

CITY OF TSHWANE

# Analysis of delays on roads and

The seeds for this study were sown during years of experiencing frustrating delays on infrastructure construction projects at the City of Tshwane.

By HOFFIE CRUYWAGEN, University of Pretoria



**Was it a South African phenomenon or just a local government problem that was frustrating the authors? What could be done to improve the situation?**

**T**HESE AND OTHER questions were translated into problem statements and hypotheses that formed the basis of a treatise that was submitted in fulfilment of part of the requirement for the degree — Master of Science (Project Management) in the Faculty of Engineering, Built Environment and Information Technology at the University of Pretoria (UP).

## Methodology

The study covered a five year period ending at the end of 2010. A three tier approach was followed to collect data for the study. Firstly, a literature review was done on relevant literature

to evaluate the global situation with regards to delays on construction projects.

Secondly, a questionnaire was used to targetted personnel who formed part of the Roads and Stormwater Division (RSD) project teams (internal and external) at the City of Tshwane (COT). Thirdly, historical data on construction projects completed in the stated five year period were filtered from the records of the RSD.

## Magnitude of the problem

From literature, it seems that the problem of delays are not just a South African or local government problem, it is a global challenge on construction projects in general. Many

authors on construction project management are of the opinion that one of the most serious challenges facing construction projects today is delays. Alkass et al. (1996) states that “Delays are the most common and costly problem encountered on construction projects.” The reasons for delays are varied, but the extent and effects are far reaching. Delays are a global phenomenon, according to Sambasivan and Soon (2007), which results in time over runs on projects around the globe.

---

**The reasons for delays are varied, but the extent and effects are far reaching**



# stormwater projects

In addition to the negative economic implications of delays on capital projects, Odeh and Battaineh (2002) site extensive delays to be a fertile ground for costly disputes and claims. These disputes and claims will not have a positive effect on the working relationship. The environment could deteriorate into a hostile one where parties become adversaries in the project, with relationships failing. A possible breakdown in the relationships could in severe cases lead to mediation, arbitration and ultimately litigation. Alkass et al (1996) support this view and are of the opinion that delays are not only costly, but might often result in litigation.

## The government sector

Al-Kharashi and Skitmore (2009) see “frequent and lengthy delays” as one of the critical problems faced by the Saudi Arabian government sector. The effects of delays are however generally under estimated and the cause and effects with regards to delays are not appreciated. This is especially true at public sector institutions where officials are generally not as sensitive to the cost of capital or loss of potential income as people would be in a profit driven environment. Infrastructure development is extremely capital intensive and delays will increase the cost of the infrastructure. Escalation and the cost of capital will impact negatively on the feasibility of projects because of the time slippage. In some cases to a point where development of the infrastructure may not be affordable anymore or a reduced specification level needs to be implemented with increased maintenance cost in the long run.

In addition to this, most organisations within the government sector have very rigid budget cycles. A “use it or lose it” principle is used by the COT when it comes to capital budgets. Time lost due to a specific construction delay can be magnified many times due to the fact that the delayed construction project does not match the funding profile for the project after a schedule delay, and results in possible cost overrun. In addition to the time lost, the budget has to be amended to make provision for the delay. This process is slow and with ever changing priorities. The delay could thus result in funds for a specific construction project



drying up if it experiences a schedule delay and in a worst case scenario the delayed projects could fall by the wayside and may never be completed.

## Importance of study

The time overrun caused by delays will have a knock-on effect that leads to cost overruns as

## Infrastructure development is extremely capital intensive and delays will increase its cost

a result of increased overheads. The client/owner will have additional supervision cost, whereas the contractor will have to pay or use resources for an extended period of time to complete activities not completed in the time allowed for in the programme. In addition the owner will not have the use of the new facility. This could mean an extended dependence on the existing infrastructure with high maintenance costs, loss of income or production capacity. Time overrun could ultimately impair the feasibility of the project for the owner. For the contractor and the owner delays could result in missing possible new opportunities due to capital and other resources not being available.

It is thus important to manage delays efficiently as it forms part and parcel of a construction project. To do this, it is essential to know what the most significant causes of

## A “use it or lose it” principle is used by the COT when it comes to capital budgets

delays are, specific to one’s own environment. The magnitude of the effects and what can be done to mitigate or limit the effects of an individual delay needs to be determined. The capacity of the project team to predict possible

delays will lower the risk of delays occurring and limit their negative effects as they can be taken into consideration in the planning process for the project.

## Results of the study

The questionnaire was distributed via email and by hand to selected COT employees and consulting firm employees. About 63 possible respondents were targeted for the study. Out of this group thirty completed the questionnaire and returned it via email or delivered it by hand, representing a 47.6% response rate.

Construction projects completed in the five-year period spanning from the beginning of 2006 up to the end of 2010 were investigated. Only conventional roads and stormwater projects were considered for the study. Expanded Public Works Programme, learnerships and maintenance contracts were

excluded from the study. These contracts numbered nineteen.

The data from these two sources were analysed and some of the important findings were:

- Personnel on the RSD project teams do not appreciate the amount of projects that are being delayed because of construction delays.
- The time lost during the construction phase of RSD construction contracts to delays is underestimated by personnel that are involved in the projects.
- All the conventional projects completed in the last five years at RSD were delayed.
- The average time delay compared to the original contract time is 67%.\*
- Insufficient production rates and services made up 50% of time lost to delays.
- Weather related delays are the most frequent type of delays.



### Specific delay mitigation

On a practical level the following were identified as actions that could be taken to reduce the impact of the major delay groups that were identified.

### Delay: low production rate

In this case the contractor is not performing and is thus causing a delay by his actions or lack thereof. It would be seen as a non-compensable delay as per Loots (1995). The Contractor would thus not be entitled to any extension of time or monetary claim. The following could be used to improve the quality of contractors appointed and to motivate them to up their performance:

- The procurement points system must be adapted to make provision for technical evaluation of contractors.

- Construction time calculation must be done on a more scientific basis.
- A reward system needs to be built into the contract to motivate contractors to perform at higher production rates.
- A record of contractor performance must be kept centrally on a data base at the COT to assist in tender evaluation.
- The penalty clauses must be enforced.

### Delay: services related delays

Services are to be expected in an urban area, but the potential risk of delay that this poses to the program could be limited by the following:

- Funds should be budgeted for services location and relocation that is not connected to a specific project.
- Service investigation must be made part and parcel of all feasibility studies.
- Pressure should be put on electricity and

- start excavations for stormwater systems at the outlet to limit flooding of excavations
- do not construct any structures below the 1:50 year flood line during the rainy season
- make provision for temporary drainage of low points during construction
- construct temporary diversions for stormwater if flow is obstructed

### General delay mitigation

In addition to the specific delay mitigation the following was identified as aspects that would help to limit the time lost to delays.

### The contract

Project management is about team work and the project team is a very important part of a successful project. Yet if one thinks of the parties to a construction contract, namely the contractor and the client, with the engineer representing the client, adversaries would be an apt description rather than team members. The one's loss is the other's gain, because a saving to the one is loss to the other. There is no incentive to work together. The relationship starts with the tendering process that is a competitive bid that could result in the contractor tendering as low as possible to be awarded the tender and then making up for the low price by instituting claims against the client. Some of these claims could be for extension of time, because additional resources to speed up production cost more money and additional time allowed will result in increased time related items being claimed. The original delays could be amplified by disputes that could follow on this adversarial relationship.

Internationally, in recent times, the relationship between clients and contractors has become more collaborative in nature. The New Engineering Contract (NEC), which was developed in the United Kingdom, is the first standard construction documentation used in South Africa that recognises this fact in using a philosophy of collaboration rather than one of opponents. This contract has been used to a limited extent at COT. The advantages of the contract could be that the contractor can be monitored more closely by COT because of the openness and the collaborative nature of the contract. This, combined with incentives for saving construction time, which will mean a saving in cost for COT, can bring construction schedules under control.

A cost structure type that could be considered in combination with the NEC or other contracts is a 'cost plus' type contract. This will enhance the cooperation between the parties even more due to the transparency of their

water departments to improve the quality of their as-built records.

- The use of electronic services detection devices should be introduced.
- All services in the road reserve must carry an X, Y and Z coordinate.
- The quality of services investigations need to be improved.

### Delay: weather related delays

Although this type of delay falls into the excusable delay category as per Loots (1995) and no party is at fault, the following actions could help to limit the effects of rain on the works programme:

- limit stormwater construction in summer (or winter for Western Cape)
- prepare budget plans that will allow for stormwater construction in winter



costs. There will be no need to hide information or play claim games. Focus will be on the real issues of the construction project; these being time, cost and quality. It needs to be noted that the current procurement system does not make provision for cost plus type contracts and that this will have to be added as an option.

### Record keeping

Alkass et al. (1996) report that 70% of the effort involved in a claim is searching and organising of information. Extension of time claims should be evaluated on the facts. The facts in this case are records of variations, correspondence, minutes of meetings, progress reports etc. Gibson (2003) describes this effort as “looking for a needle in a haystack!”

In certain cases during the evaluation of historic contract data on projects of COT, only part of the picture could be filtered from the contract files. Some delays had to be put down as unknown. It could be that some of the data is on the engineer’s records and it never made it to COT’s records. In other cases details of the delays are not recorded until the construction time has lapsed and the COT Finance Department demands that penalties be charged as per the contract before payment is processed. The evaluation of the delays would thus be a retrospective process that could leave the door open for the contractor to challenge the engineer’s ruling on an extension of time claim due to a lack of conclusive evidence.

Meticulous records of contract payments are kept and these are generally of a high standard. The same cannot be said of time as part of the time, cost and quality balance triangle for a project. The completion date for a contract is not calculated correctly in all cases and when extension of time is granted the picture becomes even more blurred. The issue of the Practical Completion Certificate in terms of the General Conditions of Contract (GCC) is not always done with the progress in mind but the end of a financial year or penalties that have to be paid by the contractor as the main consideration.

More focus needs to be put on the management of time. If all the negative side effects of delays are ignored, the saying that “time is money” will still apply within the contract. Time related costs will have to be paid even if it is only for the additional time that the engineer spends on the contract. It is recommended that a detailed report on time be included in the monthly payment certificate that will track time more closely. This report should include contractual dates, revised contractual dates, extension of time granted with motivations and

dates, extension of time claims in process and estimate of completion time. Some of this is already reported in the site meetings minutes and monthly reports, but the record of this is sporadic in some cases.

Improved records of delays and extension of time allowed on the construction schedules, will make a move away from a retrospective



## If the construction project knowledge is managed poorly, mistakes of the past will be repeated

system of time management to an in time system possible, which will predict the completion date of a project more accurately. This will improve the control on time with a resulting reduction in time related delays.

### Knowledge management

At this stage there are on the one side very experienced individuals at many municipalities and on the other people with very limited experience, hence very little applicable knowledge. Many delays occur or are aggravated by the failure to anticipate problems and solve them when they occur. Knowledge management can be used to reduce the impact of construction project delays using a project learning approach.

If the construction project knowledge is managed poorly, mistakes of the past will be repeated. Decision-making will be slow and incorrect, which in turn will lead to an increase in time delays according to Abdul-Rahman et al (2008). He proposes a four phase model that includes knowledge identification, sharing, exploitation and storage.

It will take some time and further research to

develop a full knowledge management system. In the interim a basic action plan that can be implemented is to include an item in the completion report of a construction project that would read ‘lessons learned’. The information gained in this manner could be shared with people in the division through various mediums. Presentations by senior personnel on knowledge that they possess that is critical to delay mitigation could also go a long way in limiting the effects of delays.

### Conclusion

Aibinu and Odeyinka (2006) call delays a leakage in the construction industry. It could in fact be more than this at some municipalities. Although it might not be possible to totally eradicate the phenomenon from construction projects, some simple and basic interventions can help limit the effects of schedule delays on construction projects at municipalities.

Planning for delays is not about being negative, but being realistic about the construction process. The knowledge of the risk that is posed by delays in a specific environment and type of project is of paramount importance in delay mitigation that will save time in the end. The improvements in service delivery to the people of towns and cities will be the reward for the management of delays in a constructive manner. **35**

### References

- \*the average delays include the three groups as categorised by Loots (1995) namely excusable, compensable and non-compensable delays.
- Abdul-Rahman, H., Yahya, I.A., Berawi, M.A. & Wah, L.W. (2008). *Conceptual delay mitigation model using a projects learning approach in practice. Construction Management and Economics*, (26), 15-27.
- Aibinu, A.A. & Jagboro, G.O. (2003). *The effects of construction delays on project delivery in Nigerian construction industry. International Journal of Project Management*, (20), 593-599
- Alkass, S., Mazerolle, M. & Harris, F. (1996). *Construction delay analysis techniques. Construction Management and Economics*, (14), 375-394.
- Al-Kharashi, A. & Skidmore, M. (2009). *Causes of delays in Saudi Arabia public sector construction projects. Construction Management and Economics*, (27), 3-23.
- Loots, P.C. (1995). *Construction Law and Related Issues. Kerwyn: Juta & co, Ltd.*
- Odeh, A.M. & Battaineh, H.T. (2002). *Causes of construction delay: traditional contracts. International Journal of Project Management*, (20), 67-73.
- Sambasivan, M. & Soon, Y.W. (2007). *Causes and effects of delays in Malaysian construction industry. International Journal of Project Management*, (25) 517-526.