



UNIVERSITY OF NIŠ
The scientific journal FACTA UNIVERSITATIS
Series: **Architecture and Civil Engineering** Vol.1, Nº 5, 1998 pp. 597 - 603
Editors of series: *Dragan Veličković, Dušan Ilić, e-mail: facta@ni.ac.yu*
Address: Univerzitetski trg 2, 18000 Niš, YU
Tel: +381 18 547-095, Fax: +381 18 547-950

INVESTMENT STUDY DYNAMIC PLAN

UDC 69.05+65.012.5:336.645(045)

Rada Plavšić, Drago Soldat

Beogradska banka, a.d. – Institute for Investment Economics
Knez Mihailova 2, Belgrade, Yugoslavia

Abstract. *Dynamic plan of project realization forms the basis for financial analysis during investment preparation. The resume of investment study analyses consists of selection and detailed description of optimal term plan for project realization. Authors pay special attention to the analysis of coordination of physical and financial realization of the project. This paper suggests contents and methods for analyses of dynamic implementation plan elements. In comparison with existing solutions given by valid investment evaluation methodology, these analyses provide for more reliable planning of necessary times and resources.*

1. INTRODUCTION

Investment study is a compulsory document according to which investment decisions containing basic elements of intended investment realization plan are made. Project feasibility analysis represents evaluation of real possibilities of project realization from the aspect of basic organizational and technical solutions, level of equipment of all participants in the realization and their real ability to complete an investment process without exceeding planned times and planned financial resources. Consistent feasibility evaluation includes assessment of critical points of the plan as well as the elaboration of anticipated solutions in order to supersede all (existing or possible) limitations.

Dynamic plan of realization of an undertaking in an investment study forms the basis for financial analysis during investment preparation. According to valid investment evaluation methodology, financial construction is closed in terms of current prices – according to dynamic plan for payment of financial obligations [1]. Thus, it is very important to plan in detail the duration of investment and to predict precisely the moment in which financial funds from individual sources of project financing will be spent.

Selection of methods for reliable prediction of project realization flow and for realistic evaluation of terms in a dynamic plan are significant because they represent the basic prerequisite for project success during realization as well as during exploitation. Practical issues of articulation and elaboration related to dynamic investment realization plan require a more thorough, more complex and more realistic approach than the one given by existing solutions based on valid domestic methodology for investment evaluation.¹ Mutual coordination between physical and financial dynamics of project realization is the issue of special importance.

Projections resulting from the dynamic plan consist of correct selection of representative activities, followed by reliable estimate and calculation of their duration, definition of interrelated activities, supply of resources according to plan and individual sources [2].

The greater the investment and the more complex the investment undertaking is, the more important is the reality of project feasibility, preliminary evaluation and prediction of dynamics of physical and financial realization. This paper gives an overview of necessary analyses and methodological solutions for investment evaluation based on research and experience arising from their implementation in Yugoslav banks and investment funds.

This paper also aims to demonstrate the required contents of necessary analyses and the way to define and present relevant dynamic plan data during the process of preparation and evaluation of investment study.

2. DYNAMIC PLAN OF PHYSICAL PROJECT REALIZATION

Dynamic plan of physical project realization includes specification of all necessary activities and evaluation of time required for their completion. Valid investment evaluation methodology regulates evaluation of time plan feasibility according to:

- how complete investment technical documentation is,
- how realistic planned beginning and ending of project are and
- is it possible to obtain permits and concords.

This approach does not usually include analyses and prognoses of key terms thus making control and tracking of realization flow practically very hard for the financier's revisor and supervisor.

It is obvious that estimating the end of project realization and the beginning of its exploitation is a very problematic issue, especially in cases where no dynamic plan of operations is devised. In domestic practice, plans of operations are usually rough and arbitrary. This can be especially risky for capital projects, because it can cause huge resources and time to be spent [3].

Depending on the complexity and the size of project, realization dynamics can be planned empirically, according to offers made by contractors and equipment suppliers or

¹ Joint methodology for evaluation of social and economic justification and efficiency of investments in SFRY, Official Gazette of SFRY, no.50/87; Book of regulations on contents and scope of preliminary justification study and justification study, Official Herald of RS, no.39/99.

according to one of network planning techniques, such as PERT or CPM. Gantt charts² consist of global activities or groups of work activities, such as preparatory works, rough construction, craft works, plumbing works, finishing works, equipment assembly, etc. (Table 1). Horizontal time scale of this diagram depends on planned duration of the entire project realization. As a rule, scale is comprised of smaller time periods (weeks or months) for shorter duration, quarters for medium duration, while for projects that last for several years, dynamic plan is expressed in semesters or years.

Table 1. Term plan of physical project realization

N ₀ Investment activity	Terms			
	I quarter	II quarter	III quarter	IV quarter
1. Compilation of investment documentation				
2. Procurement of financial sources				
3. Preparatory works				
4. Contracting				
5. Rough construction works				
6. Craft works				
8. Plumbing and utilities				
7. Finishing works				
9. Arrangement of free surfaces				
10. Acquisition of concords and permits				
11. Equipment delivery				
12. Equipment assembly				
13. Staff training				
14. Test production				
15. Regular production				

The degree of accuracy of time estimates for project realization, during preparatory phase (investment study compilation), directly depends on the level of completeness of investment technical documentation. Total reliability of term plan is determined by the accuracy of evaluation of individual activities duration (or duration of group of operations or construction stages).

It is necessary to predict the time needed for all planned operations according to their usual average duration. For example, compilation of contracting projects for smaller objects from two to three months, for medium-sized three to four, and for large and complex no less than six months; then, acquisition of permits and concords at least 15 days (according to legal regulations), for tender a little over 30 days (legal deadline for conclusion of a tender is 30 days) etc. It is important to include time needed to close the financial construction; it should be estimated according to duration of individual activities: assessment of investment project evaluation (30-60 days) and creditor's decision making (at least 15 days) [4].

As far as deadline for construction of facilities is concerned, it is best to respect fixed terms – if empirical, rough control confirms that such dynamics is possible [5]. In

² In English literature "Gantt chart", introduced as a planning tool by Henry Gantt in 1900.

geographic areas where weather conditions dictate the timetable of project realization, it has to be coordinated with realistic possibilities of work performance. For example, it is not realistic to plan to dig foundations of a mountain resort hotel during winter; an October deadline for completion of cold storage for berrylike fruits is also unacceptable and so on.

Part of the dynamic project realization plan that refers to furnishing and putting into operation (items no.11-15), usually requires that preceding investment activities from Table 1. are completed, or, in cases where it is possible, these activities can go on simultaneously.

Equipment delivery is planned according to dynamics agreed on during negotiations with manufacturers or suppliers. Dynamics of delivery depend on type of activity, complexity, diversity and number of equipment items estimated during investment realization process. Projects of low and medium complexity are characterized by delivery of equipment in one shipment, while delivery of equipment in projects of higher complexity³ is usually gradual. Equipment delivery dynamics ranges from 3-18 months, while this period is even longer in processing industry.

Assembly of equipment, especially for production, should be coordinated with delivery activities, which, as was already mentioned, can be whole or gradual. It is advisable to include maintenance specialists as well as direct production workers into equipment assembly process – regardless of the agreed upon method of investment realization, which can be based on utilization of investor's own staff or staff engaged according to engineering principles. Experiences of this paper's authors show that assembly takes from 1 to 12 months, depending on the criteria that are identical to equipment delivery dynamics.

Staff training is an important issue in the process of investment realization. It is common practice to transform training of key staff members into training of prospective operators of certain pieces of equipment in the production process. Duration and organization of staff training directly depends on the type of activity and complexity of equipment and ranges from 1 to 3 months. For training of maintenance staff it is sufficient to provide 1/3 less time than the time needed for training of direct production workers [6].

Test production is a very important issue in the process of investment realization. In equipment for processing industry, it is required to coordinate its characteristics for uninterrupted functioning of the investment during the period of investor's regular activity. Prediction of test production in projects outside processing industry and continuous work process should make it possible to conquer new technologies or specific knowledge and skills. Test production in previously mentioned cases should be planned to last from 3 to 6 months. It is neither technically argued nor justified to plan for longer duration than this.

Finally, it should be said that it is not recommended to make plans based on minimum necessary time unless such an approach can be supported by strong arguments. Shorter total time for investment realization should be achieved by solid preparation and organization, so that so called "day zero" is activated in the optimal moment. When plan begins to develop without previous preparations, "lateral" or subsequent activities caused by this lack of preparation can take up a lot of time and significantly extend all planned terms.

³ For a more detailed discussion, see: Plavsic, R., Soldat, D., Dubonjic, R., Milanovic, Lj. D., Knezevic, S., Izrada investicione studije, op.cit.

From the above discussion, it can be concluded that dynamics of investment project physical realization is one of the factors of investment cost optimization as well as one of the factors of optimization of total effects of investments.

3. DYNAMIC PLAN OF FINANCIAL PROJECT REALIZATION

Once the dynamic plan for physical project realization is completed, analysis of dynamic finance plan is performed. Necessary financial resources are obtained from planned sources in accordance with dynamics of financial realization and determined terms.

Dynamic plan of financial realization includes sums invested in individual items of physical realization plan – specified according to dates when funds are spent.⁴ Realization dynamics and financing dynamics do not have to coincide, and as a matter of fact they are often parallel activities of unequal duration.

When planning financial realization of customary (nonspecific) projects, dynamic plan is based on preliminary information or offers made by prospective contractors.

In more complex cases, project financial realization plan can precede the tender. In this way, investor sets certain conditions by which optimization of terms and costs should be achieved, while for contractors they define certain specifics required by the investor. This refers primarily to time terms and conditions of payment because creditor cannot always be expected to be ready to approve smaller installments for temporary monthly situations. Having this in mind, it is also important to obtain accordance from contractors to negotiate payment conditions in accordance with investment financing terms.

Dynamic plan of investment financial realization contains analytical cost structure (broken up by objects, types of works, equipment, etc.) and it is presented in a form used for recapitulation based on global division into primary items, according to structure given in Table 2.

Table 2. Dynamic plan of project financial realization

Investment purpose description	Value per period (din)				total dinars	structure %
	I	II	III	IV		
Investment year/quarter						
1. FIXED ASSETS						
1.1 Land purchase and furnishing						
1.2 Infrastructure						
1.3 Building facilities						
1.4 Equipment						
1.4.1. Domestic equipment						
1.4.2. Imported equipment						
1.4.3. Customs and import duties						
1.5. Foundation capital						
1.6. Physical reserves						
2. PERMANENT CAPITAL GOODS						
TOTAL INVESTMENTS						

⁴ Moment of withdrawal or deposit of money represents a business event in investment projects

Projection of money spendings according to term plan is based on current values of investment costs, so called "fixed prices", thus making it possible to reduce all values to the same time plane⁵ and balance in this way the uneven effects of investments during time. The actual value in the investment base period is called "project fixed prices". They are the values according to which project can be realized at the moment in which preliminary calculation is made. However, part of financial spendings refers to the future so that the present value has to be recalculated to obtain the value at the moment when resources are engaged. These values are called "current prices" and they represent future value of the costs. In order to build the financial construction which should be based on values and duration of engagement of resources, particular items from the dynamic plan are expressed in current prices.

In order to recalculate costs from fixed into current prices it is important to anticipate the increase in prices during the construction period. For spendings in domestic currency so called planned rate of annual inflation is used, while for foreign funds average annual rate of domicile currency inflation is utilized.⁶

4. CONCLUSION

Dynamic plan of project realization forms basis for financial analysis during investment preparation. Evaluations of realization dynamics include prediction of conditions and circumstances that may influence realization of the plan as well as other elements of the plan that are significant for project completion.

Projections resulting from the dynamic plan require correct selection of representative activities, calculation of their duration, definition of interrelated activities, provision for resources according to plan and according to individual sources, prediction of conditions and circumstances which may influence realization of the plan and other elements of the plan significant for project completion. Research and experience of the authors demonstrate that one of the reasons for inefficiency of investments in Yugoslavia is the inadequate project preparation consisting of unrealistic and/or unreliable elements of the project realization dynamic plan.

Even though detailed dynamic plan is one of the desired preliminary studies, valid methodology does not require it to be made in standard cases, but requires only a basic term plan to be presented (i.e. beginning and duration of key events in relation to turning points of physical realization of the project – beginning of realization, ending of realization, putting into operation). Depending on project size and complexity, dynamics of realization can be planned empirically, according to offers presented by building contractors and equipment suppliers. Gantt charts are commonly used in investment

⁵ Definitions taken from literature on Economics : Fixed prices are project prices that reflect current values in the moment in which estimate is made; in an investment study they are fixed on price level of basic term (usually month and year in which study is compiled); Current prices are projected (planned) prices calculated to neutralize the expected (estimated) price inflation in the future.

⁶ Data provided by Federal Bureau of Statistics is used for domestic inflation, while *Economic Survey*, OECD, is New York is used for inflation of foreign currency.

studies. In the process of planning for complex, large and long-term projects one of the network planning techniques, such as PERT or CPM are applicable.

Financing dynamics together with estimation of cost scope and structure (by time in which resources are spent) represent a separate segment of realization of all projects. Total investments at the moment in which investment study is being prepared should be projected into the future and expressed in fixed and current prices.

Dynamic plan is an element of crucial significance for the overall efficiency of investment project realization. It is done on the basis of analyses of predicted solutions and estimates of resources necessary for their realization. Planning of time and resources necessary for project realization must be based on reliable preliminary research and scientific prognoses. Methods which can make this possible deserve attention of all participants in the process of investment planning.

REFERENCES

1. Priručnik za primenu Zajedničke metodologije za ocenjivanje društvene i ekonomske opravdanosti i efikasnosti investiranja u SFRJ, Operativno uputstvo za izradu investicionog programa, Udruženje banaka Jugoslavije, Beograd, 1989.
2. Plavšić, R., *Inženjerski aspekti ocene investicionih projekata*, (doktorska disertacija), Arhitektonski fakultet Univerziteta u Beogradu, Beograd, 1994.
3. Hackney, W. J., *Control and Management of capital projects*, John Wiley & sons, New York, 1965.
4. Plavšić, R., Soldat, D., Dubonjić, R., Milanović, Lj. D., Knezević, S., *Izrada investicione studije*, AŠ "Delo", Beograd, 1998.
5. *Dokumentacija Instituta za ekonomiku investiranja*, Beogradska banka, a.d., Beograd, (case study), Beograd, 1988 - 1998.
6. Soldat, D., *Efikasnost održavanja*, KIZ "Altera", Beograd, 1993.

DINAMIČKI PLAN U INVESTICIONOJ STUDIJI

Rada Plavšić, Drago Soldat

Dinamički plan izvođenja projekta čini osnovu za finansijsku analizu u pripremi investicije. Rezime analiza u investicionoj studiji obuhvata izbor i detaljni opis optimalnog terminskog plana realizacije projekta. Posebnu pažnju autori posvećuju analizi planske usaglašenosti fizičke i finansijske realizacije projekta. U radu se sugerišu sadržaj i metode analiza elemenata dinamičkog plana implementacije koje obezbeđuju veću pouzdanost planiranja potrebnog vremena i sredstava u odnosu na rešenja u važećoj metodologiji za ocenu investicija.