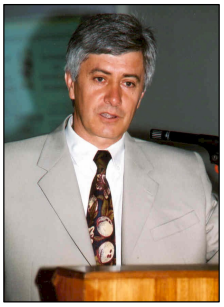
Article Category: TIME

LATE COMPLETION OF BUILDING PROJECTS



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ABSTRACT

An investigation was launched to determine whether building projects in the Republic of South Africa (RSA) are generally completed on time and, if that is not the case, what the impact potential of late completion holds for the parties to the contract. The extent of delays caused by individual factors, (each considered separately) are investigated in addition

From the interpretation of the processed data conclusions are made that the extent of delays on and the resulting late completion of building projects in the RSA is higher than generally accepted. The potential results emanating there from contain real risks to the parties to the building contract. In addition the conclusion is made that the factor having singly the most substantial influence on late completion of building projects, is indicated as insufficient work rate by the contractor

KEY WORDS

Delay, extension, construction period, planning, time

DEFINITIONS

Construction period: The period lapsing from the date of tender acceptance up to and including the date of issuing the first delivery certificate as described in the Department of Public Works: Conditions of Contract (PW 677)[2], clauses 20 en 21

1. BACKGROUND

1.1 Introduction

The contractual completion date of a building project forms part of the *essentialia* of the contract and is one of the most important milestones to be achieved by the contractor. Success in this respect determines to a great extent the success or failure of the project. Literature refers to delays and accompanied extension of construction periods on building projects and more specific the negative consequence thereof on the respective contracting parties. The occurrence and extent of such delays however, have not yet been established in a scientific way in the RSA. It should be of great value to the employer if the occurrence and extent of late completion of building projects are known, because it may have a direct influence on the choice and compilation of the consulting team for a certain building project. The consulting team, in conjunction with the employer, may in turn be influenced with the choice of contract strategy they may exercise

Various factors contribute to delay of *practical completion.* Contractors may obtain an extension of the construction period, or may be penalised for such delays during the execution of the work. The influence of these factors on progress should be managed in such a way that their impact on time and costs are minimised. The parties to the building contract should be made aware of such influences in order to ensure in time that they are able to review their options in relation to their

objectives. Although these factors are generally known and frequently referred to in the literature, the potential delay each may cause on building projects in the RSA, are unknown. It should be of great value to the employer and project team should above information become known to them as it could influence the contract strategy and management of the building process as a whole

1.2 Limitations

1.2.1 The study is limited to the building industry in the RSA

1.2.2 Data collected is limited to selected building projects erected for the Department of Public Works (DPW)

2. INDICATIONS FROM LITERATURE OF THE SCOPE AND CAUSES OF LATE COMPLETION OF BUILDING PROJECTS

With reference to late completion of building projects the following comment is made by James R. Knowles and Binnington Copeland[4]:

> *Extensions of time provisions and their application cause more disputes than almost any other aspect of building and civil engineering contracts*

H.M. Hohns[3] is in agreement with this opinion and further states with regard to the extent of time-related disputes:

> *Those involved in a construction problem quickly learn that it is not hard (or the nuts and bolts) dollars that are important, rather it is in the time-related costs that the huge damages arise to all concerned*

Although above authors express clear opinions in this regard, the absence of scientific investigation of late completion of building projects, fall short. Existing knowledge in this regard is based on the experience and perceptions of individuals and the information is therefore vague and fragmentary

Standard building contracts clearly indicate the factors normally contributing to delay or extension of construction periods. Although these factors are well known and are frequently referred to in the literature, the global extent of delays caused by each separately on building projects in the RSA is unknown, or at most, limited to the personal experience of individuals. It should be mentioned that no literature could be found in this regard

3. DETERMINING OF CONSTRUCTION PERIODS FOR BUILDING PROJECTS

Contractors could by means of applying the appropriate planning techniques and with consideration of the required resources available do their planning so that the work on any *reasonable* given construction period could be completed in time. Few literature however contain any information regarding determining of the construction period on building projects. It is informally observed that this important aspect is generally dealt with in practice at random by the construction professions

4. RESEARCH METHODOLOGY

Each building project is unique. Apart from general known differences such as underground circumstances, weather conditions and location, factors such as contractors, professional consultants, conditions of contract, economy and the

authorities all play an important role in the timely and successful completion of building projects. It is evident that the process of erection of building projects is a multi-million-Rand industry and can therefore not be simulated in a laboratory on a small scale for the purpose of a study of this nature

It has therefore been decided to do *ex post facto* research on suitable available data of completed building projects

5. DATA

5.1 Nature and scope of the data

5.1.1 In order to determine the frequency and scope of late completion, the following data is collected for each building project included in the survey:

5.1.1.1 Contract amount

5.1.1.2 Tender closing date

5.1.1.3 Date of acceptance of tender

5.1.1.4 Planned completion date

5.1.1.5 Date of completion (First Delivery Certificate)

5.1.1.6 Applicable building cost indices obtained from the Bureau of Economic Research, University of Stellenbosch (BER) for adjustment of contract amounts to a common date for comparison purposes

5.1.2 To determine the frequency, influence and contribution of delay (calculated in calendar days) caused by individual delay factors, only the data of building projects completed after the original planned completion dates, have been admitted to the sample. For each building project the following data in addition to the above, is obtained. (Symbols between brackets serve as references hereafter):

5.1.2.1 Inclement weather [A]

5.1.2.2 Non-availability of materials and prime cost items [B]

5.1.2.3 Default by nominated sub-contractors or insolvency of selected sub-contractors [C]

5.1.2.4 Repair of damage to the works [D]

5.1.2.5 *Vis Major* [E]

5.1.2.6 Addition of public holidays [F]

5.1.2.7 Civil commotion, riot, local combination of work men, strike or lockout [G]

5.1.2.8 Additional work and/or disruption emanating from architect's instructions [H]

5.1.2.9 Architect's instructions or other information issued late [I]

5.1.2.10 Disruption by others [J]

5.1.2.11 Late site hand-over [K]

5.1.2.12 Underground factors [L]

5.1.2.13 Repair of poor workmanship [M]

5.1.2.14 Insufficient work performance [N]
(insufficient work performance – the contractor is penalized in accordance with the conditions of contract [Na]; insufficient work performance – total [Nb])

5.1.2.15 Other [O]

5.2 Sources and collection of data

5.2.1 Building projects in the RSA can be divided in two main categories on the basis of ownership, namely the private sector and the public sector. There is no existing suitable central databank containing the required information relevant to building projects in the private sector. The information required for a sample size is spread between a large number of property owners country wide. Further more, project data is not easily accessible because property owners, for various reasons are generally reluctant to supply any information. It has therefore been decided to collect data from public bodies. The applicable conditions of contract and the methods prescribed by the national, provincial and local government are different and it has therefore been decided to restrict the collection of data to public bodies active on a national level

5.2.2 Investigation revealed that the DPW implemented and maintained a computerised data base for the past 20 years. Certain data in respect of all construction projects, administered by this department is recorded. More than twenty-six thousand projects have already been documented on this system

Data described in 5.1.1 is obtained from the above mentioned data basis

The limitations of the sample are formulated as follows:

(a) Only building projects with bills of quantities as basis of contract have been included

(b) Building projects with construction periods shorter than six months have been excluded

(c) Completion date for each building project must have been achieved

Above sample of building projects have been extracted from the database by means of reliable programming techniques and the necessary data is obtained. The final sample, in order to determine the frequency and scope of late completion, included seven hundred-and-eleven building projects (for the distribution of data see table 1)

5.2.3 Enquiries to obtain data described in 5.1 from the DPW have been made. It revealed that quantity surveyors of the department kept files of completed final accounts for building projects for a minimum period of 7 years before it was destroyed. This data was made available conditionally on request. Unfortunately these files were not stored in a structured way so that it was not practically possible to obtain samples in a scientific way. It has therefore been decided to inspect all the available building projects in the files and only concentrate on the relevant files where delays accrued and the detailed records were kept meticulously regarding the circumstances that lead to delays as described in 5.1.2

5.2.4 Data as described in 5.2.3 was obtained. The senior public servant of the DPW

responsible for finally approving all the extensions of time on building projects made available on request, additional information and statistics. This data made a huge contribution towards the completeness of this study

The final sample, in order to determine the frequency, influence and contribution of delay caused by individual delay factors, included two hundred-and-eleven building projects (for the distribution of data see table 2)

5.3 Analysis of data

5.3.1 Appropriate building cost indices by the BER have been provided for each building project

5.3.2 In order to compare the building projects in monetary terms, the contract amounts have been adjusted to a common date by making use of the said estimated building cost indices. This date is selected arbitrarily as January 2003 and the estimated BER-index provided by the building economists, Medium-Term Forecasting Associates (MFA)[5] (February 2003-addition), has been applied

5.3.3 In order to determine the frequency and scope of late completion, the following calculations have been performed by means of the data (sample: 711 projects):

5.3.3.1 The original planned construction period in calendar days: *Planned completion date* minus *Date of acceptance of tender*, plus 1 ....(A)

5.3.3.2 The actual construction period in calendar days: *Completion date (date of first delivery certificate)* minus *Date of acceptance of tender*, plus 1 (B)

5.3.3.3 Exceeding of the planned construction period in calendar days: B minus A. In the event of a negative result, nil (0) days delay is indicated (C)

5.3.3.4.1 The number of building projects completed on time, are the instances where C = nil (0). The number of building projects exceeding the planned construction periods, are the instances where C represents a positive result

5.3.3.5 The extent of exceeding the planned construction period expressed as a percentage of the planned construction period mathematically expressed as follows: [C / A X 100], where A and C represent the values described above

Seeing that the mentioned percentages are spread amongst data of a relatively large sample and to make the interpretation thereof more meaningful, the following groupings have been made:

5.3.3.5.1 Based on the extent of late completion:

(a) 0% late (completion within the original planned construction period)

(b) 0% to 10% exceeding of the original planned construction period

(c) 10% to 25% exceeding of the original planned construction period

(d) 25% to 50% exceeding of the original planned construction period

(e) 50% to 100% exceeding of the original planned construction period

(f) More than 100% exceeding of the original planned construction period

5.3.3.5.2 Based on the estimated contract amounts (R-value: January 2003):

(a) R0 to R2 000 000;

(b) R2 000 001 to R10 000 000;

(c) R10 000 001 to R30 000 000; and

(d) R30 000 001 and larger

5.3.3.6 The following abbreviations are used in tables and figures hereafter:

SA (or South-Africa)	=	Republic of South Africa
n	=	No of building projects
COMLETED ON TIME	=	See 5.3.3.5.1 (a)
COMLETED ON TIME +0-10% LATE	=	See 5.3.3.5.1 (b)
COMLETED ON TIME +0-25% LATE	=	See 5.3.3.5.1 (c)
COMLETED ON TIME +0-50% LATE	=	See 5.3.3.5.1 (d)
COMLETED ON TIME +0-100% LATE	=	See 5.3.3.5.1 (e)
COMLETED ON TIME +0-100%+ LATE	=	See 5.3.3.5.1 (f)
R0 - 2M	=	See 5.3.3.5.2 (a)
R2 - 10M	=	See 5.3.3.5.2 (b)
R10 - 30M	=	See 5.3.3.5.2 (c)
R30M+	=	See 5.3.3.5.2 (d)

5.3.4 In order to determine the frequency, influence and contribution of delay caused by individual delay factors, the following calculations have been performed on data of building projects completed after the original planned completion dates only by means of the data (sample: 211 projects). The following have been calculated in addition to 5.3.3.1 - 5.3.3.3 above:

5.3.4.1 Number of building projects expressed as a percentage of all building projects influenced by factors (table 6)

5.3.4.2 The impact of each factor that leads to delay expressed as a percentage of the planned construction period is calculated as follows:

$$\frac{\textit{Average delay in calendar days due to each factor } X\ 100}{\textit{Average planned construction period in calendar days}}$$

(See table 7)

5.3.4.3 The contribution of each factor, that lead to delay expressed as a percentage of the total delay is calculated as follows

$$\frac{\textit{Average delay in calendar days due to each factor } X\ 100}{\textit{Average total delay in calendar days}}$$

(See table 8)

Note: Above calculations from 5.3.4 to 5.3.4.3, for the following groupings of building projects have each been given separately:

(a) all the building projects used in the sample (n=211)

(b) all the building projects used in the sample (n=211), according to size (based on the monetary values) grouped as follows:

(i) R0 to R2000 000 (n=117) and

(ii) R2000 001 and larger (n=94)

5.3.5 Abbreviations and explanations used in the tables and figures including their

respective meanings are listed below:

SA	=South Africa
n	=Number of projects
R0 – 2M	=See 5.3.4.3 above
R2M+	=See 5.3.4.3 above

6. INTERPRETATION OF DATA

6.1 Interpretation in order to determine the frequency and scope of late completion (Sample: 711 projects):

6.1.1 The average for A, B, C, and the average percentage exceeding of the construction period in accordance with 5.3.3 is indicated in table 3. The right hand column marked C / A, indicates the average percentage building projects exceed the original planned construction period

6.1.1.1 The original planned construction period is exceeded by an average of 25,1%. Building projects that have reached completion within the original planned construction period forms part of this exercise. It is therefore realised that a significant portion of these building projects were completed at a considerable late stage

6.1.2 To further study the scope of exceeding the original planned construction periods on building projects, the information as described in 5.3.3.5 is implemented. Table 4 is prepared for this purpose

6.1.3 The figures included in table 4 indicate the number of building projects either completed on time or late, expressed as a percentage of the sample in each separate category

6.1.4 Close study of the results of the processed data contained in table 4, lead to the following conclusions:

6.1.4.1 Building projects completed within the original planned construction periods

6.1.4.1.1 The original objective was achieved on only 173 out of 711 building projects (24.3%). Expressed alternatively, 75.7% of the building projects were only completed at a later stage as described hereafter

6.1.4.1.2 Construction projects divided in categories from small to large, classified in monetary terms:

A higher number of smaller construction projects are completed within the original planned construction periods than in the case of larger construction projects (see figure 1 for a clear display of this tendency)

6.1.4.2 Building projects completed after the original planned construction periods

Table 4 is compiled to display construction projects completed within the original planned construction periods. To determine when the balance of the building projects have finally been completed, table 5 has been prepared

Above table reflects amongst others, the cumulative percentages completed building projects in the categories of completion set out in 5.3.3.5.1. After further studies were performed on computer (several graphical representations have been studied on the monitor screen), this part has been limited to the discussion

hereafter

6.1.4.2.1 Building projects in categories of small to large classified in monetary terms:

Under 6.1.4.1.2 it was indicated that larger numbers of smaller building projects are completed on time in comparison with large projects. Close study of the results that can not be described in detail due to the scope of this article, revealed that on larger projects the said back log is reduced at later stages and that larger projects are generally not extended in terms of time as in the case of smaller projects

6.2 Interpretation in order to determine the frequency, influence and contribution of delay caused by individual delay factors (Sample: 211 projects):

6.2.1 To analyze the factors leading to exceeding of the original planned construction periods, the processed data has been arranged in table formats. Tables 6 - 8 have been prepared for this purpose

NB: *Repair of poor workmanship* [M] is indicated as 0.0% influence. The analyzed data did not provide separately for this factor. Repair of damage to the works *[D]* are for the same reasons absent from tables 7 or 8. For the purposes of this study it is assumed that such repair work have been included with other causes

6.2.2 It is important to determine the frequency of the different causes of delay on building projects. These frequencies represent the opportunities when the professional team or the contractor must control the mentioned circumstances in such a way that the influence thereof on the building project, or the contracted parties, is minimized. Consequently it is calculated how many building projects have been influenced through the different factors in 5.1.2. Alternatively stated: on how many building projects do these individual factors appear? (table 6)

6.2.2.1 All building projects in the sample size (n=211)

On 65.4% of the building projects insufficient work performance stood out [Nb] and on 63.0% of the building projects the contactor was penalized for late completion [Na]

The *influence of architect's instructions* [H] (33.6%), *other causes* [O] (28.4%), *inclement weather* [A] (24.2%) and *architect's instructions or other information issued late* [I] (20.9%) achieve high frequencies of appearance (see also figure 3 for a simple graphical representation in this regard)

6.2.2.2 All building projects in the sample size (n=211) separately grouped in monetary terms

Larger building projects (R2M+), are characterized by higher frequencies in the following instances:

Inclement weather [A] (42.6% against 9.4%);

Civil commotion, riot, local combination of work men, strike or lockout [G] (22.3% against 6.0%);

Influence of architects instructions [H] (42.6% against 26.5%);

Architects instructions and other information issued late [I] (26.6% against 16.2%) and *underground factors* [L] (6.4% against 3.4%)

(See figure 4 in this regard)

6.2.3 It is of the utmost importance to determine the impact of the various causes of delays on building projects. These factors represent the circumstances when construction

periods are extended or not. Such circumstances can have far reaching implications on the management of the whole building process and contract strategy. (See table 7 & 8)

In this section reference is made to late completion or exceeding of construction periods. Where such references occur, exceeding of the *original planned construction period* is meant

6.2.3.1 Building projects in the sample (n=211)

The construction period is exceeded due to *insufficient work performance* by 30.4%. This influence represents 39.0% [table 7 Nb] of all delays that seem to be the largest single contributing factor to late completion. Contractors are penalized in 22.5% [table 7 Na] of these cases*. Influence of architects instructions* [table 7 H] (14.5%), *other* [table 7 O] (10.3%), *disruption by others* [table 7 J] (8.0%) and *architects instructions or other information issued late* [table 7 I] (6.1%) represent the other prominent factors contributing to late completion. Attention is drawn to *inclement weather* [A] with an impact of 2.1% [table 7] on delays and a contribution of 2.7% [table 8]. These figures are much lower than generally accepted in relevant literature. (See also figures 5 & 6 in this regard)

6.2.3.2 All building projects in the sample (n=211), separately grouped in categories of small to large in monetary terms

Exceeding of construction periods of smaller building projects (R0 – R2M) have in the following cases been influenced more than larger building projects (R2m+):

The *influence of architect's instructions* [table 7 H] (18.7% against 9.3%); *disruption by others* [table 7 J] (13.3% against 1.4%); and *insufficient work performance* [table 7 Nb] (40.6% against 17.7%)

Contractors penalized in the case of last mentioned factor on smaller projects is also significantly higher in the case of larger projects [table 7 Na] (28.7% against 14.7%). *Inclement weather* [table 7 A] (3.6% against 0.8%) and *architect's instructions or other information issued late* [table 7 I] (7.5% against 4.9%) indicate contrasting results. (See figure 7 for a simple representation in this regard)

Insufficient work rate is constantly observed as the single most contributing factor leading to exceeding of the original planned construction periods on building projects

7. CONCLUSIONS

7.1 An investigation was launched to determine whether building projects in the RSA are generally completed timeously and, if that is not the case, what the impact potential of late completion holds for the parties to the contract. By means of *ex post facto* research on available data of completed building projects it was possible to arrive at the following conclusions (sample: 711 projects):

7.1.1 *The order of magnitude of timeous completion and the excess beyond the original planned construction periods in general:*

7.1.1.1 The original planned construction periods on building projects in general are exceeded by considerable long periods. The extent of the problem is such that the potential consequences thereof are real risks to both contracting parties

7.1.2. *Building projects completed within the original planned construction periods:*

7.1.2.1 A considerable number of building projects are not completed within the original planned construction periods. The magnitude of the problem is such that the potential consequences thereof represent a real threat to the objectives of both contracting parties because it contains substantial high risks for both.

7.1.2.2 A substantial number more smaller building projects are completed within the original planned construction periods than in the case of larger building projects.

7.1.3 *Building projects completed after the original planned construction periods:*

7.1.3.1 It is indicated in 7.1.2.2 that a substantial number more smaller building projects are completed within the original planned construction periods than in the case of larger building projects. With larger building projects, however, the stated backlog is made up shortly after expiry of the original planned construction periods and they show better results thereafter than smaller building projects

7.2 The extent of delays on building projects in the RSA caused by individual factors (each considered separately) are investigated. By means of *ex post facto* research on available data of completed building projects it was possible to arrive at the following conclusions (sample: 211 projects):

7.2.1 The frequency of the factors causing delay on building projects:

7.2.1.1 The factors indicating the highest occurrence on building projects, in order of frequency, are:

Insufficient work performance, *influence of architect's instructions*, *other*, *inclement weather* and *architect's instructions or other information issued late*

7.2.1.2 The occurrence of the factors causing delay indicate substantial differences when comparing smaller and larger building projects

7.2.2 The impact of the factors causing delay on overrunning the original planned construction periods on building projects:

7.2.2.1 The factors indicating the most substantial influence on building projects in order of the impact observed are:

Insufficient work rate, influence of architect's instructions, *other*, *disruption by others* and *architect's instructions or other information issued late*. *Insufficient work rate* has singly the most substantial influence, whereas the influence of *inclement weather* is relatively small in contrast to the prominent roll ascribed thereto by the literature

7.2.2.2 The impact of the factors causing delay on building projects indicate substantial differences when comparing smaller and larger building projects

7.2.3 In conclusion, the factor having singly the most substantial influence on the overrun of the original planned construction periods on building projects, are indicated as *insufficient work rate* by the contractor. Distinction has been made between *influence of architect's instructions* and *architect's instructions or other information issued late* and are dealt with separately in the literature. These factors have therefore also been kept separate in this study. Both these causes however appear in the top five main factors causing delay. If these factors are combined, they still have a smaller influence than *insufficient work rate* by the contractor although the influence on the overrun of the original planned construction periods on building projects were substantial

7.3 The question, if the answers and conclusions made are restricted to the milieu directly linked to the selected population only, or can important conclusions be made for building projects on a broad basis in the RSA? All building projects studied, with the exclusion of the employer, are dealt with by the same built environment professionals and contractors, as is the case for other building projects in South Africa. The assumption is therefore made that the findings and conclusions would also be applicable to building projects in the private sector. It needs to be stated that a doctoral thesis by C.P. de Leeuw[1] supports this view

8. EXHIBITS

8.1 Tables

TABLE 1: DISTRIBUTION OF BUILDING PROJECTS (SAMPLE: 711 PROJECTS)					
		(1)	(2)	(3)	(4)
AREA	**BUILDING-PROJECTS (1, 2, 3 + 4)**	**ERECTION**	**REPAIR AND RENOVATION**	**SUNDRY**	**HOUSING**
SA	n=711	n=430	N=109	n=91	n=81
MPU	n=38	n=20	n=1	n=5	n=12
GAU	n=176	n=103	n=32	n=36	n=5
NW	n=33	n=26	n=1	n=5	n=1
NP	n=113	n=66	n=3	n=6	n=38
WC	n=128	n=80	n=19	n=17	n=12
KZN	n=84	n=41	n=29	n=9	n=5
EC	n=67	n=40	n=14	n=9	n=4
NC	n=30	n=24	n=3	n=0	n=3
FRE	n=42	n=30	n=7	n=4	n=1

TABLE 2:

DISTRIBUTION OF BUILDING PROJECTS (SAMPLE: 211 PROJECTS)

		(1)	(2)	(3)	(4)
AREA	**BUILDING-PROJECTS (1, 2, 3 + 4)**	**ERECTION**	**REPAIR AND RENOVATION**	**SUNDRY**	**HOUSING**
SA	n=211	n=114	n=52	n=18	n=27
MPU	n=12	n=7	n=2	n=1	n=2
GAU	n=44	n=32	n=7	n=5	n=0
NW	n=14	n=8	n=4	n=2	n=0
NP	n=40	n=10	n=4	n=2	n=24
WC	n=29	n=23	n=4	n=2	n=0
KZN	n=30	n=8	n=21	n=1	n=0
EC	n=19	n=12	n=7	n=0	n=0
NC	n=10	n=5	n=1	n=3	n=1
FRE	n=13	n=9	n=2	n=2	n=0

TABLE 3:

EXCEEDING OF THE ORIGINAL PLANNED CONSTRUCTION PERIOD

AREA	**A (Days) (Average)**	**B (Days) (Average)**	**C (Days) (Average)**	**C/A (%) (Average)**
South Africa (n=711)	395	482	99	25.1

TABLE 4:

PERCENTAGE BUILDING PROJECTS COMPLETED ON TIME

AREA	**All Projects**	**R0 - 2 M**	**R2 - 10 M**	**R10 - R30 M**	**R30 + M**
South Africa (n=711)	24.3	31.9	23.7	21.7	14.9

TABLE 5:

PERCENTAGE BUILDING PROJECTS COMPLETED ON VARIOUS TIME STAGES

AREA	ON TIME	B + 0-10% LATE	B + 10-25% LATE	B + 25-50% LATE	B + 50-100% LATE	B + 0-100% + LATE
SA (n=711)	24.3	40.6	61.0	82.7	95.8	100.0
SA R0-R2 M	31.9	43.2	56.9	78.4	94.1	100.0
SA R2-R10 M	23.7	41.7	63.7	83.7	96.8	100.0
SA R10-R30 M	21.7	41.0	65.8	84.4	96.2	100.0
SA R30 M+	14.9	32.7	55.5	86.2	96.1	100.0

TABLE 6:

OCCURRENCE/FREQUENCY OF DELAY FACTORS ON BUILDING PROJECTS

	DELAY FACTORS														
AREA	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
SA (n=211)	24.2	5.7	2.8	0.5	2.4	9.0	13.3	33.6	20.9	14.7	9.5	4.7	0.0	65.4	28.4
SA (R0 - 2M) (n=117)	9.4	5.1	2.6	0.0	0.9	1.7	6.0	26.5	16.2	17.9	11.1	3.4	0.0	66.7	23.9
SA (R2M+) (n=94)	42.6	6.4	3.2	1.1	4.3	18.1	22.3	42.6	26.6	10.6	7.4	6.4	0.0	63.8	34.0

TABLE 7:

"IMPACT" OF DELAY FACTORS (%) ON BUILDING PROJECTS

	DELAY FACTORS														
AREA	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
SA (n=211)	2.1	1.7	1.2	0.0	0.1	0.2	0.6	14.5	6.1	8.0	1.8	0.8	0.0	30.4	10.3
SA (R0 - 2M) (n=117)	0.8	2.3	0.7	0.0	0.0	0.2	0.4	18.7	4.9	13.3	2.2	0.5	0.0	40.6	11.0
SA (R2M+) (n=94)	3.6	0.9	1.9	0.0	0.1	0.3	0.9	9.3	7.5	1.4	1.4	1.2	0.0	17.7	9.5

TABLE 8:

"CONTRIBUTION" OF DELAY FACTORS (%) ON BUILDING PROJECTS

AREA	DELAY FACTORS															
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**Q**
SA (n=211)	2.7	2.2	1.5	0.0	0.	0.3	0.8	18.6	7.8	10.3	2.3	1.0	0.0	39.0	13.4	100.0

SA (R0 - 2M) (n=117)	0.8	2.4	0.7	0.0	0.	0.2	0.4	19.5	5.1	13.9	2.3	0.5	0.0	42.4	11.8	100.0
SA (R2M+) (n=94)	6.4	1.6	3.4	0.0	0.	0.5	1.6	16.7	13.4	2.5	2.5	2.1	0.0	31.7	17.4	100.0

8.2 Graphs

Figure 1: South Africa: Graphical representation of the percentage building projects completed within the planned construction period

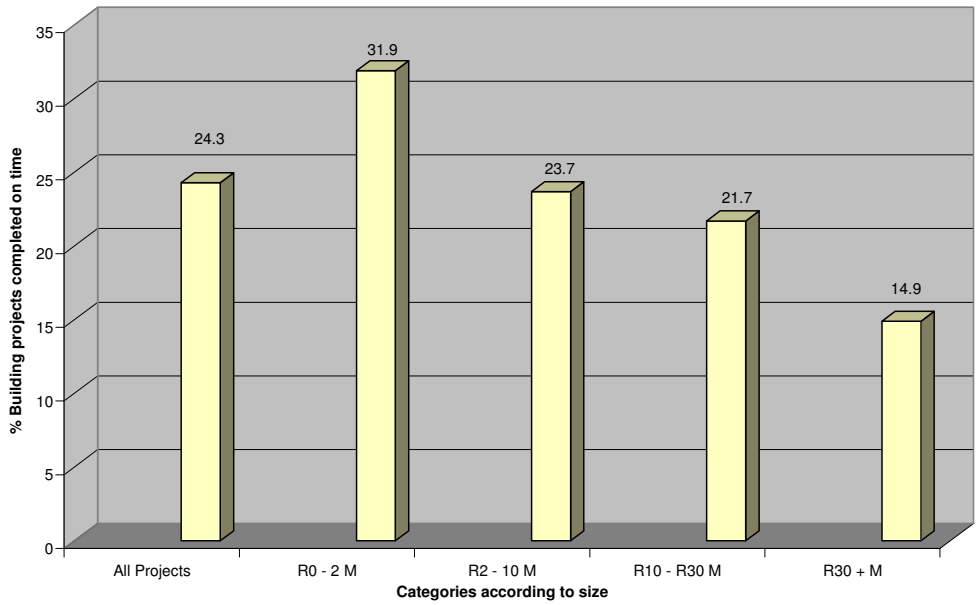


Figure 2: South Africa: Graphical representation of the percentage building projects completed on various time stages

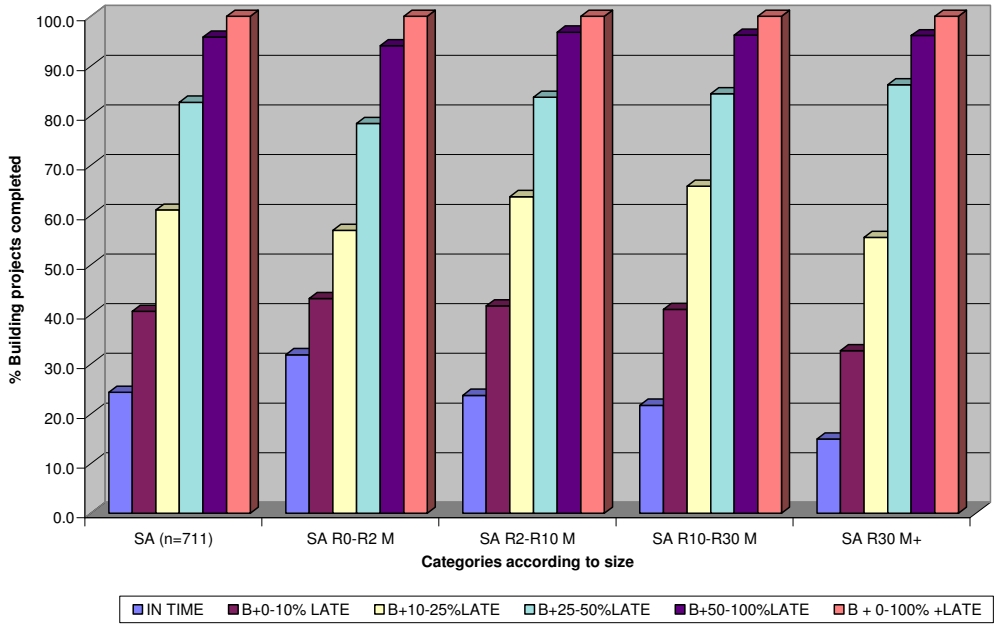


Figure 3: South Africa: Graphical representation of the percentage building projects influenced by the delay factors (occurrence/frequency)

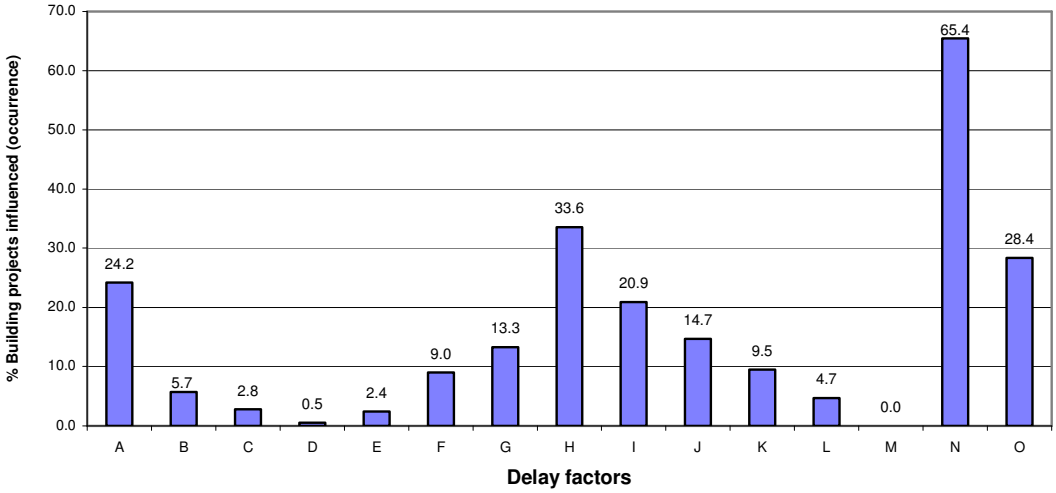


Figure 4: South Africa : Building projects - graphical representation of the percentage delay caused by the delay factors (occurrence/frequency) (categories according to size)

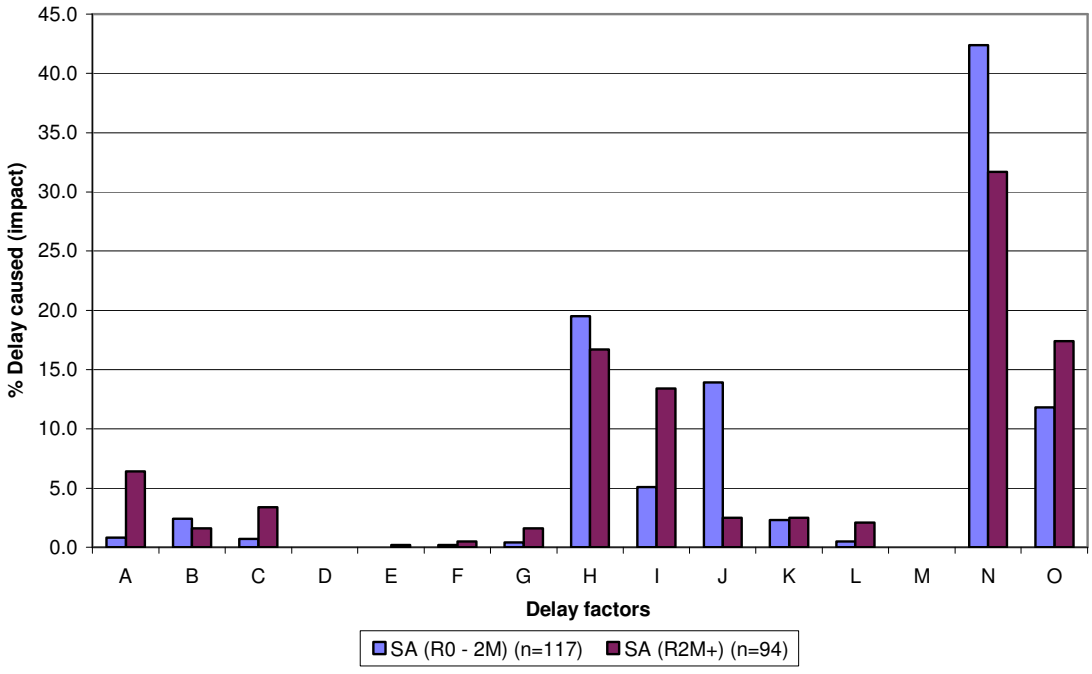


Figure 5: South Africa: Building projects - graphical representation of the percentage delay caused by the delay factors (impact)

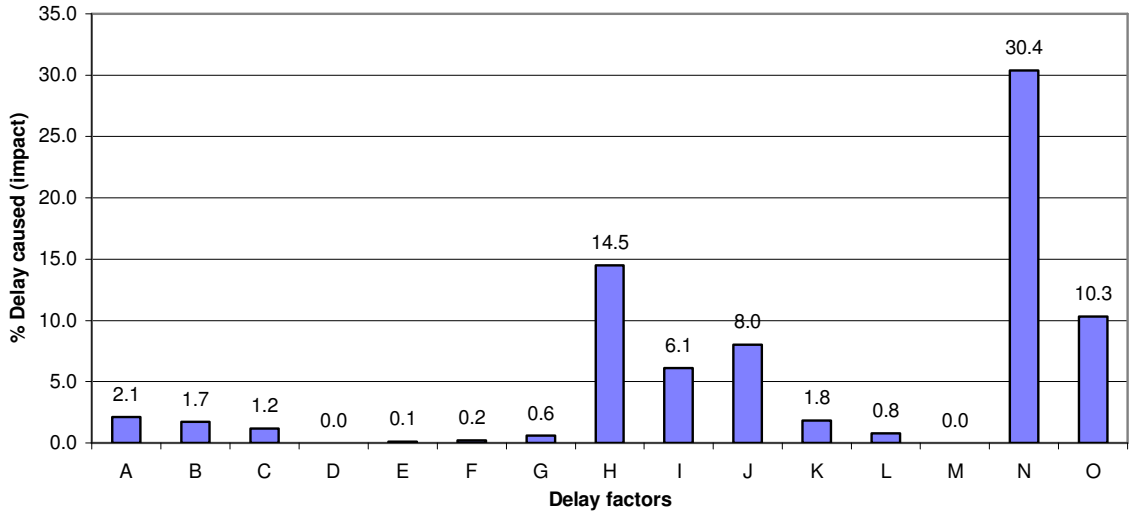


Figure 6: South Africa: Building projects - graphical representation of the percentage contribution to total delay caused by the delay factors

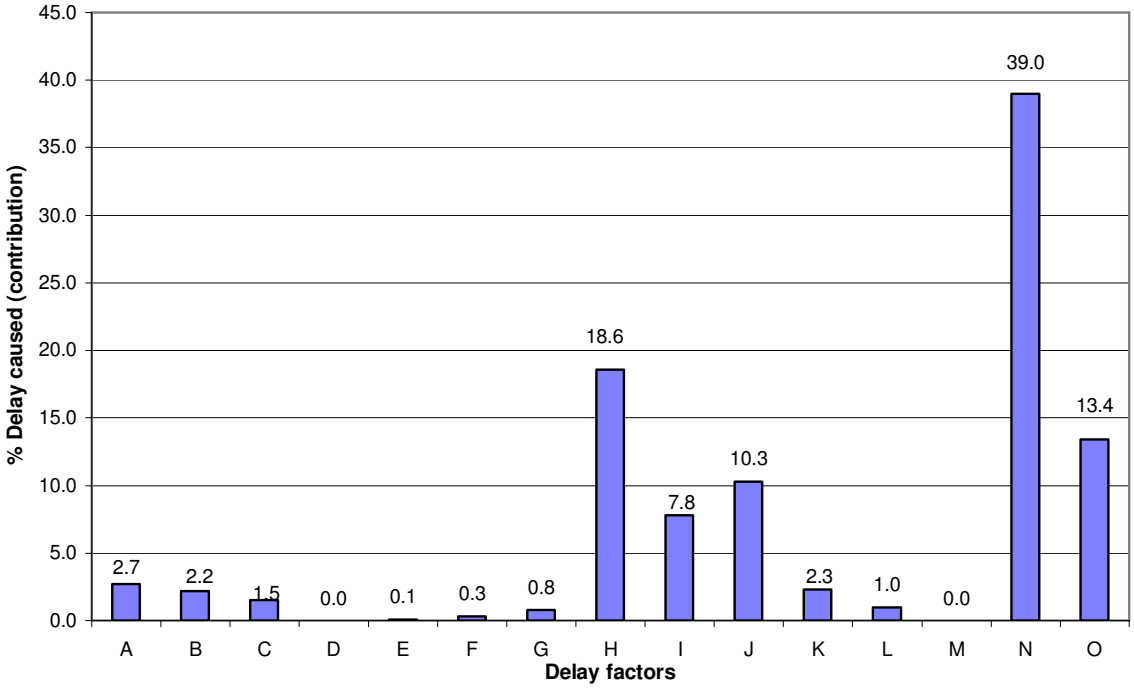
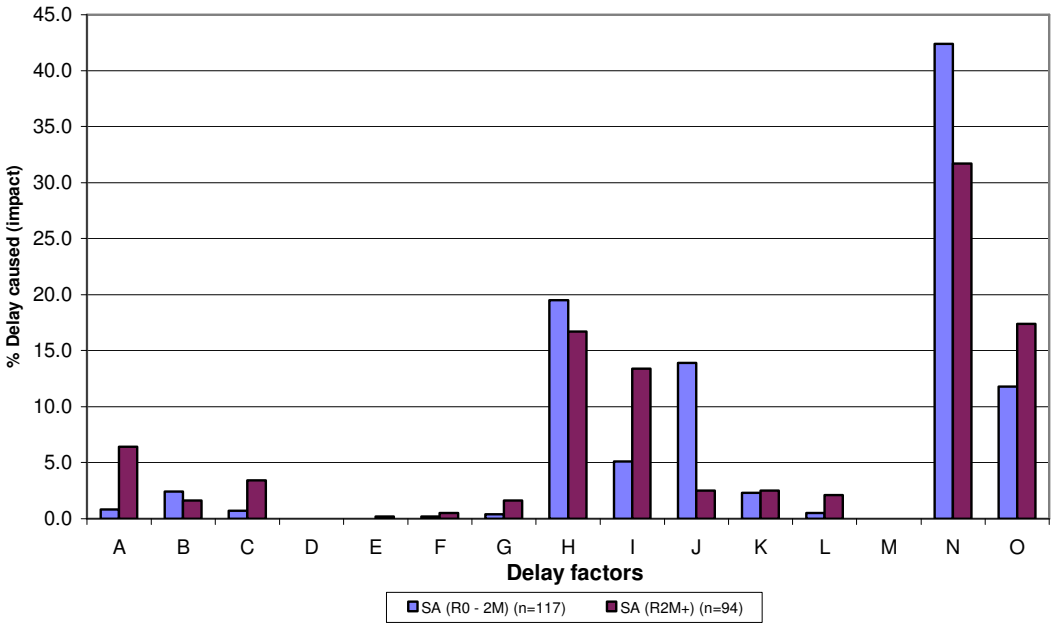


Figure 7: South Africa : Building projects - graphical representation of the percentage delay caused by the delay factors (impact) (categories according to size)



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6 The Joint Building Contracts Committee: JBCC Series 2000 (Principal Building Agreement)

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