MEMORANDUM

To

Rod Edwards

From

Mr Ross Allen

Subject

Dissertation Report

Date

28th June 2002

Rod,

Please find attached a copy of my Dissertation Report for my final year project entitled ‘Construction Project Management and People Skills – A Primer For Entry-Level Engineers’ that I submit in fulfilment of the requirements for my Autumn 2002 enrolment in the course ENPR 14010 entitled Co-op Dissertation.

This report includes an the aims, results and conclusions of the study.

I hope you will find the content and form of this report are satisfactory.

Sincerely

Ross Allen
Construction Project Management and People Skills: A Primer for Entry-Level Engineers

By Ross Allen  Student Number q96022996

Supervisor Rod Edwards
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1 Problem Definition

This report is for engineering graduates wishing to pursue a career in project management and in particular construction management. The basic aims of the report are to determine:

'What is an entry level engineer?'
'What are the roles of an entry level engineer?' and
'How can entry-level engineers best fulfill these roles?'

From a literary review it is evident that communication, leadership and interpersonal skills are critical skills that require careful development in entry-level engineers. The focus of this report is to present entry-level engineers with advice on how to develop these skills and communicate effectively with both superiors and subordinates.

A survey targeting practicing construction managers will provide the basis for this advice. The survey will be in the form of written questionnaires that will be available on the web. There will be two questionnaires:

- One quantitative (numerical, multiple choice or yes/no answers) and relatively quick and easy to complete.
- One qualitative, requiring more thought and hence time from the interviewee.

The questionnaires will be analyzed and the results reported in a form suitable for dissemination to entry-level engineers. The advice presented will be for entry-level engineers in particular, however communication, interpersonal skills and leadership are core skills for all engineers and therefore the findings may have a wider audience.
2 Literary Survey

2.1 The Construction Industry

2.1.1 The Construction Project

"Construction projects are complex and time-consuming undertakings. The structure must be designed in accordance with applicable codes and standards, culminating in working drawings and specifications that describe the work in sufficient detail for its accomplishment in the field. The building of a structure of even modest proportions involves many skills, materials, and literally hundreds of operations. The assembly process must follow a more or less natural order of events that, in total combination, constitutes a complicated pattern of individual time requirements and sequential relationships among the various segments of the structure."

As engineers often orchestrate the construction process it is important that they have the knowledge, skills and experience to perform the necessary functions described by Clough and Sears.

"The construction process is subject to the influence of highly variable and often unpredictable factors. The construction team – which includes various combinations of contractors, owners, architects, engineers, workers, sureties, lending agencies, governmental bodies, insurance companies, material dealers, and others – changes form one job to the next. All of the complexities inherent to different construction sites, such as sub-soil conditions, surface topography, weather, transportation, material supply, utilities and services, local subcontractors, and labour conditions, are an innate part of the construction project.

"As a consequence of the circumstances just discussed, construction projects are typified by their complexity and diversity. Despite the use of pre-fabricated units in certain
applications, it seems unlikely that field construction can ever completely adapt itself to the standardised methods and product uniformity of assembly line production.”

2.2 Managing Construction Projects

2.2.1 What is Project Management?

"Project management is the process of planning, allocating, directing, and controlling company resources to complete a project on time, within budget, safely and in accordance with the specified technical and quality requirements."²

2.2.2 The Traditional Approach

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"The first phase in the traditional building process is the decision phase. The owner establishes the need for a new facility and defines his requirements and budgetary constraints. At some point during the decision phase he hires the architect.

"The second phase is the design phase – the architect and his engineers develop a solution to the owners requirements. This solution is reduced to a series of drawings and a set of specifications. These are called the contract documents.

"The third phase is called the bid phase and here there are two main alternatives. If the owner intends to follow a competitive bid procedure, he or his agent issues copies of the contract documents to general contractors interested in bidding the job, and sets a specific time and place for the opening of bids. Each bidding contractor then decides which elements of construction he will subcontract and develops his cost estimates for the project on the basis of lowest estimated cost.

"If, on the other hand, the owner forgoes the competitive bid approach and plans to negotiate with one general contractor, the two parties ordinarily work out a cost-plus-fixed-fee or a fixed-price contract.

"The fourth phase is construction. Usually the general contractor subcontracts most of the work, often 81% or more, and thus his major effort goes to managing the flow of materials and men so that the contract is satisfied and his profit assured. The owner typically depends on his architect for inspecting the work performed by the general contractor and his 'subs'.

"During the construction phase, it sometimes happens that the architect and the owner decides that a particular configuration, material, or method different from that described
in the contract documents is desirable. Then the architect enters into negotiations with the general contractor to define the price and scope of desired changes.3

2.2.3 Construction Management


“Although this approach has several variations, the essence of the concept centers on the introduction of a construction manager as the owner’s agent and the manager of the entire construction process.

“The construction manager is more commonly a company with two paramount characteristics: construction know-how and management ability. The construction manager assists the owner in arranging for the contractors and architects who will actually do the work, seeing to it that their efforts are coordinated right from the very start of the design process to the final delivery of the completed facility.

“Since the construction manager has overall management responsibility, there is no general contractor on the job. Each segment of construction is contracted separately with

3 Davis, Edward W. and Lindsay White. “How to Avoid Construction Headaches.”

the owner - not the construction manager – with the advisement of the construction manager.”3

2.3 Where Do Entry-Level Engineers Fit In?

This report will focus on graduate and beginner engineers wishing to enter construction and project management and therefore will place emphasis on the roles of the construction manager/ general contractor.

2.4 The Construction Manager

2.4.1 Attributes

As stated above: “Project management is the process of planning, allocating, directing, and controlling company resources to complete a project on time, within budget, safely and in accordance with the specified technical and quality requirements.”

From this statement the key elements of construction project management can be derived. These are:

- Planning and Scheduling
- Budget
- Safety
- Quality
- Communication
- Leadership
- Decision Making
- Experience

3 Davis, Edward W. and Lindsay White. “How to Avoid Construction Headaches.”

The report will address each of these elements focusing on those determined to be more applicable to entry-level engineers.

2.4.2 Desired Project Manager Skills

"Patterson (1991) stresses the importance of a project manager possessing the technical and management skills to match a project. Similarly, Jaselkis and Ashley (1991) identified project manager experience and technical expertise as key skills to ensure high levels of construction project performance. Parfitt and Sanvido (1993) found that experience and time availability were critical success factors for building projects.

"Other studies have identified desirable skills for project managers beyond traditional technical or management skills. Goodwin (1993) states that the difficulties inherent in the management of a project are compounded by the increasing complexity of environmental, regulatory, project financing and political issues. According to Goodwin, the project manager’s two major functions are the ability to provide leadership to integrate the project system and to provide leadership to the project team. His or her effectiveness will depend on human negotiation skills and, to a lesser extent, on technical skills. Similar to Goodwin, Anderson and Tucker (1994) identified desirable project manager attributes to be strong human relations, leadership, technical, and administrative experience.

"Gushgar, Francis, and Saklou (1997) presented results of a survey of engineering firms to assess required project manager skills and found the most critical skill to be communication."

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“It is also important to be thoroughly familiar with the contracting forms a company uses including all of the components of the contract documents and related items. These include all bid documents; purchase orders change orders, bond and insurance forms and subcontractor agreements.

“Other basic principles include having a cost accounting and cost control system and understanding construction material, methods and systems well enough to make intelligent decisions during the project.

“You also have to be able to recognize when a decision is needed and not be afraid to make it. The reality is that to effectively manage the construction process, you will in fact have to make a series of decisions, one after another.

“Good decision makers know when to call in an expert.”

“Ultimately, construction is not as much about construction materials and methods, or even about contracts and other documents, as it is about people and their interactions. The fact is, communication issues speak to the heart of construction management, perhaps even more than these technical issues.”

“The backbone of the management skeleton is planning.”

From the texts surveyed, it is apparent that the following are desired attributes/skills of a construction manager:

- Technical
- Management
- Time Availability


- Leadership
- Human Relations
- Communication
- Familiarity with Contracting Forms
- Cost Accounting and Control
- Understanding of Construction Materials, Methods, and Systems
- Decision Making
- Planning

These attributes/skills are in no particular order of importance and it is hence unclear where exactly to direct the focuses of the report. Through interviews with practising construction managers and project managers, an effort will be made to ascribe a level of importance to each of these elements and at the same time, determine those most applicable to entry-level engineers.

2.5 What is an Entry-Level Engineer?

There is no authoritative definition of what constitutes a workforce entry-level engineer. Clearly a graduate engineer with no practical work experience, in his or her chosen career, fulfils the definition but what defines when they are beyond that level and considered experienced project engineers. A search of job advertisements in a Queensland newspaper (Courier Mail - Careers Section) explored what employers see as constituting an engineer, beyond the entry-level stage. Job advertisements were reviewed each week for an eight-week period to establish what typically was considered an engineer beyond the entry-level or graduate stage. Senior project management and graduate positions where hence excluded from the analysis. The findings are:

- Number of engineering positions of a construction/project nature identified - 57
- Range of experience call for – 1 to 10 years
- Most quoted range of experience – 2-5 years
- Most quoted maximum – 5 years
• Most quoted minimum requirement – 2 years
Therefore it is posed that for this report an Entry-Level Engineer is a qualified engineer with limited (less than two years) experience in construction or project management.

2.6 What is Their Role?

The Literary Survey did not reveal what Entry-Level Engineers can expect, upon entering construction or project management. The Institute of Engineers Australia competency standards provide a good summary of what experience is expected before competence in practical skills is considered achieved, however they do not provide a detailed summary of what should be known of these issues by entry-level engineers. The survey will attempt to determine this.

2.7 Communication, Human Relations and Leadership

“Site communication is an issue central to all building contracts and has been a cause for concern.”7

The IEAust competency standards also recognise the importance of communication, interpersonal skills and leadership, under the performance criteria:

_manage People_

- _Implements people management plan_
- _Monitors team and individual performance targets_
- _Ensures that the project team has adequate skills and resources to achieve the project outcomes_

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d. **Participates in selection of staff**
e. **Manages the workplace culture so that staff work in a continual learning environment**
f. **Discusses project scope and project objectives with those involved in the project**
g. **Delegates the achievement of outcomes to ensure cost, time and material resources are appropriately allocated and applied**
h. **Ensures the adherence to ethical, OH&S and quality standards**
i. **Provides performance feedback**
j. **Informs project members of the relationship of the project to other program outcomes**

Many of the texts list communication as having a high level of importance but apart from the odd snippet - "In addition to formal arrangements, informal gatherings were also considered important." there is little advice or direction on the best methods of communication, justifying the need for this report.

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3 The Survey

See Appendix A for the structure used to derive each of these questionnaires

3.1 Quantitative Component

1 Name

2 Briefly describe your role in the company.

3 How long have you been in construction management?

4 Estimate the amount of time you, as an entry-level engineer, spent on administrative tasks (e.g. preparing submittals, cost reports)
   1 never - 5 constantly

5 Estimate the amount of time you, as an entry-level engineer, spent on technical tasks (e.g. surveying and design)
   1 never - 5 constantly

6 Estimate the amount of time you, as an entry-level engineer, spent on managerial tasks (e.g. scheduling, conducting meetings)
   1 never - 5 constantly

7 At what level of importance do you consider an individuals GPA to be an indicator of future job performance?
   1 worst - 5 best

8 Score these attributes by level of importance:
   Technical
   Management
   Communication
   Time Availability
   Leadership
   Administrative skills
   Human Relations
   Familiarity with contracting forms
   Understanding of construction materials, methods & systems
   Decision Making
   Planning

   1 worst – 5 best

9 On average which would spend more time communicating with?
   Superiors or Subordinates

10 How important do you consider listening to be when communicating?
5 crucial - 1 irrelevant

11 Do you communicate differently with your subordinates than you do with your superiors?
   Y/N
   a) Is your attitude the same?
      Y/N
   b) Do use the same language?
      Y/N

12 Do you ever have to direct your subordinates to do something you know they will be reluctant to do?
   Y/N
   a) How often? 1 never - 5 constantly

13 In a typical day, how often are you required to make a decision?
   1 never - 5 constantly

14 How important do you consider workforce morale to be?
   1 irrelevant - 5 crucial

15 Do you think it is appropriate to reward workers with a bonus, for extra effort?
   Y/N

16 How important is the respect of your workers towards you, in your leadership of them?
   1 irrelevant - 5 crucial

17 As a leader which do you consider to be more important to a project?
   The Job or The Team

18 Is your relationship with your coworkers entirely professional or personal as well?
   Professional or Personal

19 Do think that because you are in a position of power over them, that workers will automatically resent you?
   Y/N

20 Do you relate differently to your superiors than you do to your subordinates?
   Y/N
3.2 Qualitative Component

1 Name

2 Briefly describe your role in the company.

3 How long have you been in construction management?

4 What administrative tasks would you, as a construction manager, prescribe to an entry-level engineer working under you?
   a) What were the first administrative tasks you performed as an entry-level engineer?

5 What technical tasks would you, as a construction manager, prescribe to an entry-level engineer working under you?
   a) What were the first technical tasks you performed as an entry-level engineer?

6 What managerial tasks would you, as a construction manager, prescribe to an entry-level engineer working under you?
   a) What were the first managerial tasks you performed as an entry-level engineer?

7 What technical skills do you value most in an engineer?
   a) Why?

8 What is the first indicator that an engineer may not be suited to a career in the construction industry?

9 What is the first question you normally ask in an interview?

10 What do you consider to be the most important attribute of a construction manager?

11 What do you consider to be the most important aspect of communication?

12 How do you communicate differently with your subordinates than you do with your superiors?
   a) How does your attitude differ?
   b) Why?
   c) How does the language you use differ?
   d) Why?

13 Describe the measures you use to ensure subordinates perform work to your specifications?

14 How do you go about directing your subordinates to do something you know they do not want to do?

15 What criteria do you consider in making the best decision?
16 What advice would you give an entry-level engineer regarding decision making?

17 How do you create morale?

18 In what instances would you reward workers (if at all)?
   a) What is a common reward you have given?

19 Is the respect of your subordinates important to you?
   a) Why?
   b) How do you earn this respect?

20 Briefly list some of the major leadership dos and don’ts you’ve encountered in your experience.

21 What sort of relationship do you keep with your coworkers: strictly professional or personal as well?
   a) Why?

22 Do you think that workers will automatically resent you because you are in a position of power over them?
   a) How do you combat this?

23 Compare your relationship with superiors and subordinates, listing the major differences between the two?
4 Sampling

4.1 Quantitative Component

"The objective of sampling is to estimate population parameters [...] from information contained in a sample."\(^8\) From a sample of construction and project managers, it is the aim of this survey to estimate the attitude of the entire population, of construction managers, towards various aspects of communication, leadership and interpersonal skills. "But how do we determine which procedure to use and the number of observations to include in the sample?"\(^8\)

"If \(\theta\) is the parameter of interest and \(\theta'\) is an estimator of \(\theta\) we should specify that \(\theta\) and \(\theta'\) differ in absolute value by less than some value \(B\):

\[
\text{Error of estimation} < B = |\theta - \theta'| < B
\]

We must also state a probability, \((1 - \alpha)\), that specifies the fraction of times, in repeated sampling, that the error of estimation will be less than \(B\). This condition can be stated as:

\[
P[\text{error of estimation} < B] = 1 - \alpha^8
\]

From this expression equations for the minimum sample size \(n_0\) can be derived, assuming a normal distribution.

These equations, however, require that some parameter of the sample already be known; for example the sample variance or the sample mean. Usually this information can be gathered from:

- The work of others

\(^8\) Scheaffer R.L, Mendenhall W, Ott R.L; Elementary Survey Sampling 5\(^{th}\) Edition; Duxbury Press; Melbourne; 1996
- Pilot studies
- Practical considerations of the structure of the target population
- A preliminary sample

In this case however these parameters cannot be found therefore statistical significance of the results, from the quantitative part of the survey, cannot be guaranteed.

The method used, in the case of this survey, to derive the sample was: *Judgmental or Purposive Sampling.* "[...] The experimenter exercises deliberate subjective choice in drawing what he regards as a ‘representative’ sample. The results of such a sampling procedure can be very good [...] and it is recognizes that some surveys may employ this principal to some extent."\(^9\)

In essence then, the quantitative element of this survey represents a preliminary sample. From it an *exploratory data analysis* has been conducted to generalize the findings and a set of from this generalization a set of hypothesis may be developed which may then undergo further, more rigorous, statistical analysis.

### 4.2 Qualitative Component

#### 4.2.1 Introduction

"Phenomenological inquiry, or qualitative research, uses a naturalistic approach that seeks to understand phenomena in context-specific settings. Logical positivism, or quantitative research, uses experimental methods and quantitative measures to test hypothetical generalizations. Each represents a fundamentally different inquiry paradigm, and researcher actions are based on the underlying assumptions of each paradigm

"Where quantitative researchers seek causal determination, prediction, and generalization of findings, qualitative researchers seek instead illumination, understanding, and

\(^9\) Barnett, V; Sample Survey Principles and Methods; Edward Arnold; Sydney; 1991
extrapolation to similar situations. Qualitative inquiry accepts the complex and dynamic quality of the social world."

4.2.2 Features of Qualitative Research

1. Qualitative research uses the natural setting as the source of data. The researcher attempts to observe, describe and interpret settings as they are, maintaining what Patton calls an "empathic neutrality".

2. The researcher acts as the "human instrument" of data collection.

3. Qualitative researchers predominantly use inductive data analysis.

4. Qualitative research reports are descriptive, incorporating expressive language and the "presence of voice in the text".

5. Qualitative research has an interpretive character, aimed at discovering the meaning events have for the individuals who experience them, and the interpretations of those meanings by the researcher.

6. Qualitative researchers pay attention to the idiosyncratic as well as the pervasive, seeking the uniqueness of each case.

7. Qualitative research has an emergent (as opposed to predetermined) design, and researchers focus on this emerging process as well as the outcomes or product of the research.

8. Qualitative research is judged using special criteria for trustworthiness."}

4.2.3 Selecting the Sample

As mentioned previously, quantitative sampling uses probability sampling to apply research findings to an entire population, maintaining a level of statistical confidence.
The dominant strategy in qualitative analysis, however, is *purposive sampling*. Purposeful sampling seeks information rich cases that can be studied in depth.

"The particular design of a qualitative study depends on the purpose of the inquiry, what information will be most useful, and what information will have the most credibility. There are no strict criteria for sample size and there is no statistical test of significance to determine if results 'count'. Judgments about usefulness and credibility are left to the researcher and the reader."\(^5\)

### 4.3 Conclusion

A *Purposive Sampling Strategy* was adopted for both the quantitative and qualitative components of this survey. As stated in the problem definition, the two questionnaires were made available on the Internet and the address was distributed to a cross section of both experienced (engineering) project managers and engineering students. Candidates were deemed appropriate based on the following criteria.

**Students**

- Is or has been enrolled in an engineering within the last two years
- Less than two years, engineering experience

**Engineering Project Managers**

- Worked as an engineering project manager
- Greater than two years project management experience

*Table 4.3* is a summary of the sample elements for both components of the survey.
### Table 4.3 - Summary of Sample Characteristics

<table>
<thead>
<tr>
<th>Name</th>
<th>Years of Experience</th>
<th>Current Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luke Smith*</td>
<td>0</td>
<td>Student Engineer At NRG. Requirements of my position are to complete analysis work, research, and modifications and perform minor engineering assistance to the other engineers.</td>
</tr>
<tr>
<td>David Zammit*</td>
<td>0.5</td>
<td>Project Engineer for Reduction Line 3 at Boyne Smelters Limited.</td>
</tr>
<tr>
<td>Dane Tappenden</td>
<td>0.5</td>
<td>Assistant mechanical engineer at Sugar Research Institute.</td>
</tr>
<tr>
<td>Luke Iliff*</td>
<td>0.5</td>
<td>I work in the site office on a coal mine. I keep track of job costs and plant costs. I also work closely with the people who hire me off inform them of the hours that their machines are working. So basically I work with people and numbers all day.</td>
</tr>
<tr>
<td>Chris Shields*</td>
<td>0.75</td>
<td>I am currently a site engineer with Thiess Pty. Ltd on the Awoonga Dam job. My duties include ordering and recording all concrete poured on site, forecasting material usage, material management, accounting accruals, writing JSEA's (Job Safety and Environmental Analyses), writing WAB's (Work Activity Briefings), writing WPs (Work Procedures), quality assurance for structural concrete pours on site, crew supervision (batch plant crew), forecasting and program construction.</td>
</tr>
<tr>
<td>Daryl Kidcaiff</td>
<td>0.75</td>
<td>Student Engineer - Managing environmental parts of jobs at the present.</td>
</tr>
<tr>
<td>Tom Jones**</td>
<td>1</td>
<td>Layout, subcontractor co-ordination, safety.</td>
</tr>
<tr>
<td>James Hadley</td>
<td>1</td>
<td>Co-op Engineer - Powerlink.</td>
</tr>
<tr>
<td>Jeff Davey</td>
<td>1</td>
<td>Co-op / Project Engineer @ Roadtec Consulting.</td>
</tr>
<tr>
<td>Hammo Kalantany</td>
<td>1</td>
<td>Co-op Engineer @ QR.</td>
</tr>
<tr>
<td>Ken Smith</td>
<td>1</td>
<td>Project Engineer.</td>
</tr>
<tr>
<td>Ross Smith</td>
<td>1</td>
<td>I was involved in the monitoring, recording and reporting on a number of project activities. My tasks involved invoicing all of the jobs for this division as well as completing a number of heavy lift studies.</td>
</tr>
<tr>
<td>Madonna Christopher*</td>
<td>1.5</td>
<td>Graduate Transport Planning Engineer.</td>
</tr>
</tbody>
</table>

| John Thomas**         | 2                   | Project Engineer - responsible for quality control, layout and field management   |
| Shelby Fryman**       | 2                   | Conducting layout, site control, subcontractor coordination, document keeper.     |
| Nick Profill**        | 2                   | Project Engineer: Responsible for document control, layout, co-ordination of trades. |
| Mike Welding**        | 4.5                 | Project Manager.                                                                |
| David Osborne         | 5                   | Provide technical consulting to clients.                                         |
| Alex Burger           | 5                   | Track construction project planning and budget management, and client contract management. |
| Chris Hegarty         | 10                  | Manage track construction division.                                              |
| Grant Hulme           | 11                  | Section Manager QAL, Calciner Project - Gladstone.                               |
| Peter Allen*          | 12                  | Formerly managing director of Danby Pty Ltd.                                   |
| Mark Hill*            | 15                  | Overseer/Support the on-site project management of several projects. Also includes the contracting of all subcontracting works and development of bid packages. |
| GARY MURPHY           | 16                  | MANAGER CIVIL OPERATIONS BUDGET $20M +++ STAFF 140 MANAGE MANY VARIED PROJECTS AS WELL AS OVERALL DEPARTMENT |
| David Doss**          | 18                  | Daily management of projects to meet all project goals including safety, quality, schedule and budget. |
| Dan France**          | 23                  | 20% Corporate leadership, management and vision, 80% leading Central Kentucky Market for Messer. |
| Charles Pytwel*       | 25                  | CEO, Project Manager, Construction Manager, Principal Consultant.                |
| Greg Goad*            | 30                  | Facilities construction manager involved in all aspects of design & construction of built assets, and contract administration. |

* Filled out qualitative questionnaire in addition to the quantitative questionnaire

** Filled out a preliminary qualitative questionnaire (See Appendix A) in addition to the quantitative questionnaire
5 Analysis Procedure

5.1 Qualitative

The results of the qualitative questionnaire were analyzed for the recurrence of key words and phrases and occasionally the responses were quoted directly. The purpose of analyzing for key words and phrases is to determine the themes behind the data and hence generalize the findings in a way that is not biased towards any one element of the sample. There is no method for determining the confidence of these results; the reader can decide their credibility.

5.2 Quantitative

It was stated previously that the survey results would represent a preliminary sample assumed to be representative of the entire population; as a result, a detailed test of statistical confidence was not carried out. The data has undergone an exploratory data analysis, which aims to indicate any trends or patterns within the sample and thereby identify possible hypothesis that may be developed and tested further for significance.

*Figure 5.2* illustrates the procedure of ‘attaining statistical confidence’ and indicates the scope of the analysis carried out in this report.
5.2.1 Exploratory Data Analysis

➢ Relative Frequency

The Relative Frequency is the frequency of a response relative to the number of people sampled:

\[
\text{Relative Frequency (rf)} = \frac{f}{N}
\]

Where \( f \) = Frequency of a particular response to a question

And \( N \) = Total number of people sampled

The relative frequencies for the student group have been graphed alongside those of the professional group to facilitate a comparison between the two.
Mean Response

As with the relative frequency, the *Mean Response* has been calculated independently for the student group and the professional group and is simply the arithmetic mean of all the responses, of that group, to a particular question.
6 Analysis & Discussion

See Appendix B for the all of the results in raw form.

6.1 General

Table 6.1 - Survey Sample Information

<table>
<thead>
<tr>
<th></th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students</td>
<td>Professionals</td>
</tr>
<tr>
<td>Number of Respondents*</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Range of Years of Experience</td>
<td>0 - 1.5</td>
<td>2 - 30</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>15</td>
</tr>
</tbody>
</table>

*Includes the results of the preliminary qualitative survey.

6.2 Entry Level Engineers Entering Construction Project Management

6.2.1 Introduction

This section of the report investigates the roles, responsibilities and desired attributes of entry-level engineers entering a career in construction project management. It lists tasks commonly prescribed to entry-level engineers and also compares the attitude towards each question of the student group with that of the professional group. A significant difference in these attitudes obviously indicates some misconception on the student’s behalf and it is the design of this discussion to illuminate these misconceptions.
6.2.2 Roles & Responsibilities

➢ Administrative

Question 4, of the quantitative questionnaire produced the results displayed in Figure 6.2.2.1 on how much time entry-level engineers can expect to spend on administrative tasks such as preparing submittals and cost reports.

![Figure 6.2.2.1 – Time Spent on Administrative Tasks](image)

The mean responses for students and professionals are 3.1 and 2.9 respectively. This represents a small difference (7%) in the attitude of the students compared with that of the professionals. The relative frequency distribution does however indicate that students predict they'll be spending slightly more time on administrative tasks, than they will actually experience in the field.

Questions 4 and 4a, of the qualitative questionnaire provided the following information on the type of administrative tasks that will be prescribed to entry-level engineers entering construction management (from most commonly listed):

- **Document Control, including:**
  - Transmitting RFI’s (Request’s for Information)
  - Filing
  - Updating project schedule
  - Checking of shop drawings
  - Collecting quotes and estimates
  - Completing invoices
Writing reports
Recording and distribution of meeting minutes

- Materials Ordering
- Costing
- Site inspections
- Quality assurance
- Workplace health and safety records

> Technical

Question 5, of the quantitative questionnaire investigated the amount of time that entry-level engineers, entering construction management, can expect to spend on technical tasks, for example surveying and design. Figure 6.2.2.2 illustrates an obvious difference in the predictions of the student group and the experience of professional group. Students, it seems, do not expect to spend as much time on technical tasks as is common in industry.

Figure 6.2.2.2 – Amount of Time Spent on Technical Tasks

Questions 5 and 5a, of the quantitative questionnaire investigated the type of technical tasks that entry-level engineers, entering construction management, can expect to be prescribed. The results were (from most commonly listed):

- Quality control checks, including:
  - Defect inspections
  - Checking of formwork and steel prior to concrete pours
- **Surveying and geometry, including**
  Vertical and horizontal control of building layout
  Interpretation of plans and specifications

- **Resource procurement, including:**
  Quantity takeoffs prior to ordering
  Ordering
  Compliance checks upon delivery

- **Elementary design and drafting**

  ➢ **Managerial**

  Question 6, of the quantitative questionnaire investigated the *amount of time* that entry-level engineers, entering construction management, can expect to spend on managerial tasks, for example scheduling and conducting meetings. *Figure 6.2.2.3*, below, shows that the expectations of the students group are, on average, concurrent with what they will experience.

  ![Figure 6.2.2.3 – Amount of Time Spent on Managerial Tasks](image)

  Questions 6 and 6a, of the quantitative questionnaire investigated the *type of managerial tasks* that entry-level engineers, entering construction management, can expect to be prescribed. The results were (from most commonly listed):

  - **Coordination and supervision of small crews**
  - **Workplace Health and Safety Management**
  - **Chairing meetings**
6.2.3 Desired Attributes

> General

Question 10 of the qualitative question asked: ‘What is the most important attribute of a construction project manager?’ The responses are listed below.

“Have good communication skills, be able to listen to other opinions and take them on board, not to be shy or scared of confrontation, be confident in themselves and their ability, have good administrative skills, good verbal and written skills.”

“Willingness to put in the extra hours”

“Organization and good, all round, people skills.”

“Communication to subordinates and superiors.”

“Time management and the ability to allocate tasks and resources.”

“Good interpersonal skills as well as knowledge of project progression”

“Good leadership skills and understanding of project planning”

“An ability to lead and motivate people to achieve a defined set of objectives”

“An ability to convert ideas into tangible assets. To combine individuals into a team.”

Question 8 of the quantitative questionnaire measured the importance of each of the desired attributes - of construction project managers - identified in the literary survey. Table 6.2.3 displays the results.
Both the student group and the professional group listed Communication, Decision Making and Planning as the most desired attributes of project managers; leadership attained an above average, mean score of 4 (out of 5) from the group of managers. This information, coupled with the results of Question 10 of the qualitative questionnaire (stated above), supports the literary review and the initial contention of this report. That is: ‘Communication and Leadership are key skills for Entry-Level Engineers’.

Interpersonal Skills

Interpersonal skills were also listed as a desired attribute of project managers in the literary survey, however this attribute only attained an average mean score of 3.4 from the experienced professionals. This result does not contradict the initial contention that ‘Interpersonal Skills are a Desired Attribute of Project Managers’: but it indicates that these skills are considered less important than other attributes - including Time Availability and Management skills – by practising professionals. Really though, both Communication and Leadership incorporate aspects of Interpersonal Skills and, as such, Interpersonal Skills deserve to be allocated the same level of importance.
➢ **Time Availability**

The student group, with a mean score of 3.2, listed Time Availability as the least important, desired attribute of project managers. At the same time the professional group scored Time Availability at 3.7 and listed it before other attributes such as Technical and Administrative Skills. This demonstrates a misconception, on the student’s behalf, about the importance of time availability. Entry-Level Engineers should be aware that Time Availability is considered an important desired attribute of project managers and that they should expect to work long hours and weekends.

➢ **Academic**

Question 7 of the quantitative questionnaire investigated the importance of an entry-level engineer’s Grade Point Average (GPA) as an indication of future job performance. The figure below indicates that the professional group placed more of an emphasis on the importance of the GPA than the student group, although it was never listed as crucial.

Entry-level engineers must realize that prospective employees have limited resources from which to forecast an applicant’s future job performance and therefore the GPA is as good as any. It *may* indicate an ability to learn quickly and a strong work ethic.

*Figure 6.2.3 – The Importance of the Grade Point Average*
Undesired Attributes

Question 8 of the qualitative questionnaire asked “What is the first indicator that an engineer may not be suited to a career in the construction industry?” The results are (from most commonly listed):

- Doesn’t want to work the extra hours needed
  - Listed 5 times in 11 responses
- Lack of initiative
  - Listed 4 times in 11 responses
- Lack of enthusiasm
  - Listed 3 times in 11 responses
- Unwillingness to learn to listen
  - Listed 3 times in 11 responses
- Strictly a theoretical thinker
  - Listed 2 times in 11 responses

The remainder of the responses was only listed once.

- Does not get out of the office to check on a job personally and interact with subordinates
- No practical experience
- Susceptible to stress
- Irresponsibility

Entry-level engineers should exercise vigilance in avoiding these weaknesses, considered detrimental to the success of a project manager.
6.3 Communication

6.3.1 General
Question 11 of the qualitative questionnaire asked: ‘What do you consider to be the most important aspect of communication [in the context of project management]?’ The common responses were (from most frequently listed):

- Listening
  - Listed 5 times out of 7 Responses
- Being at the level of communication as the other person or group i.e. not talking down and using language they can understand.
  - Listed 4 times out of 7 responses
- Being able to give opinions as well as be able to accept the opinions of others.
  - Listed 2 times out of 7 responses

6.3.2 Superiors/Subordinates
Communication, in the context of project management, can be divided into two areas: Communication With Superiors and Communication With Subordinates. Figure 6.3.2.1, below, demonstrates that 75% of practising project managers spend a majority of their time communicating with subordinates. The student group has mixed expectations.

\[\text{Figure 6.3.2.1 - More Time Spent Communicating With?}\]
Whilst recognizing the importance of being able to communicate effectively with superiors, project managers clearly indicate that they spend more time communicating with superiors. As a result this report has focussed on practises that should be adopted, by entry-level engineers, when communicating with subordinates.

Question 11 of the quantitative questionnaire investigated whether or not different styles of communication are adopted when communicating with each group.

![Figure 6.3.2.2 – Are Different Styles of Communication Used for Superiors/Subordinates](image)

Clearly a majority (almost 80%) of practising project managers adopt a different style of communication when communicating with each group.

Question 12 of the qualitative questionnaire investigated how these styles of communication differ.

The responses, which have been summarized, are listed below:

- *When Communicating with Subordinates*
  - Use more casual, layman terms
  - Be proactive i.e. work harder at engendering trust and respect
  - Communicate with a greater depth of detail
• When Communicating with Superiors
  - More use of written communication
  - Overview and only concentrate on key aspects/issues

In summary, language and attitude represent the major differences in the communication style adopted for superiors or subordinates.
But why adopt a different attitude and language? Simply because both sides are motivated differently, as one response to Question 12a of the qualitative questionnaire demonstrates: “Superiors rely on you to perform profitably, on time and safely; Subordinates want to understand the job easily, with no confusion about their role. They also want a sense of satisfaction when it is completed.” To help subordinates understand a job it may be necessary to adopt layman’s terms. To ensure they have no confusion about their role it may be necessary to explain how they fit into the ‘bigger picture’. In general, the language and attitude should be tailored to suit the recipient.

6.4 Leadership

6.4.1 Introduction
The key elements of leadership studied in this report are: Direction of Subordinates and Decision Making.

6.4.2 Direction of Subordinates
Directing a subordinate to do something they want to do poses no real challenge, however, in project management, entry-level engineers may have to direct someone to do something they don't want to do; this situation poses more of a challenge. Questions 12 of the quantitative questionnaire investigated this possibility.
The figure above illustrates that one hundred percent of the practicing project managers are required to direct subordinates to do something they do not want to do. The figure below is the relative frequency distribution of the responses to Question 12a, of the quantitative questionnaire, investigating how often entry-level engineers will be required to direct reluctant subordinates.

Practicing project managers clearly indicate that they are often called upon to direct reluctant subordinates. Students, however, expect to encounter this situation far less frequently. The mean scores for the student group and the professional group were 2.8 and 3.5, respectively, which represents a significant difference.

Recognizing now, that entry-level engineers may be under-prepared to deal with this situation Question 14 of the Qualitative asked practicing project managers: “How do you go about directing you subordinates to do something you know they do not want to do?” Below is a summary of the results.
1. Be straightforward: this builds trust and hence respect.

2. Approach the task in a way that will assure their understanding of the 'bigger picture', and obtain their commitment to performing the task. Subordinates are far more cooperative and enthusiastic when they are aware of the importance of their contribution, in relation to the progress of the project as a whole.

3. Negotiate a reward or incentive for this work, for example: finish work early, long lunch.

In summary, motivation and respect are important aspect of project leadership. Some project managers also see benefit in rewarding subordinates for work done. Entry-level engineers should strive to earn respect and motivate their subordinates.

➢ Respect

Question 16 of the quantitative questionnaire measured how important project managers consider the respect of their workers towards them, to be.

Figure 6.4.2.3 – The Importance of Respect

Obviously managers consider the respect of their workers towards them, to be an almost crucial aspect of project management. The following statements are themes derived from analysis of all of the responses to Question 19a, of the qualitative questionnaire: they are the reasons why respect, towards you, from your subordinates, is important:

- Subordinates will perform and deliver with less reluctance and to a higher standard if they respect you.
- They will want to work for you, not just because they have to.
• From time to time you will require them to work unsupervised.
• Without a reasonable amount of respect subordinates will begin to question directions, which may result in conflict.

To manage and lead more effectively entry-level engineers should strive to earn the respect of their subordinates. The results of Question 19b, of the qualitative questionnaire, provided the following advice on how to earn respect:
• Be open to communication: ask for opinions and listen to suggestions.
This concept behind this response is openness in communication and this theme appeared in three other responses, therefore these responses have not been listed.
• Always conduct yourself in a professional manner.
• Treat others how you expect to be treated.
• Accept responsibility for mistakes.

➢ Morale

Morale is a significant factor in the success of any team-based exercise: project management is no exception, as the results of Question 14, below, illustrate.

_Figure 6.4.2.4 – The Importance of Morale_

The following advice for entry-level engineers, on how to create morale, represents all of the results of Question 17, of the qualitative questionnaire.
• Use clear, open, honest communications; recognize achievements, and recognize that shortcomings are generally not intended, and can be addressed for the future.
• Contribute and show interest
• Demonstrate that you are fair and consistent in your dealings and that you can be trusted

➤ Rewards

One way to recognize achievement, and hence encourage morale, is to provide some form of reward or bonus. Negotiation of a reward can also be used as an incentive to encourage subordinates to perform a task that they would usually be reluctant to do. Entry-level engineers, entering project management, should employ rewards to some extent, however they must realize that rewards are not appropriate in all circumstances. Below is a list representing the results of Question 18, of the qualitative questionnaire. These are the instances that practicing project managers consider provision of a reward or bonus suitable:

• The required performance, whether measured by schedule or budget, has been exceeded.
• In recognition exceptional contribution.
• Achievement of milestones, e.g. key construction stages, safety performance. May also reward (in the sense of say a night out) for non achievement where everyone has done their best

Below are the responses to Question 18a – 'What is a common reward you have given?':

• Social functions
• Financial bonuses
• Allowed to leave work early
Ensuring Quality

Quality control was listed earlier as one of the most common responsibilities of entry-level engineers. So, once subordinates have been directed to do a task, how should entry-level engineers ensure they complete it within the project’s specifications? Question 13 of the qualitative questionnaire asked this question and all of the results are represented in the summary below:

- Discuss what is required, emphasizing key aspects or tolerances. You need to communicate such things as time frames; resources needed, quality and safety issues. In some instance the instruction may need to be reinforced with written detail etc.
- Constantly monitor progress through site inspections, review of material submittals and review of shop drawings. Immediately notifying them if there are any discrepancies.
- Let them know of the ramifications if the job is not performed to scratch.
- Implement appropriate reporting processes.

6.4.3 Decision Making

An ability to make good decisions was listed in the Literary Review as a desired attribute of a project manager. The results of Question 13 are illustrated in Figure 6.4.4, it indicates that decision-making is a critical element of project management and support the contention that decision-making is skill, which needs to be developed by entry-level engineers.
It is understood that the criterion affecting a decision varies from situation to situation. In answering Question 15, of the qualitative questionnaire, project managers did however indicate that, in project management, there are a few broad areas that effect almost every decision. These criteria and the number of times they were listed by project managers:

- SAFETY 1 out of 7
- Risk 2 out of 7
- Cost 3 out of 7
- Time available 2 out of 7
- Necessity 1 out of 7
- Resources available 1 out of 7

Entry-level engineers will become familiar with each of these areas and learn to manipulate each in affecting the best decision.

Below is all but one of the project manager's responses to Question 16 of the qualitative questionnaire, on advice for entry-level engineers, regarding decision-making. The omitted response had the same theme as the first quote only it was worded differently:

- 'Be open minded to all options and balance the criteria above.'
- 'Get as much info as possible, don't be afraid to ask for help, if you make a mistake don't worry about it too much, just learn from it.'
- 'Consult a project engineer or another superior if you are at all unsure of what is required or how to go about it.'
- 'Step up to the plate. Never decide not to do something because "it's someone else's job"'.
‘Get the best facts that you can, but above all make a decision that is timely. The cost of not making a decision is generally higher than making a less than perfect one.’

‘Evaluate the options, make recommendations, and seek formal acceptance from superiors.’

Entry-level engineers must try to find out all of the facts affecting the outcome of a decision but at the same time realize when they lack the required knowledge and seek the advice of an expert.

### 6.4.4 Leadership Dos & Don’ts

Table 6.4.4 displays the all of results to Question 20 of the qualitative questionnaire. The question was: “Briefly list some of the major leadership dos and don’ts you have encountered in your experience.”

<table>
<thead>
<tr>
<th>DO</th>
<th>DO NOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate well (which means listening)</td>
<td>Be intimidating</td>
</tr>
<tr>
<td>Know your job</td>
<td>Act as though you are more important than others.</td>
</tr>
<tr>
<td>Delegate well - ensure that the job is understood</td>
<td>Don’t be officious</td>
</tr>
<tr>
<td>Everything that is necessary to get to the objective</td>
<td>Blame your team when things don’t work out</td>
</tr>
<tr>
<td>Plan properly and resources properly</td>
<td>Be misleading of deceptive with your people (or anyone for that matter)</td>
</tr>
<tr>
<td>Always be one step ahead</td>
<td>Put square pegs into round holes...look for a round peg</td>
</tr>
<tr>
<td>Be decisive</td>
<td></td>
</tr>
<tr>
<td>Always act in the best interest of and for those you are representing</td>
<td></td>
</tr>
<tr>
<td>Be firm and show strength</td>
<td></td>
</tr>
<tr>
<td>Be approachable</td>
<td></td>
</tr>
<tr>
<td>Treat everyone equally</td>
<td></td>
</tr>
</tbody>
</table>
6.5 Interpersonal Skills

Over 80% of the project managers surveyed indicated that their relationship with co-workers goes beyond a strictly professional association.

![Figure 6.5.1 - Professional or Personal Relationship With Co-Workers](image)

Entry-level engineers should endeavour to engage co-workers (superiors and subordinates) on a personal level; as such relationships are considered beneficial. Below is a summary of the results of Question 21a of the qualitative questionnaire. Every response has been accounted for in this summary and there were no contradicting answers:

- People are generally more trusting if they know you personally.
- Encourages more of a team mentality
- Staff is whole people, not just working devices.
- Makes working more enjoyable

Entry-level engineers entering project management will be usually command a level of responsibility; often they’ll be in a position of power over subordinates that are both older and more experienced: this situation has an obvious potential for conflict. Question 19 of the quantitative questionnaire investigated the possibility that subordinates may display resentment towards a project manager simply because the manager is in a position of power over them. Figure 6.5.2 shows that most project managers do not consider this to be the case.
By engaging subordinates on a personal level and by showing them respect, entry-level engineers will find that they will cooperate much more willingly.
7 Conclusions

7.1 Introduction

The aims of this report were to determine:
'What is an entry level engineer?'
'What are the roles of an entry level engineer?' and
'How can entry-level engineers best fulfill these roles?'
The initial contention of the report was that: Communication, Leadership and Interpersonal Skills are core skills that require careful development in entry-level engineers. This contention was supported initially by the literary survey, and then, subsequently, in the results.

7.2 What is an Entry-Level Engineer?

An Entry-Level Engineer is a qualified engineer with less than two years practical experience in construction or project management.

7.3 What Does an Entry-Level Engineer Do?

The tasks listed below apply to entry-level engineers in construction project management.

7.3.1 Administrative Tasks

- Document Control, including: Transmitting RFI's (Request's for Information)
  Filing
  Updating project schedule
  Checking of shop drawings
  Collecting quotes and estimates
  Completing invoices
  Writing reports
  Recording and distribution of meeting minutes

- Materials Ordering
- Costing
- Site inspections
- Quality assurance
- Workplace health and safety records

7.3.2 Technical Tasks

- Quality control checks, including:
  - Defect inspections
  - Checking of formwork and steel prior to concrete pours

- Surveying and geometry, including:
  - Vertical and horizontal control of building layout
  - Interpretation of plans and specifications

- Resource procurement, including:
  - Quantity takeoffs prior to ordering
  - Ordering
  - Compliance checks upon delivery

- Elementary design and drafting

7.3.3 Managerial Tasks

- Coordination and supervision of small crews
- Workplace Health and Safety Management
- Chairing meetings

7.3.4 Other

In addition to these specific tasks, entry-level engineers (of any discipline) entering project management will be required to:

- Communicate, with both superiors and subordinates.
- Direct subordinates
- Make Decisions
7.4 How Can Entry-Level Engineers Best Fulfil These Roles?

7.4.1 Communication

- **When Communicating with Subordinates**
  - Use more casual, layman terms
  - Be proactive i.e. work harder at engendering trust and respect
  - Communicate with a greater depth of detail

- **When Communicating with Superiors**
  - More use of written communication
  - Overview and only concentrate on key aspects/issues

7.4.2 Direction of Subordinates

- Be straightforward: this builds trust and hence *respect*.
- Approach the task in a way that will assure their understanding of the ‘bigger picture’, and obtain their commitment to performing the task. Subordinates are far more cooperative and enthusiastic when they are aware of the importance of their contribution, in relation to the progress of the project as a whole.
- Negotiate a reward or incentive for this work, for example: finish work early, long lunch.

➢ Earn Respect

- Always conduct yourself in a professional manner.
- Be open to communication: ask for opinions and listen to suggestions.
- Treat others how you expect to be treated.
- Accept responsibility for mistakes.
➢ Create Morale

- Use clear, open, honest communications; recognize achievements, and recognize that shortcomings are generally not intended, and can be addressed for the future.
- Contribute and show interest
- Demonstrate that you are fair and consistent in your dealings and that you can be trusted

➢ Ensure Quality

- Discuss what is required, emphasizing key aspects or tolerances. You need to communicate such things as time frames; resources needed, quality and safety issues. In some instance the instruction may need to be reinforced with written detail etc.
- Constantly monitor progress through site inspections, review of material submittals and review of shop drawings. Immediately notifying them if there are any discrepancies.
- Let them know of the ramifications if the job is not performed to scratch.
- Implement appropriate reporting processes.

7.4.3 Decision Making

Consider the following:

- SAFETY
- Risk
- Cost
- Time available
- Necessity
- Resources available
And attempt to find out all of the facts affecting the outcome of the decision but at the same time realize when they lack the required knowledge and seek the advice of an expert.

### 7.4.4 Interpersonal Skills

Entry-level engineers should endeavour to engage co-workers (superiors and subordinates) on a personal level; as such relationships are beneficial for the following reasons:

- People are generally more trusting if they know you personally.
- Encourages more of a team mentality
- Staff is whole people, not just working devices.
- Makes working more enjoyable
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APPENDIX A – Structure Used to Generate Questionnaire

Questions
# Questionnaire Structure

## Focusses

<table>
<thead>
<tr>
<th>Element</th>
<th>Issues</th>
<th>Questions</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Interviewee</td>
<td>Personal Information</td>
<td>Name</td>
<td>Briefly describe your role in the company.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How long have you been in construction management?</td>
<td></td>
</tr>
<tr>
<td>Regarding Entry-Level Engineers</td>
<td>Roles &amp; Responsibilities</td>
<td>Administrative</td>
<td>What administrative tasks would you, as a construction manager, delegate to an entry-level engineer working under you?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What were the first administrative tasks you performed as an entry-level engineer?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Estimate the amount of time you, as an entry-level engineer, spent on administrative tasks with 1 equal to 0% of the time and 5 worth 100% of the time.</td>
</tr>
<tr>
<td></td>
<td>Technical</td>
<td></td>
<td>What technical tasks would you, as a construction manager, delegate to an entry-level engineer working under you?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What were the first technical tasks you performed as an entry-level engineer?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Estimate the amount of time you, as an entry-level engineer, spent on technical tasks with 1 equal to 0% of the time and 5 worth 100% of the time.</td>
</tr>
<tr>
<td></td>
<td>Managerial</td>
<td></td>
<td>What managerial tasks would you, as a construction manager, delegate to an entry-level engineer working under you?</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>What were the first managerial tasks you performed as an entry-level engineer?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Estimate the amount of time you, as an entry-level engineer, spent on managerial tasks with 1 equal to 0% of the time and 5 worth 100% of the time.</td>
</tr>
<tr>
<td>Desired Attributes</td>
<td>Technical</td>
<td></td>
<td>What technical skills do you value most in an engineer?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Academic</td>
<td>At what level of importance do you consider an individual's GPA to be an indicator of future job performance? (1 worst - 5 best)?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
<td>What is the first indicator that an engineer may not be suited to a career in the construction industry?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What is the first question you normally ask in an interview?</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>What do you consider to be the most important attribute of a construction manager?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Score (1 worst - 5 best) these attributes by level of importance: Technical, Management, Communication, Time Availability, Leadership, Administrative skills, [Redacted], Familiarity with [Redacted], Understanding of construction materials, methods, &amp; systems, Decision Making, Planning.</td>
</tr>
<tr>
<td></td>
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<td>Advice</td>
<td>Re-Desired Attributes</td>
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<td>Communication (Spoken) Importance of \ When communicating with your superiors is communication with your superiors important? \ When communicating with your subordinates is communication with your subordinates important? \ Do you consider listening to be an important element of communication?</td>
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<td>Listening</td>
<td>Do you communicate differently with your superiors than you do with your subordinates? (do your attitudes on the same? Do you use the same language?)</td>
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<td>Comparison</td>
<td>Do you ever have to direct your subordinates to do something you know they do not want to do?</td>
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<td>Leadership</td>
<td>When directing your subordinates to perform a task, do you use any measures to ensure they will complete it to your requirements?</td>
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<td>Method</td>
<td>Briefly describe these measures.</td>
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<td>Persuasion</td>
<td>Do you consider morale to be an important aspect in the leadership of the workforce?</td>
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<td>Morale</td>
<td>How do you create morale?</td>
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<td>Decision Making</td>
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<td>The percentage of your work involves decision making?</td>
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<td>What criteria do you consider in making the best decision?</td>
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<td>What advice would you give an entry-level engineer regarding decision making?</td>
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<td>Do you consider morale to be an important aspect in the leadership of the workforce?</td>
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<td>How do you create morale?</td>
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<td>Rewards</td>
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<td>Do you think it is appropriate to reward workers?</td>
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<td>In what instances would you reward workers?</td>
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<td>What is a common reward you have given?</td>
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<td>Earning Respect</td>
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<td>Acting as a role model</td>
<td>Do you believe it is important to lead by example?</td>
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<td>Do you think this helps to earn the respect of the workers?</td>
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<td>Dos &amp; Don'ts</td>
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<td>Briefly list some of the major leadership dos and don'ts you've encountered in your experience.</td>
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<td>Human Relations</td>
<td>Professional or Personal</td>
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<td>Is your relationship with your co-workers entirely professional or personal as well?</td>
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<td>Resentment</td>
<td>Do you think that because you are in a position of power over them, that workers will automatically respect you?</td>
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<td>How do you combat this?</td>
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<td>What are the major differences between the two?</td>
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APPENDIX B – Preliminary Qualitative Questionnaire
Interview

Name: ____________________  Date: ____________________

Briefly describe your role in the company.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

How long have you been in construction management?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

At what level of importance do you consider an individual's GPA to be an indicator of future job performance? 1 2 3 4 5

Do you think it is valuable for a new engineer to work or intern with the craft labour force? Why?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
What one personality trait do you value above all others in evaluation of graduate engineers wanting to work in the construction industry?

What is the first indicator that an engineer may not be suited for a career in the construction industry?

What technical skills do you value the most in an engineer?

What one communication skill do you look for most in an engineer?
What is the first question you normally ask in an interview?

What is the last question you normally ask in an interview?

What do you consider to be the most important attribute of a construction manager?
Rank these attributes by level of importance

- Technical
- Management
- Communication
- Time Availability
- Leadership
- Administrative Skills
- Human Relations
- Familiarity with contracting forms
- Understanding of construction materials, methods and systems
- Decision Making
- Planning

What is your method for making “the best decision”? What criteria do you consider?

__________________________

__________________________

__________________________

What advice would you give to an entry-level engineer regarding decision making?

__________________________

__________________________

__________________________
What system do you use to ensure on-time procurement of resources?


What measures do you take to ensure subcontractors meet the quality of work stipulated in the specifications?


Please fill out this survey:

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<th>Affection</th>
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<td><strong>Wanted From Others</strong></td>
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(1-low, 2-moderate, 3-high)

Do you prefer to keep your relationship with subcontractors and craft force workers strictly professional or is the relationship personal as well? Explain?


Do you consider morale to be an important aspect in the leadership of the workforce?

- How do you create morale?

Do you think that because you are in a position of power over them that workers will automatically resent you?

- How do you combat this?

What are the most common tasks you prescribe to an entry-level engineer?

What was the first assignment you had as a graduate engineer?
In general, is a project manager with ten years experience better than one with five?

Why?
APPENDIX C – Raw Survey Results
**Quantitative Questionnaire Results**

**Question Field**

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<td>I am currently a site engineer with Thiess Pty. Ltd on the Awoonga Dam job. My duties include ordering and recording all concrete poured on site, forecasting material usage, material management, accounting accruals, writing JSEA's (Job Safety and Environmental Analyses), writing WAB's (Work Activity Briefings), writing 3b (Years) 0 0.5 0.5 0.5</td>
<td>Luke Smith 0 0.5 0.5 Dane Tappenden 4 3 4 1.2.3.4.5</td>
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<td>Response</td>
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**Qualitative Questionnaire Results**
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Qualitative Questionnaire Results
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<td>Enter your responses here.</td>
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**Comments:**

Describe any specific areas you feel need improvement.

**Suggestions:**

Provide any suggestions or feedback to improve the service.

**Qualitative Questionnaire Results**

**Date:**

**Time:**

**Comments:**

Describe your overall experience.

**Suggestions:**

Provide any suggestions for improvement.

---

**Scores:**

- **Overall:** 12
- **Service:** 12
- **Product:** 12

---

**Additional Notes:**

Describe any other relevant information or feedback.

---

**Balance:**

**Cash:**

**Check:**

**Credit Card:**

---

**Assistance:**

**Self-Service:**

**Reception:**

---

**Contact:**

**Website:**

**Telephone:**

**Email:**

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**Emergency:**

**Location:**

**Nearest Exit:**

---

**Weather:**

**Traffic:**

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**Parking:**

**Restrooms:**

---

**Miscellaneous:**

Describe any other miscellaneous observations or feedback.

---

**Instructions for Next Customer:**

Follow the instructions provided for proper interaction with the facility.

---

**Summary:**

Provide a brief summary of your experience and feedback.

---

**Thank You:**

Thank you for your feedback. We appreciate your input to help us improve our services.

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<td>Yes</td>
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<td>Do you have a history of drug or alcohol abuse?</td>
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**Qualitative Questionnaire Results**

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Relative Frequency Distributions for Each Question of the Quantitative Questionnaire

Q4. Amount of Time Spent on Administrative Tasks

Q5. Amount of Time Spent on Technical Tasks

Q6. Amount of Time Spent on Managerial Tasks

Q7. Importance of GPA

Q8a. Importance of Technical Ability in Project Management

Q8b. Importance of Management Ability in Project Management

Q8c. Importance of Communication Ability in Project Management

Q8d. Importance of Time Availability in Project Management

Q8e. Importance of Leadership in Project Management

Q8f. Importance of Interpersonal Skills in Project Management

Q8g. Importance of Familiarity with Contracting Forms in Project Management

Q8h. Importance of Understanding of Construction Methods and Practices in Project Management
1. Q8a Importance of Familiarity with Contracting Forms in Project Management

2. Q8b Importance of Decision making in Project Management

3. Q8c Importance of Understanding of Construction Materials, Methods and Systems in Project Management

4. Q8d Importance of Planning in Project Management

5. Q9 Majority of Time Spent Communicating With

6. Q10 Importance of Listening

7. Q11 Different Style of Communication Adopted When Communicating With Superiors/Subordinates?

8. Q11a Different Attitude Adopted When Communicating With Superiors/Subordinates?

9. Q11b Different Language Adopted When Communicating With Superiors/Subordinates?

10. Q12a Frequency - Direction of Reluctant Subordinates

11. Q12b Frequency of Decision Making

12. Q12c Direction of Reluctant Subordinates