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COMPARISON OF GC AND CM SYSTEMS FROM INVESTMENT EFFECTIVITY POINT OF VIEW

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ABSTRACT: In investment projects it is visible repeatability of organizational cycle. Scale of investment and capitalization of investment group has influence on choice of realization method of particular building (GC, CM) as also on managing system (PM, CM). It was discussed in Ref. 4 written on LSCE 2014 jubilee conference in Warsaw. However final effect not depends only on selected realization system. On stage of construction there, have influences numerous risks, Ref. 7. Efficient staff and proper interpretation of project course have significant influence on final effect. In this paper are shortly presented consequences of some choices and its results on effectiveness of realised investment.

Keywords: Comparison, GC, CM, investment, process, effectiveness.

1. INTRODUCTION

Lately in Poland, investors more and more frequently, before beginning of any activity over planned enterprises, are thinking over proper choice of method for leading and managing the construction. When the smaller is planned building, also the smaller is its budget and much more are analyzed the costs, Ref.14.

Often, is resigned from additional control of construction or just its managing for seemingly minimization of costs.

In the present paper, we try to show, that results of decision about choice of managing system, (Construction Management (CM) or General Contractor (GC)) have visible influence on obtained rates if IRR(...) Ref. 1, and on promptness of realized building investments.

2. PHASES OF INVESTMENT PROCESS [z LSCE 2015]

The investment process - it is group of operations and action, leading by performance or growing up existing durable resources, to achieve planned functional effects, Refs 4, 21. Actions undertaken in frames of investment process, needs decisions, which are charged by economical risk, Refs 3,5. Understanding of market rules and acquiring of ability to practical application financial instruments for evaluation of investment projects, is necessary range of knowledge for each investor or coordinator of investment.

Investment process concern of whole cycle for planned project (it is complex preparation and realization of enterprise) is composed from three phases, Refs 6, 19, 20:

- **Phase before investment** (preparatory phase) or before decision – on this stage are conducted studies and expert opinions for selection the most appropriate option for project and undertaking decision about exit/enter into investment.
- **Phase of investment** (realization phase) – it includes planning and completion of delivery (materials, installations, machines, equipments etc.), recruiting contractors for works: engineering-montage, installations, finishing all necessary for realization of project.

- **Phase of operation** (exploitation phase) – normal use and managing of object, through leading of correct exploitation, conservation and repairs.

3. SYSTEMS OF MANAGING BY INVESTMENT PROCES[2016]

The phases of project are exactly defined. Sequential parts of particular investment process are introduced according to the assumed graphic building (base) schedule, Ref. 2. Some differences and deviations from intentions, starts on stage of selection particular managing system for planned investment process. Dependently on type of selected system, it concentrates itself on particular phases or on whole process. In practice, market verifying different approaches indicates, that when the more complicated is task, it should be more carefully done selection of manner of project managing.

It can be set apart following systems for investment realization:

1. GC – General Contractor (General Performer).
2. PM – Project Management (Substitution Investor).
3. CM – Construction Management (pack system).
4. MC – Management Contracting (contract and realization managing).
5. EPCM – Engineering, Procurement, Construction Management.

Essential planes of managing by particular parts of investment process presents following collation.

The firms serving favours EPCM, CM and MC offer also some additional profits – concentrating on assurance of the highest standards and safety. It is a priority matter, but for not numerous General Contractors can be successfully to fulfil high expectations of investors.

4. GENERAL CONTRACTION (GC)

General Contraction (GC) it is the traditional method. Such system concern preparation and construction of building itself. In this system for managing, just contractor is organizing building process. In Poland it is applied the most frequently. Its characteristic feature is that choice of contractor is carried out after finishing designing works. Next, during lasting of construction, just general contractor is choosing

subcontractors in own scope. He takes decision independently. Also, general contractor is responding before investor for whole building process, starting from handing over a building ground, through obtaining permission on building, up to return of building ground for investor.

The fault of such solution is bigger risk of growing up cost and realization time of investment as result of possibilities of internal conflicts. Very often they follow from mistakes done on designing stage. It often leads to extension of range the works and the same to additional costs for additional works and payment by general contractor.

The next minus of such solution is limited influence of investor on subcontractor firms. On the contrary, as a profit is guarantee on making of range particular works with regard to one subject.

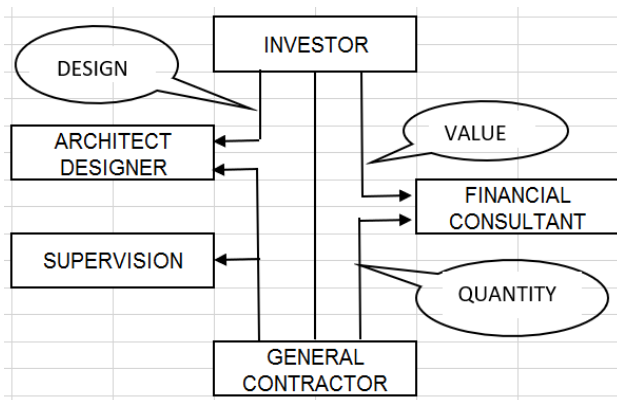


Fig. 1 Organizational scheme of GW system

5. CONSTRUCTION MANAGEMENT (CM)

Construction Management System (CM) depends on managing of building process. It concern of preparation of building ground and making of construction oneself. Here, the investment is managed by specialized advisory firm.

Characteristic feature of this system, is division of investment on a few packs (ranges of works) reciprocally coordinated. The agreements are concluded directly by investor with each contractor for particular works packs. Contrary, recruitment of contractors for each pack is successive according to inflow of technical documentation or dependently to actual advances of works.

Investor is monitoring whole process through undertaking final decisions with regard to all realization events. In final effect, non all decisions are undertaken on the ground of thorough analyses of result recommendations dedicated for managers project.

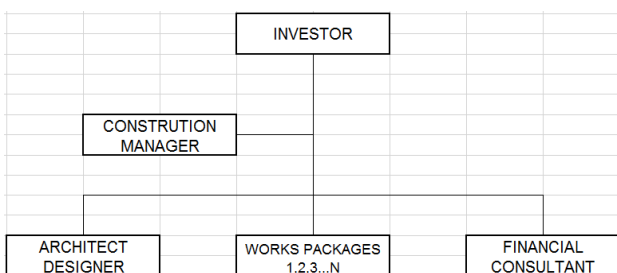


Fig. 2 Organizational scheme of CM system.

The profit of such system for building management is possibility of quick reaction on potential abnormality, what in consequence minimizes risk level for this investment. There, is also possible parallel designing for particular investment, and in effect is speeding up whole investment process.

6. METHOD OF ORGANIZATIONAL CYCLE

Each building process is subjected under very similar organizational cycles. It can be found in literature some manners for approaches to this problem. Therefore, organizational cycle is also an organized action. It is action oriented on obtaining particular, defined aim, and is

characterized by keeping proper sequence of activity stages. There, are consequently applied rules for realization of each one, with possible their gradual improvement.

These notion was systematized by French engineer Le Chatelier, which using achievements of F.W. Taylor, has elaborated conception of organizational cycle, according to it, that any action flow efficiently, it should be proceeded in ordered manner, realizing one by one particular cycle stages.

On the ground of Le Chateliers model, J. Zieleniewski has elaborated five-stage cycle for organized activity:

- Determination the aim of activity.
- Analysis of conditions and disposed resources.
- Preparative activities.
- Realization of task.
- Results control.

In literature it can be most frequently to meet organizational cycle divided on three stages:

- Preparation to activity.
- Realization of the task.
- Control of obtained results.

7. INVESTMENT EFFECTIVENESS

Effectiveness from definition point of view is the result of undertaken activity. It with respect to relation of obtained effects to incurred expenses. Therefore, it means the best effects for leded investment process. In this case it concern of efficient activity and minimization of costs for obtaining intended aim. In civil engineering building projects for investors or developers depends on the highest return rates and obtaining of index IRR. From here follow analysis and choice the most effective or the most proper managing system for particular investment project.

8. CASE ANALYSIS

Below, are analysed 7 residential buildings. It was selected 4 objects realized in system of General Contractor (GC) and 3 in pack system (CM). The investments were localized in Warsaw, Cracow and Poznań. For analysis were taken projects finished by obtained permissions on exploitation and financially settled. They were selected randomly from trial - data set of 30 projects. By this choice was not looping on localization, but first of all by undertaken investment managing system: GC or CM.

The analysed objects are listed in Table 1. The bigger buildings were realized in system GC approximately with 80 apartments. Contrary, smaller buildings were realized in system CM with approximately 30 apartments. So, here is coming additional suggestion, that selection of system depends from investment scale, too. Sometimes however, it is consequence of policy particular firm and magnitude of its capitalization.

On the first diagram, show in the Fig.3, are analysed and compared periods of realization leader in system GC. It concern of 4 investments.

Similarly on second diagram given in the Fig 4, are analysed and compared periods of realization, leded in system CM. Trial for 3 investments.

Comparing both diagrams it is evidently visible, that in case of investment realized in GC system, 2 of them from 4 (2/4, Fig. 3) were finished practically in the time. There, as additional element was applied control these investments by order for playing function of PM for other exterior subject, Ref.9. Remaining 2 investments (1 and 2), without additional control, were realized by small exceeding of planned time.

Contrary, in the case of investment realization in system CM, Fig 4, planned time limits were not fulfilled. Additionally, when the more long was planned period of realization, the deviation of time from planned was bigger. As next factor deciding about not keeping the time was leak of additional external supervision control in the form of PM, as it was in the case of investments in system GC (Fig.3).

In the case of lengthen time of building construction, e.g. from the reason of finances, it has influence on final time of expected term of investment finishing.

Table 1. Comparison of analyzed analytical trial of 7 buildings

Object	Time of completion [month]			Implementation	Management system
	plan	actual	d=		
Residential Building 1	38	43	-5	GW	PM
Residential Building 2	16	18	-2	GW	PM
Residential Building 3	22	22	-0	GW	PM
Residential Building 4	61	61	-0	GW	PM
Residential Building 5	9	10	-1	CM	CM
Residential Building 6	15	17	-2	CM	CM
Residential Building 7	21	23	-2	CM	CM

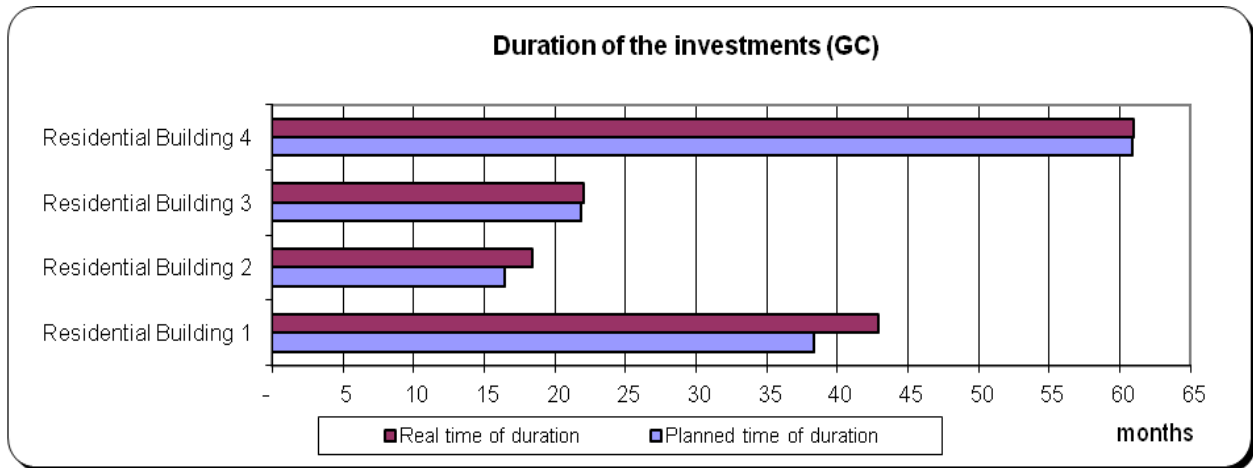


Fig. 3 Investments realized in system GC (in Polish – Generalne Wykonawstwo (GW)). The buildings are bigger up to app. 80 apartments, Ref. 7.

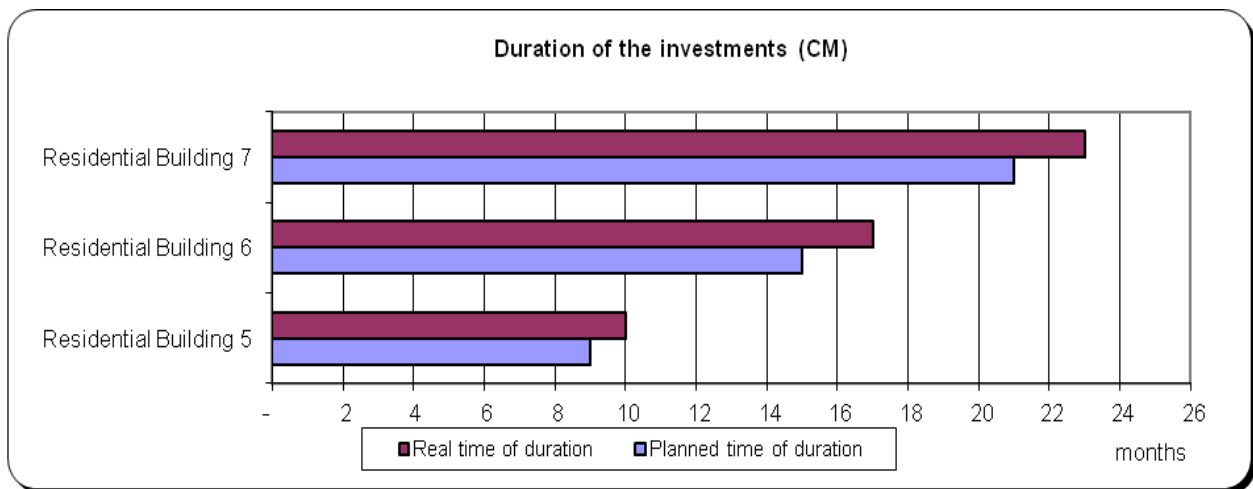


Fig. 4 Investments realized in system CM. The buildings are smaller up to app. 30 apartments, Ref. 7.

Additional reasons influencing on realization times, are risks – such as: designing, external, organizational, constructional and risks with engineering character. The most frequently repeated factors influencing on delaying fixed time of investment finishing are: changes of materials prices and their accessibility, elongation of times for gaining necessary building permissions, problems with accessibility of general resources (e.g. human resources), errors in building schedule, problems with recruiting of sufficient number of sub-contractors for task and unexpected increase of building costs. At the end also important here is experience of managerial personnel and proper evaluation and identification of risks before its appearing, Ref. 7. To late identification of above reasons, fatally influences on planned term of building finishing.

9. SUMMARY

Frequent reason of choice system CM but not GC, is economical reason. Taking into consideration mark-up and additional costs for managing by packs by GC, it is evaluated even on 20% potential savings. But if we taking into consideration longer time of investment, and connected with this fact additional costs, they are eliminating expected savings, and even generating costs increasing, Ref. 10. Here also are next costs of ordered works, which are not in the case of GC system. There, can also appear additional costs, what touch building budget independently on system of realization of building. The buildings realized in system CM often don't have kipped time schedule and appears there additional works. In this way assumed in the

beginning original costs aren't fulfilled. In effect budget for hard costs is exceeded for particular investment at 15% and even at 25%.

In final effect it can be confirmed, that in Polish business reality, more frequently the buildings realized in system GC and additionally supervised (PM), are more profitable and quicker are finished.

REFERENCES

1. M. Obrębski: Analysis of management effectiveness for investment process. LSCE 2011, Micro-Publisher, Łódź, 2 December, 2011 pp. 93-97.
2. M. Obrębski: Critical points by accomplishment of investment into commercial objects. LSCE 2012, Micro-Publisher, WAT, Warsaw, 7 December 2012, pp. 138-141.
3. M. Obrębski: Analysis of profits by application of the method EV for monitoring realization of running investment project. LSCE 2013, Micro-Publisher, UWM Olsztyn, 6 December 2013, pp. 91-96.
4. M. Obrębski: Analysis of influence a choice of management system for investment project on its profitability. LSCE 2014, Micro-Publisher, Warsaw, 25-28 September 2014, pp. 144-149.
5. M. Obrębski: Application of the EV method to monitoring of projects realised by applying of Housing Trust Accounts. LSCE 2015, Micro-Publisher, Rzeszów, 4 December, 2015. pp. 61-66.
6. M. Obrębski: Verification and monitoring of housing investment by the Earned Value Method. XXII LSCE, Olsztyn, 2 December, 2016
7. M. Obrębski: Risks influence on selection of applied managing system for investment project. LSCE 2017. Bydgoszcz, 1.12.2017, pp. 63-67.
8. W. Jabłoński, Procesy inwestycyjne i ocena ich efektywności, Sosnowiec, 2002, s. 57
9. A. Minasowicz: Analiza ryzyka w projektowaniu przedsięwzięcia budowlanego, wyd. OW PW, Warszawa 2008
10. W. Majewski: Zarządzanie kosztami i doradztwo finansowe w procesie budowlanym. Inżynier budownictwa. nr 6-7 2006
11. N. Mingus: Zarządzanie projektami. Wydawnictwo Helion. Gliwice 2002.
12. A. Minasowicz: Efektywność i zarządzanie finansami w budownictwie. Wydawnictwo Poltex, Warszawa 2009
13. Projekt celowy Nr 6T07 2004 C/6413 „Krajowy system zarządzania budowlanymi przedsięwzięciami inwestycyjnymi finansowanymi z udziałem środków publicznych i pomocowych Unii Europejskiej”, kierownik projektu J. Kulejewski,
14. D. Doyle: Kontrola kosztów, wyd. SIW Znak, Karków 1996
15. J. Jakubczyc: Zarządzanie finansami. Odpowiedzialność finansowa, wyd. Uniwersytetu Wrocławskiego, Wrocław 1999.
16. K. Jaworski: Metodologia projektowania realizacji budowy, wyd. PWN, Warsaw 1999.
17. E. Kucharska-Stasiak: Zarządzanie nieruchomościami, praca zbiorowa, wyd. Instytut Nieruchomości Valor, Łódź 2000.
18. A. Minasowicz:.. Analiza ryzyka w projektowaniu przedsięwzięcia budowlanego, wyd. OW PW, Warsaw 2008.
19. W. Werener: Procedury inwestowania, wyd. OW PW, Warsaw 2004.
20. W. Werener: Proces inwestycyjny dla architektów, wyd. OW PW, Warsaw 2007.
21. W. Kietliński, J. Janowska, C. Woźniak: Proces inwestycyjny w budownictwie, wyd. OW PW, Warsaw 2007.