



Inventory of building projects in the semi-formal sector in the Republic of Congo.

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Abstract :

The growing concern for housing in developing countries, where the need for housing far exceeds the supply offered by the public authorities, has encouraged the development and growth of self-construction in towns and cities. It is with this in mind that the informal and semi-informal sectors are being called upon by property developers wishing to study and carry out their projects according to the means available to them. The survey conducted in the semi-informal sector in the Republic of Congo confirms the existence of shortcomings in the management of construction projects in developing countries. Contractors, engineers and architects are at the heart of most residential construction projects. Most projects are financed by the property developers' own funds. Labour productivity on building sites varies from one project to another, and delays in delivery caused by poor project planning, scarcity of financial resources or poor project management are often recorded.

Keywords : Construction, semi-informal sector, planning, project, management.

1. Introduction

Developing countries are constantly faced with a shortage of social housing to take account of the imbalance between housing supply and demand in large urban cities, as in the case of Brazzaville and Pointe-Noire in the Republic of Congo. Despite the efforts made by the public authorities, the current rate of production of public buildings does not seem to offer housing capable of curbing the growing needs expressed by the population [1; 2]. What's more, it has been found that in most African countries, almost 90% of the production of individual housing is self-built, with each player building according to the availability of his or her own resources [3; 4; 5]. The players who carry out the work in this case are generally SMEs or groups of companies, whether or not they are registered on the trade register, and who carry out their work in what is known as the semi-informal sector [6]. According to *Sonia Mengueli et al*, there is in fact a continuum of situations between the entirely formal and the entirely informal [7]. The informal sector is considered to be the boundary between the informal and formal sectors. However, depending on the size of the site and the client, the inefficiency of self-build often lies in the inadequate organisation and management of the work. This is because self-build often fails to ensure the quality of the work carried out, and often leads to a deadlock in the implementation of projects due to a lack of serious planning. In the Republic of Congo, the companies most frequently invited to tender are mainly those operating in the semi-formal sector. The "semi-informal construction sector" can be defined as all semi-structured companies or groups of companies, i.e. those recognised as SMEs (Small and Medium-sized Enterprises), identified and registered in the trade register. However, the level of technical expertise in this sector does not fully guarantee the proper execution and feasibility of construction projects [5]. We are interested in these companies to understand how projects are managed in this sector.

2. Materials and methods

2.1. Investigation of construction project management problems in the Republic of Congo

2.1.1. Data collection methods

Face-to-face interviews were used to collect the data. These interviews were conducted at company headquarters, base facilities and worksites. This method enables the interviewer to obtain the answers according to an outline or guide that specifies all the questions to be dealt with, their sequence and the way in which they are to be approached. It is therefore both qualitative and quantitative.

2.1.2. Sampling

Given the type of study and in order to ensure the representativeness of the sample, the method chosen for this study is the quota method [8]. An appropriate choice of quotas can reduce the variance of the estimate and the size of its confidence interval. If applied rigorously, the quota sampling method can be as accurate as random sampling, or even more accurate if the sample size is small [9]. It is in fact very practical for this type of study and allows better control over the characteristics of the sample or identifiers. The sample selected consisted of 35 companies; the survey was carried out in Congo's two main cities (Brazzaville and Pointe-Noire). This was justified by the concentration of the country's activity in these cities.

2.1.3. Survey objectives :

Identify :

- the organisational structure
- company specialisation
- sources of funding for projects
- methods for determining labour costs
- the method for determining the number of workers
- cost estimation methods
- project planning methods
- methods of carrying out the work

- factors contributing to late delivery of construction projects

3. Results and discussion

A study of the management of residential building construction companies in the Republic of Congo shows that, in recent years, a large number of young architects and engineers have come to the fore. However, most of them are working in the semi-formal sector, setting up small and medium-sized enterprises (SMEs) or groups of construction companies.

3.1. Organisational structure

The SME is run by an architect or engineer, with a senior technician acting as site manager and a secretary (Figure 1). However, the site manager is not permanent. Sometimes, even without a secretary, the company manager recruits staff as and when required by signing works contracts (C.D.D.).

The architect or engineer does everything himself (drawing up plans, preparing estimates, drawing up schedules, preparing tender documents, seeking contracts, etc.). In the case of a major project, they call on other partners (engineer, architect or company), and may also have a senior technician to assist them as site manager, or even a secretary. If he wins a small contract, he plays the role of both general manager and site manager.

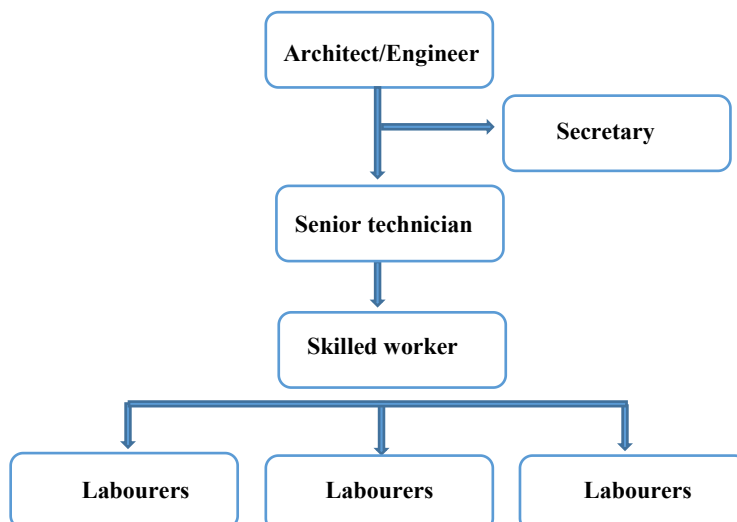


Figure 1. Organisation chart of a semi-formal company

3.2. Company specialisation

The majority of companies in this sector specialise in building. There are also mixed companies (building and public works). Figure 2 shows that 83% of these companies specialise in building, compared with 17% in public works.

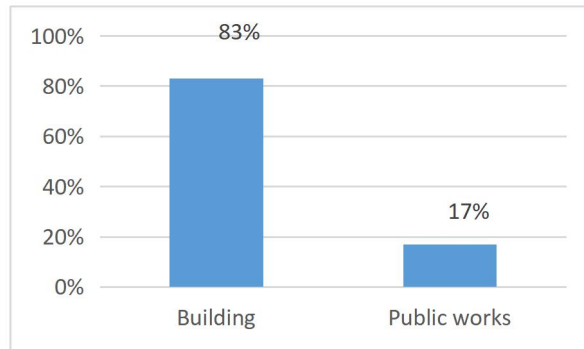


Figure 2. Company specialisation

3.3. Source of funding for projects

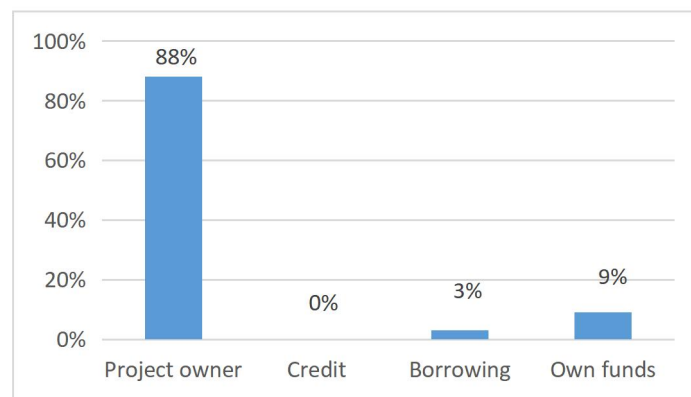


Figure 3. Source of project funding

Figure 3 shows that 88.57% of projects are financed by the project owner's own funds, compared with 3% by loans and 9% by the contractor's own funds (in the context of pre-financing). This may be one of the causes of project slippage. If the project owner encounters financial difficulties, it is no longer easy to finance the rest of the work.

3.4. Determining the cost of labour (4)

a) Private market (individuals and businesses)

The architect or engineer draws up an estimate of the materials he will need to carry out the work before submitting it to his client for approval and signature of the contract. He calls on

the workmen (Maîtres) and each of them tries to work out his estimate in relation to the task that will be assigned to him.

At the end of this technical meeting, the contractor compares the two estimates (his own and the workmen's) and tries to improve the workmen's estimate by taking a safety margin of between 20 and 50% for each trade. After this stage, the contractor deducts 30% of the total amount of the estimate for the purchase of materials, which he considers to be the cost of labour.

When the contract is signed, there are other customers who are looking to reduce the estimate by at least 10%. The contractor takes all these parameters into account when drawing up his estimate.

The 30% labour cost is broken down as follows : 20% for the contractors (bricklayer, plumber, formworker, reinforcement worker, etc.), 5% for contingencies and 5% for the contractor's profit and site supervision, including bonuses for his workers (site manager and secretary). In other cases, the contractor sets the cost of labour at 40% because he knows that the customer will discount it (i.e. to 30%).

b) Public contracts

In this case, the cost of labour is determined by taking into account the different categories of trades, the number of staff per trade, the daily income of workers per trade and the time required to complete the sub-constructions.

Table 1. Productivity of workers/days

N°	Assigned task	Yield and number of units per working day
01	Earthworks, structural work and masonry	<ul style="list-style-type: none"> •Excavation: $4m^3 /d/worker$ (in sandy soil) •Mortar : $3m /d/worker^3$ •Vertical plastering : $19m /d/worker^2$ •Horizontal plastering: $13m /d/worker^2$
02	Carpentry, roofing, false ceilings, formwork and woodwork	Formwork for beams and frameworks : <ul style="list-style-type: none"> •Footings : $0.01 m /d/worker^3$ •Nails and wire : $0.4h/u/worker$

		<ul style="list-style-type: none"> •Carpenter's helper: 0.4h/u/worker
03	Paint	<ul style="list-style-type: none"> •Scraping, puttying: $80m /d/worker^2$ •Water-based paint: $130m /d/worker^2$ •Oil paint: $100m /d/worker^2$
04	Tiling	<ul style="list-style-type: none"> •Laying horizontal tiles: $30m /d/worker^2$ •Laying vertical tiles: $25m /d/worker^2$ •Skirting board installation: 20ml/day/worker

3.5. Determining the number of workers

The number of workers is determined partly by experience, and partly by applying the rules set out in the collective agreement (in the case of a public contract). But given that in this sector of activity the time parameter and the terms of payment are not often respected, to maximise his profit, the entrepreneur relies on his experience.

Figure 4 shows that 48.78% of companies used nine (09) workers to carry out an F4 single-storey project, compared with 19.51% for six (06) workers and 7.32% for three (03) workers. This variation is explained by the cost of labour. When financial resources relating to labour are satisfactory, the contractor increases the number of workers.

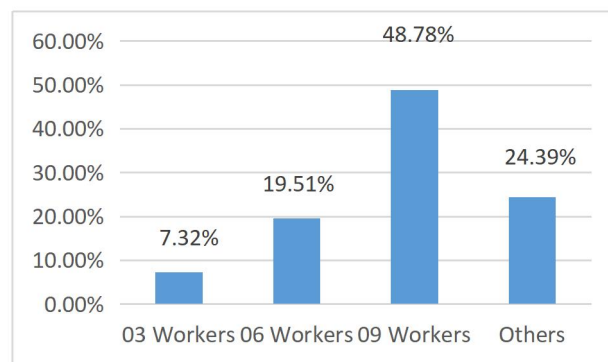


Figure 4. Number of workers required to complete an F4 single-storey project

3.6. Cost estimation method

The essential aim of this method is to highlight the requirements necessary for the price study of a sub-work or an elementary work. It contains a method for composing prices by sub-detail, and a framework for presenting an objective which we feel is suitable for most cases. Here,

we are essentially looking for the cost price (PR) and selling price (PV) of an elementary sub-work (specific part of a sub-work) which is distinguished from the others by the particular nature of the work required.

3.6.1. Cost price (CP) :

It represents the actual cost, taking all expenditure into account, of an elementary sub-structure or of a sub-structure in its entirety.

It can be :

- provisional when it is drawn up at the study stage on the basis of an estimate ;
- real when it is established after the sub-works have been completed on the basis of performance data.

Table 2. Breakdown of cost price (excluding tax)

Designation	Features	Contents/ Remarks
Dry disbursements (DD)	Linked to elementary subworks	Labour + materials + equipment
Site costs (SC)	Linked to a sub-structure in its entirety	Site huts, site lighting, etc. Impossible to assign to a basic structure
Overheads (O)	Linked to the general operation of the company	Administrative salaries, head office rent, etc. Not directly related to the site but borne by the company
Special expenses (SE)	Linked to specific terms of the contract	Application fees, inspection office fees, etc.
The composition of a cost price can therefore be written as follows		
$CP = DD + SC + O + SE$		

3.6.2. Selling price (SP) :

This is the price that the project owner will pay to the contractor carrying out the work defined in the works contract.

$$\text{SP (excluding tax)} = \text{CP} + \text{Expected profit (EP)} \quad (1)$$

The composition of a selling price can therefore be written as follows :

$$\text{PV (excluding tax)} = \text{DD} + \text{SC} + \text{O} + \text{SE} + \text{EP} \quad (2)$$

3.6.3. Method of payment for the contract

a) Private market

In the semi-formal sector, the architect or engineer seeks a minimum profit, regardless of the method of payment. In some contracts, the customer pays the full amount requested by the architect or engineer (the total cost of the project, including labour). In this case, the contractor provides the customer with a detailed schedule of the work and the date on which the project will be handed over, with a contingency margin of around 10%. This approach is much more closely linked to trust between the two parties and the customer's income.

Sometimes, the customer takes care of the supply of materials himself, and the contractor is content only with the labour part, which the customer disburses step by step as the work progresses (Figure 5). In some cases, the contractor makes a down payment for the labour required at the start of the job and pays the balance at the end.

In addition, the customer pays 50% of the labour and, as the work progresses, pays a further 30%, with the remaining 20% paid on completion.

Other customers who have a good grasp of business law require the contractor to include taxes (VAT, CA) in the estimate and check that the contractor is in a legal position with the government. Very often, this type of customer honours their commitments.

As a general rule, whatever the method of payment, the contractor, architect or engineer will do their best to check that the materials that are important for carrying out the job are available before starting it.

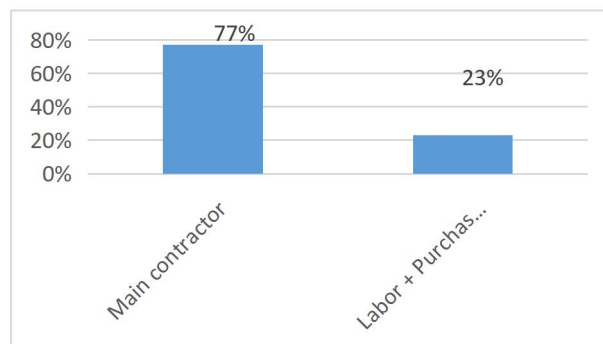


Figure 5. Contract payment terms

b) Public contracts

In this type of contract, it is the government that sets the method of payment, based on the procurement regulations applicable in the Republic of Congo.

3.7. Planning method

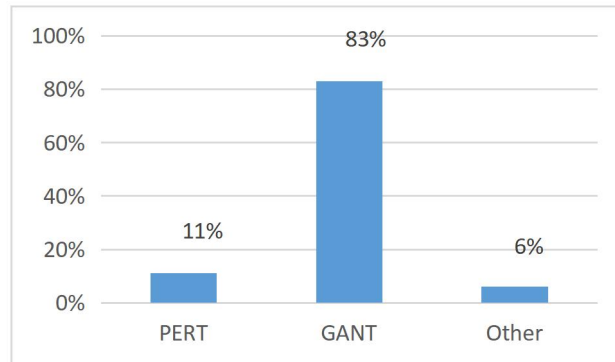


Figure 6. Planning mode

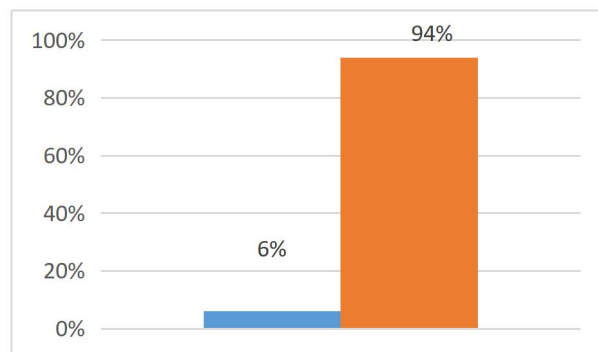


Figure 7. Reliability of planning methods

Figure 6 shows that the Gantt method is the most widely used, followed by PERT and other methods. The Gantt method accounts for 83% of all methods used.

Figure 7 shows that these methods do not appear to be reliable for carrying out a construction project in this sector.

3.8. How the work is carried out

Executing a project in this sector is much easier than in the informal sector.

In the case of a major project, the work is directed by the engineer or architect in charge of the project, followed by the senior technician acting as site manager.

The senior technician is permanent on the site and manages the workers. They are responsible for getting the workers to carry out the schedule. They produce daily reports on site progress for the engineer or architect, and appeal to the latter in the event of a site dispute.

All work packages follow the schedule drawn up in advance by the architect or engineer. If the schedule changes during the day, the architect or engineer must be notified before the task is carried out. If a task is delayed, an incentive is given to each worker to speed up the work. This bonus is deducted from the 5% contingency allowance and paid by the contractor.

For small jobs, the architect or engineer acts as site manager. When pouring concrete for a large job such as a slab or footings, all those involved join forces instead of recruiting other workers. However, when the quantity of work is very high, particularly when pouring floor slabs, in addition to the site workers, the labourers located in the area of the site are involved in the daily task for a fixed fee.

3.9. Delivery of construction projects

Delays in delivery may be due to poor project planning, scarce financial resources or poor project management.

Planning is very often confronted with contingencies occurring during the execution phase of a project that planners generally do not foresee. In fact, requirements relating to tasks or sub-tasks, such as taking account of weather conditions, days off, the availability of certain resources (materials, manpower, etc.) or the completion of other projects, are the factors that lead to the activity schedule not being adhered to.

It is also important to point out that some delays in the delivery of works are due to the inability of companies to carry out several projects at the same time. Companies with many projects do not have enough equipment to manage them properly. The same machines are used on all the sites, which are not always located in the same geographical area.

3.9.1. Causes of late project delivery

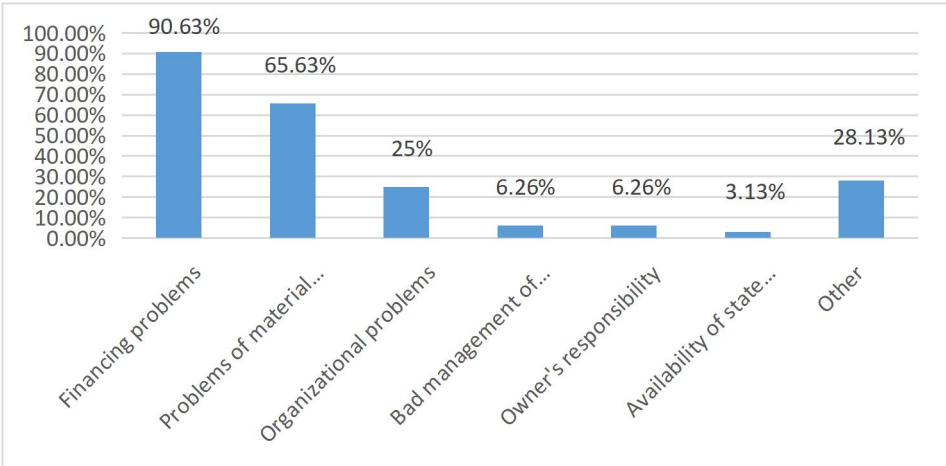


Figure 8. Causes of project delivery delays

Figure 8 clearly shows that project financing problems are the main cause of late project delivery (90.63%), followed in order by problems with the supply of materials (65.63%), the organisation of worksites and others. Problems of lesser importance appear to be poor management of the resources allocated, the responsibility of the project owner and government funding difficulties.

3.9.1.1. Other causes of delays in Congo

- delays in financing certain parts of the construction work, resulting in the need to repair the works because the causes of the damage are exacerbated: this is the case for erosion treatment works, roads, etc;
- poor control and monitoring of works ;
- change of company due to non-compliance with clauses ;
- other changes occurring during the execution of the project ;
- corruption resulting in projects not being completed ;
- awarding contracts to fictitious companies or crooked economic operators ;
- influence peddling by authorities clandestinely sponsoring non-regulatory companies, which present difficulties in carrying out projects according to the rules of the trade.

3.9.1.2. Exceptional causes : the health situation and the various armed conflicts around the world

- financing problems due to the financial crisis, resulting in a scarcity of financial resources (**unfavourable economic conditions**);
- high transport costs, which affect labour costs ;
- rising prices for building materials ;
- limiting the workforce by complying with barrier measures against Covid-19 ;
- reduced chances of banks granting loans to property developers to finance their projects (**financial difficulties**).

4. Conclusion

Analysis of the survey results reveals the following:

- companies use an almost traditional approach to project planning;
- Project planning methods in the Congo are based on experience;
- most projects are financed by the project owner on the basis of its own income, which is often subject to many uncertainties.
- planning tools are rarely used and are not adapted to this environment;
- Project delivery delays are generally due to financing problems;
- the problems of paying for labour are proving complex.

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