a-gantt-chart-scheduler>

Source: <https://vitolvechia.altervista.org/project-management-differenza-tra-diagramma-di-gantt-e-pert/>



1.2 Crashing

The crashing approach for project schedule compression is a schedule compression technique in which costs and schedule trade-offs are analysed to determine how to obtain the greatest amount of compression for the least incremental cost (*PM-BOK Guide, 6th Edition, 2017*). Project crashing is obtained by increasing the resources involved in the project. Of course, this comes with increased costs both direct and indirect ones. There are many ways of crashing activities as:

- increasing efficiency of current resources;
- increasing the resources to the critical path activities;
- adding working hours to personnel;
- adding supervisors to tasks;
- adding a shift to personnel working time.

The need for project acceleration by crashing may depends from different causes, but it should be noted this comes, more commonly, when rescheduling by overlapping was not sufficient to recover from delays.

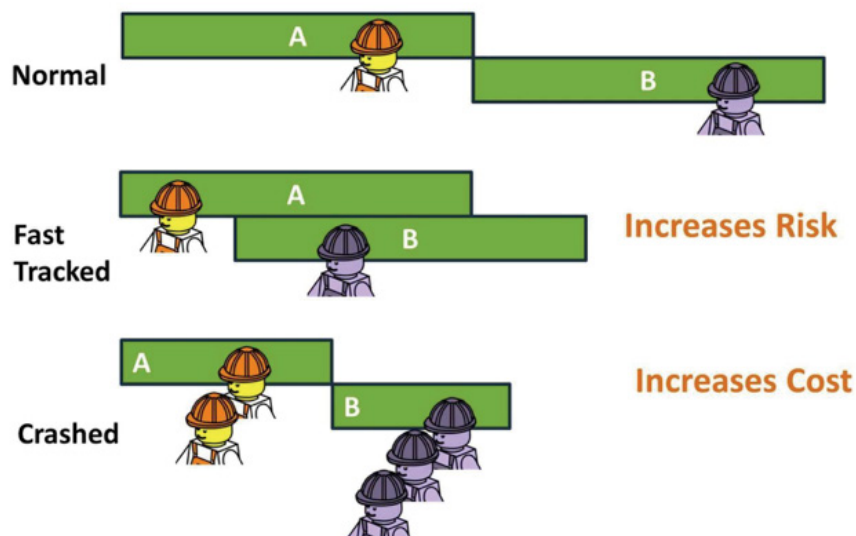
Applying the crashing approach is not risk-free. First, the tasks to consider must be in the critical path. Then, only longer tasks should be subjected to crashing because decreasing the duration of short tasks, can be hard and useless for the overall completion date.

Considering resources, one must be sure that they are available, because having to get new materials, personnel, machinery, is going to be too costly to reach a good level of efficiency.

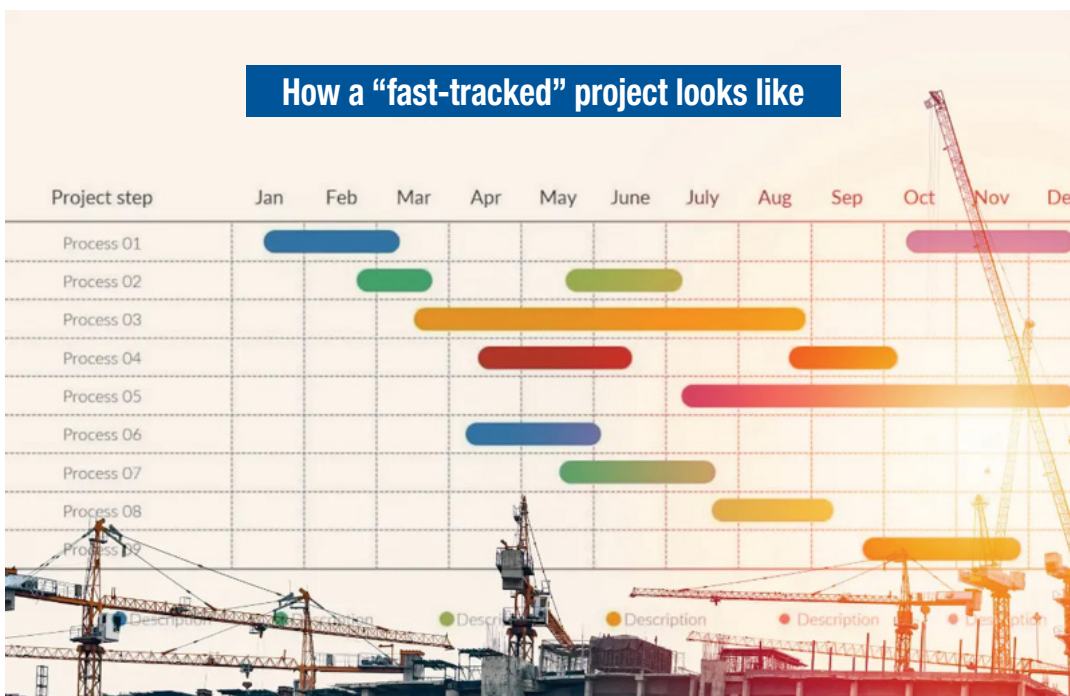
Besides, even if available, a ramping up process may take too much to reach the regime productivity. This is an aspect that should be considered, especially when dealing with new human resources to be added to the project execution.

Crashing should be applied referring to the time-cost trade-off analysis. The costs associated to schedule compression are a combination of direct and indirect costs. The first ones include basically materials, labour and equipment. The second ones include all costs that are ancillary to production work and typically they are shared among different projects.

Source: <https://monday.com/blog/project-management/fast-tracking/>



Different impacts of fast-tracking and crashing



To apply crashing the time-cost ratio (TCR) must be considered, that is:

$$TCR = \frac{Crashed\ Cost - Normal\ Cost}{Normal\ Duration - Crashed\ Duration}$$

Once the possible activities subject to be crashed are listed, one should start acting on task with the lowest value of TCR as it is the least expensive one, then proceeding in ascending order. Of course, a problem may arise when dealing with crashing. In particular, there is the need to review the critical path because non-critical activities may become critical along with the acceleration of the project.

“In light of the different existing approaches, the research illustrated here aimed to analyze the main methods applicable to recover a delayed project”

Therefore, the resulting new critical path has to be checked as acceptable.

There are some additional points to be considered about the application of crashing as a method for project acceleration. When adding resources to a project some difficulties may arise, and they deal with:

- ramping-up process of people to become productive;
- overloading of communication when human resources are increased;
- dividing tasks in subtasks so to avoid their overriding.

When dealing with new human resources, they require training by one or more experienced people. This training takes time from the experienced person, with the risk to carry out tasks slower than in normal condition.

The same concept can be widened to machinery. Adding a new one not always accelerate immediately the production process. It would be necessary to rely on additional supervision and the review of the ramping up process. Moreover, to allocate the correct amount of new resources a project manager must refer to the number of independent subtasks: the higher the independency level the most effective is the crashing of the project.

Another issue to take into account when dealing with crashing a project, is the communication required among the subtasks that can be partitioned. The communication process increases depending on the number n of people involved in communication, in principle depending on the following parameter:

$$\frac{n * (n - 1)}{2}$$

Therefore, three workers require three times as much pairwise intercommunication as two; four require six times as much as two (*F. Brooks, 1975*). This brings a lot of effort and time spent in the communication process.

The concept of maximum number of people involved in a task lead us to the third point. The problematic of overriding could harm and delay the project. Besides, only some of the whole activities can be subdivided in subtasks to optimize the use of additional resources. Some of them cannot benefit from crashing.

The problem of the ramping up process for new team members can be overcome if thinking to the

Source: <https://deeproject-manager.com/fast-tracking-vs-crashing/>



quantity, quality and role of the people added to the project. Specialists, high skilled people may reduce the time needed for training at minimum. Besides, dealing with interference among workers and communication difficulties, can be treated with the implementation of smaller teams, segmenting problems when possible.

In conclusion, crashing a project does have drawbacks but a project manager must calculate all related risks.

1.3 Reduction of project scope

One last method to cope with delays arising during the project, is the reduction of project scope. It is an alternative accelerating method which consists in performing less activities with respect to scheduled ones.

It is a method which cannot be implemented in every situation and that requires the approval of the client. Normally, it is a technique for which a company draws up a cost reduction plan and then carries it out by decreasing the activities which turned out to be unnecessary for the completion and the overall functionality of the outcome. This will help out with the cutting costs and keeping focused the project. However, a loss of functionality with respect to the nominal one may be expected, but also the quality and the value of the project itself. To obtain scope reduction, presuming the approval from the client, might imply in fact poor resulting quality.

According to the literature, quality and volume of the project delivery were the most common type of scope reduction (N. Olsson, 2015). However, it must be underlined this is a technique that sees its applicability dropping from halfway on the planned projects duration as it requires time for approval from both sides of the project's contract parties.

This latter concept is a strong component for scope reduction applicability because shared incentives for the client and the contractor must be present so one can proceed with the acceleration method.

Even though the scope reduction could be a direct consequence of clients changes to the project's design (and consequently cannot be strictly considered as a mean for project acceleration), there are some drawbacks of applying this method as a consequence of other types of delays, excluding design changes from customer.

Dealing with a different nature of delays, scope reduction is not simply usable as it requires time to be implemented therefore its usage must be defined at an early stage. At this stage, projects do not know if they will get delayed. Moreover, the aim of scope reduction was also to eliminate cost overruns, but it can impact realistically up to about 10% of the project budget. It could be desirable to develop and implement a tool at the beginning of the project to obtain a framework that identifies reductions if and when needed, instead of trying to identify specific reductions when issues arise during the execution (N. Olsson, 2015).

2. Main outcomes of the survey

The 75% of companies have developed a Project Management Information System PIMS and widely use the tools listed in the survey such as, the PERT, GANTT, CPM and EVM. The PIMS is resulted to facilitate, or even enable, the effectiveness of an acceleration plan as it allows to continuously monitor the status of a project, monitoring the probability of occurrence of unexpected events which can ge-

nerate project delays, and contributing to mitigate their impact over the project.

In the face of a good culture in terms of Project Management, 83% of respondents said they experienced delays in the projects they were involved in. The first gate to pass is the financial availability to support an acceleration/recovery plan. However, the survey suggests that regardless the financial availability, fast-tracking (overlapping) is considered the first option that companies evaluate for a recovery plan based on acceleration. This is confirmed by the fact that the 84% of the respondents decided to evaluate the overlaps of activities before adding resources to the project. A larger number of responses should be gathered before drawing a definitive conclusion, but these results seem to be emblematic of a diffused practice based on the implementation of fast-tracking as the first option for accelerating a too slow progress. The reasons for this choice are primarily sought in the lack of cost increase (or in any case far lower than for other options) and in the expected increase of productivity of the resources already available.

From the survey 80% of the respondents confir-

“ This was done through a brief critical examination (part 1) and on the basis of a survey aimed at identifying the practices most commonly and effectively adopted by companies that in the management of a project must recover a delay (part 2 - next issue) ”

med that they experienced positive results by the application of crashing. However, only 33% of them have been able to reach an optimal balance between costs and benefits, whilst 67% have not.

The research has revealed an interesting result regarding the possibility of applying a reduction of the project scope in order to achieve the needed acceleration. This option is mainly considered by companies that aim to avoid or reduce contractual penalties caused by delays in projects completion. In this scenario, the reduction of the project scope could be paired with fast-tracking, but never by crashing.

A more detailed report of the survey will be discussed in the second part of the paper.

Acknowledgement

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Antonio Calabrese

Antonio Calabrese is Associate Professor of Industrial Plant Management and Industrial Plants at the Politecnico di Milano, School of Management and Director of the international executive Master in Project Management. Former MBA&EMBA and Corporate Education Director at Polimi GSOM, he collaborates with universities in Europe and China, is a member of the IPMA Ethics Committee and of the Steering Committee of IPMA Italy. He is reviewer of scientific journals and conferences, and International Academic Advisor of the PM World Journal. In industrial and management engineering he is interested in project, program and portfolio management, in particular as for governance, risk management, planning and control and stakeholder management, as well as the design and management of industrial plants.

Accelerazione dei progetti: approcci, rischi e pratiche (parte 1)

È esperienza piuttosto diffusa nella gestione dei progetti quella di avere alcune attività la cui esecuzione è in ritardo rispetto a quanto pianificato. Questa condizione determina la necessità di definire e applicare un piano di accelerazione allo scopo di ricondurre l'avanzamento del progetto entro i termini desiderati. Alla luce dei diversi approcci esistenti, la ricerca che qui viene illustrata si è proposta di analizzare i principali metodi applicabili per recuperare un progetto in ritardo. Questo è stato fatto, oltre che attraverso una breve disamina critica (parte 1), sulla base di una survey finalizzata a identificare le pratiche più comunemente ed efficacemente adottate dalle aziende che nella gestione di un progetto devono recuperare un ritardo (parte 2).

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Formati

Il testo e le tabelle vanno forniti in formato Word, anche sullo stesso file.

Le fotografie/illustrazioni vanno fornite, in file separato dal testo, con risoluzione di 300 dpi e compressi in formati jpg; sono accettati anche formati Tiff, Eps, Power Point e PDF.

I grafici possono essere forniti in formato Excel o jpg.

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Tel. 02 5469174

ovest@ovest.it