ENGINEER TO LEADER: THE TRANSITION

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Abstract

A leader has various definitions, but is essentially a person who is able to inspire and steer a particular organisation towards success. Since human beings are non-linear (i.e. multiple reactions are possible in any given situation), they contribute a great deal to the complexity of an organisation and no standard procedure can be developed to deal with the conflicting perceptions that exist within an organisation. The leader therefore has to use his/her power of influence in getting the best out of people for the success of the organisation. Engineers, on the other hand, are more technically orientated and even though they deal with people it is usually on a smaller scale. An engineer outside operations will have even less exposure to managing or leading people. The transition from engineer to leader is therefore usually clouded with numerous challenges.

This report uses a qualitative approach called ‘action research’ methodology to understand and respond to challenges that are encountered by engineers when they progress to a senior leadership role in a complex organisation. Interviews were conducted with personnel who are in leadership positions who have engineering backgrounds and had undergone this transition. These challenges are highlighted, and recommendations are based on the role of the individual going through the transition, the organisation’s role and possible contribution of the tertiary institutions during under/post-graduate studies and through partnerships with the organisation.

The adoption of the engineer-in-training programme approach at leadership level was recommended to ensure a less turbulent transition and supply adequate leaders into the system.

Keywords: management, engineer, leadership, action research

Introduction

Most people are in agreement that employees are the greatest assets in any organisation and contribute highly to the success or failure of that organisation. A person in a leadership position is responsible for nurturing the skills and talents of employees while managing their working life cycles through development and performance management.

An engineer already practices leadership principles as a ‘middle manager’. Engineers manage for results. In this role they are expected to plan (for projects, budgets, operations and leave), solve problems, implement organisational strategies at team level, and drive performance of direct
reports, thus ensuring team effectiveness. They exercise the plan, lead, organise, control (PLOC) principles of management. As engineers progress further up the ladder, their role changes from managing small teams to managing managers with their own teams. At this level they need to have an improved understanding of the business as a whole including other functions not under their leadership. Thinking and reasoning become wider and more strategic, focusing on medium to long term goals.

In a more senior role engineers are fully responsible for a unit and focus on sustainability of the business through integration of business units. They are more likely to have managers from different functions reporting to them, and as they progress further, the amount of leadership they need to exercise increases proportionately. McGinnis (1985) expresses the split as shown in Table 1.

### Table 1. Time spent on leadership at different levels.

<table>
<thead>
<tr>
<th>Level</th>
<th>Technical</th>
<th>Leadership/HR</th>
</tr>
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<tbody>
<tr>
<td>Operator/Artisan</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>Supervisor/Engineer</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Executive</td>
<td>20%</td>
<td>80%</td>
</tr>
</tbody>
</table>

This report highlights the challenges encountered by engineers through the transition period towards a senior leadership position in an organisation. Recommendations are then made based on the roles played by the individual and the organisation. Thoughts from the human resource personnel are also shared.

**Literature review**

Engineers progress into leadership positions for various reasons other than talent and passion (Johnson and Sargeant, 1998), with the primary motivating factor usually being remuneration and benefits inherent to higher leadership positions. It is also common and would make sense to promote the best performing engineer to a higher level with the belief that he/she will do well. The transition period is usually clouded with numerous challenges as an individual has to change his/her mindset and behavior to fit the new role.

A typical hierarchical structure that would be followed through the career of an engineer is shown in Figure 1. Engineers are also able to follow different career paths such as finance, human resources, procurement, safety, marketing or sales.
Action research
Action research (AR) was used as a tool in understanding the transition challenges. AR seeks to bring about change and improvement in the researcher’s area of practice. In organisations where assessments are of interest, AR can be used as a form of personal appraisal. A change in practice will therefore change in light of the evaluation. AR is about performance, and challenges the status quo to generate transformation. Positive change is the main driver in conducting an investigation or research. This form of research has been in existence for several decades and has been widely used in educational research (Berg, 2004). It produces information and knowledge whilst empowering individuals involved in that research. It can also assist them in understanding how they can influence social change for the better using appreciative enquiry.

The intent of AR is to combine theory and practice in the aim of providing change and solutions to issues of concern. In this form of research, the practitioner or researcher does not act as an outsider or consultant but is part of the investigation through his/her own experience for the purpose of learning. This differs from other methods in that it associates practice and research thereby forming synergy between the two. Action research is iterative (Avison et al., 1999) and every iteration adds to the available theory using feedback from the research. Brydon-Miller et al. (2003) states that this is a work in progress which is continually evolving. Using AR, managers are able to create conditions of learning. They learn through this process and this has the potential of inducing organisational learning.

This form of research is qualitative and is widely used in the health, education and social care sector (Fox et al., 2007). Quantitative research is used in the objective world (e.g. science field) and its main goal is replicability, meaning that an independent researcher would obtain the same results by replicating the research.

Research methodology
The first step in action research design is to identify research questions. They form the basis of the research as it will revolve around providing answers to these questions. The questions formulated should be answerable within the given time and material constraints.
This research was pursued with responses to the following questions:

- What are the common challenges encountered by engineers during the transition period towards a senior leadership role?
- What can be done by the individuals and organisations to ensure that this process is exciting to those going through it?

A set of 14 open-ended questions was drawn up for interview purposes (as shown in Appendix 1). Some responses probed for more questions to be answered. Interviews were carried out with personnel currently undergoing the transition process (i.e. relatively new at their positions) and also with those in senior leadership positions who have been in their roles for a substantial period. The respondents had both mechanical and chemical engineering backgrounds with leadership experience varying from one year to 18 years. This variation was beneficial for the research because it showed the dynamics in different time eras. A profile of interviewees is given in Table 2. The responses from all interviewees were clustered into different subjects as deemed applicable.

<table>
<thead>
<tr>
<th>Table 2. Interviewee profile.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Total Working Experience</td>
</tr>
<tr>
<td>Experience post engineer level</td>
</tr>
<tr>
<td>Engineering discipline background</td>
</tr>
<tr>
<td>Ratio of male to female</td>
</tr>
</tbody>
</table>

*The engineer as a leader*

Engineering has always been mentioned as one of the scarce skills in the country. Literature reveals that as pupils become more aware of career choices at a younger age, they seem not to be attracted towards the engineering field (Newport and Elms, 1997). Those who choose engineering as a profession do so because of their interest in science subjects at school. The current interest in engineering has been brought about by the highly publicised skills shortage and policies that govern the country (e.g. employment equity policies).

The engineer’s job up until now has been to provide technical expertise while someone else takes responsibility of the product. Today, the responsibility has broadened to include economic, environmental and social dynamics. If these are not accomplished, there is no point in manufacturing a product that will not comply with the required standards. Therefore the response to this change also needs to be dynamic; the old practices and rules no longer apply.

Johnson and Sargeant (1998) conducted a study in the UK which revealed that 43% of engineers are motivated by money into progressing into higher level management and leadership positions. Only 29% felt that they would enjoy or were passionate about being in management positions. Other motivation factors included management status, attainment of company benefits and power to influence, while some were forced by circumstances into transition. The survey has also shown that persons with an engineering background are less likely to progress to higher management levels. Engineers are said to lack the divergent skills required in more senior
positions as their scope is perceived to be too narrow, with their main focus being on technical skills. In the author’s opinion, however, this does not hold true for engineers in a production environment, since they deal with multiple tasks including human resource management, safety and financing. Finance and strategic marketing are still viewed as much more important professions in organisations (Johnson and Sargeant, 1998). However, Barry et al. (1977) believed otherwise as they suggested that, in the British manufacturing industry, one is more likely to make it to the top with an engineering background.

Literature has also identified a number of factors causing deficiency in engineers progressing through to higher levels of leadership with some ease.

- Newport and Elms (1997) attributes the failure to secure leadership roles to the declining status and credibility of engineers in the industry. They argue that the engineering schools assume that they are producing effective engineers just because they are knowledgeable. Knowledge alone is not sufficient and is not proportional to performance of an individual.

- The scope of the engineering modules has also been condemned for placing emphasis only on the technical capabilities of the graduates. This has, however, been recognised and some engineering courses now include some aspects of management. The MBA course was also initially developed for engineers who aspire to expand their business horizons. It has nevertheless gained popularity with graduates from other fields. The leadership focuses more on the profitability of the organisations, hence the struggle through the transition period for the engineer to shift the mindset from ‘doing things right’ as an engineer to ‘doing the right thing’ as a leader.

- The engineering field is treated as having a lower social status (UK survey by Johnson and Sargeant, 1998) than other disciplines hence the reluctance to gain access to leadership positions. The author’s view and that of other authors (Glover et al., 1998) is that this perception no longer applies and the engineering field is now viewed as one of the scarce skills with more focus being placed on it.

- Engineers are often taught to think logically and sequentially whereas a leader’s schedule is heterogeneous and often involves frequent interruptions and interaction with individuals at different levels and spheres in the organisation. Flexibility and decision-making skills are even more vital in a complex organisation where multiple stakeholders are involved, including the outside environment.

Being a female leader poses an even greater challenge as co-workers and subordinates have a perception of how a female should behave which sometimes conflicts with how a leader is ‘expected’ to behave (Hoerbon, 2005). The age factor is another stumbling block facing the young generation of graduates and academics. Traditions and beliefs make it more difficult to lead individuals who might be of a similar age to one’s parents. Usually, these are also the people that ‘show you the ropes’ as a fresh graduate with zero experience.

**Findings and Analysis**

Most respondents felt strongly about differentiating between management and leadership. One respondent kept referring to management rather than leadership, making mention of how the
leadership language in the organisation has led to loss of attention to detail. They believe that for a person to be a good leader, they first need to practise management at a lower level to gain an understanding and appreciation of the details of the business. One respondent believes that a leader should be an expert in at least one field under their ‘command’.

It was intriguing to note the different behaviour of the respondents during the interview. While some wanted to take the lead (forgetting they were the interviewees), others were quick to jump to recommendations. There are those that felt the interview questions should have been structured in a particular manner. Their reaction and behaviour were quite similar to how they operate in the world of work.

The challenges encountered during the transition period and recommendations thereof, as expressed by the respondents, are discussed below.

**Challenges**

*Informal training*
Due to no formal training being available during this transition period, there is no clear understanding of some business processes. There is a lot of training through ‘osmosis’. People assume that what they have picked up is correct, which is not always the case. These business processes may include financial management principles (e.g. budgeting, procurement and forecasting), legal systems (SHE and asset management) and matters pertaining to human resources management (role of bargaining council). Some organisations have developed leadership programmes to assist with preparing future leaders after middle management positions.

*People management*
The main challenge that seems to be a stumbling block in leadership is that of managing people. Unlike physics and machinery, people portray different dynamics that are non-linear, usually complex and unpredictable. Their actions do not follow a straightforward trajectory. Motivation of people as open living systems therefore is also non-linear. A person’s mind can unfortunately not be extrapolated to achieve the desired results. Managing people old enough to be one’s parents and who have vast experience in the workplace can also be fairly intimidating. New ideas and changing routines from the way they would normally operate is a nuisance to them and resistance is usually encountered during implementation.

Managing your former colleagues, or even former superiors, as is sometimes the case, poses even bigger challenges. This can be brought about by the fact that they still view you as a subordinate or colleague that has limited knowledge, and this might undermine your authority even without noticing it. At times they will ‘forget’ that you are now wearing new shoes.

*Staff competence*
There is a lack of skilled labour, especially at lower levels. According to this research, this continues to be a struggle and consumes the leader’s time when they still have to carry out lower level duties that require attention to detail on specific aspects, hence losing sight of the bigger picture they are required to focus on. This challenge was found to be inherent with the operations
team which have a large pool of unskilled labour carrying out shift work. Not enough attention has been given to training and developing operators and foremen. Organisations continue to invest in high technology equipment and systems, while neglecting the operators of these systems. Effective training will maintain and improve staff competency.

Oosthuizen and Dunsmore (1998) highlight the benefits of training as the business views them and from the human resource perspective. These are highlighted as improving productivity, building labour relations, ensuring employee commitment, satisfying the industry needs and maintaining competence of employees in a high technology environment.

Staff shortages and high turnover also add to the skills shortage on an ongoing basis. This could be due to fatigue and sick leave, which cannot be planned in the way annual leave can. Succession planning at all levels is crucial to ensure that skill is retained from lower levels of the organisation.

**Gender stereotyping**

It is astonishing that gender stereotyping still exists. Informal comments made during conversations would suggest deficiencies in the opposite gender. Even subordinates felt that a male counterpart would probably perform better than a female. This is because most males have a fixed notion of how a female is supposed to behave and a place where they belong (Hoerbon, 2005). Some males believe that employment equity is the only reason why a female would be in a leadership position.

For a female, earning respect and learning how to interact with experienced males in a team is much more challenging. The best way is to demonstrate your abilities through hard work and never feel pity for yourself. Hoerbon’s (2005) study in Europe found that females have now adopted some male coping strategies to survive in a predominantly male environment, such as engineering.

**External stakeholders engagement**

Leaders represent their organisations. Without ever having been exposed to communicating with external contacts, this can be intimidating when what you communicate can either elevate or dent the image of the organisation. Contacts can include government, procurement (negotiating contracts), or the grower community. Allowing engineers to interact with multiple industry stakeholders will help prepare them for future roles.

**Recommendations**

The recommendations below have been divided into those that need to be actioned by the individual going through the transition, and some actions that can be taken by the organisation to assist during the transition period. These actions will be of mutual benefit to the individual and the company.

**Individual’s responsibility**

There are certain characteristics that are required to ease the transition challenges. Dedication, hard work and taking the initiative will form the core that encourages people to rally behind a
leader. Positive attitude, humility, respect for self and others, self-discipline and an ability to see the bigger picture were mentioned during the interviews. It is also critical for individuals to identify and pursue their career interests in order to avoid frustration in a higher paying job that they do not enjoy. They need to take the initiative towards self-development; it is their responsibility.

_Letting go_

There are some characteristics that are pertinent to being an engineer. A strong trait that is visible amongst all engineers and highlighted by all respondents is that of logical thinking and the tendency to quickly look for solutions when faced with a situation. The engineer has the responsibility of finding engineering solutions to every problem, hence the necessity for this natural reaction. On the other hand (as a leader), dealing with people requires that the individual be more humane and sympathetic to employees’ problems. There is a need for this at a leadership level, but it should not be the only way of dealing with problems. The above characteristic must be utilised with caution at leadership level as it generally does not work well when dealing with people and not numbers that are linear and easy to interpret. The mind shift expected obviously requires a lot of effort. Changing a way of thinking and performing that has come naturally over years is not easy to achieve. Most leaders tend to cling to their field of expertise even at leadership level, especially when faced with challenges, and his/her background as an engineer can be clearly seen.

In the workplace, a leader may be expected to understand and influence a team that might have been a ‘rival’, or merge departments that usually do not get along in a work context. It is therefore vital to let go of past perceptions and behaviours to achieve the desired outcome.

Slipping back into the comfort zone of the engineer clouds the judgement and prevents leaders from seeing the bigger picture. When tackling issues this may create a bias towards their original form of engineering background. It was interesting to note that the individuals that had spent less time as engineers (under five years) had less resistance during the transition period. This could be due to the fact that the engineers’ characteristics were less ingrained than in those who had spent longer periods as engineers.

The art of letting go also lies in effective delegation and placing trust in subordinates to perform their tasks adequately.

_Training and development_

It is primarily the individual’s responsibility to ensure that he/she acquires all the resources required to excel in a particular role. After all, in most cases that individual would have applied for the position. However, there are occasions when talent is identified and a person is deemed to have the potential to take on a leadership post. That person will therefore be required to step out of their comfort zone in order to operate at a new level. This can be fairly stressful though as the expectations are usually higher than respective counterparts. This expectation is derived from the fact that the individual was able to perform exceptionally as an engineer, and it is assumed that the same will apply at a leadership level. It is therefore essential that individuals pursue programmes and training aimed at improving themselves as leaders. This can be done through
in-house training programmes or through registration with professional bodies offering these programmes.

**Company’s role / responsibility**

One of the challenges that is encountered is that of an environment that is not willing or prepared to accept and support the newly appointed leader. Creating an enabling environment requires a change in organisational culture.

_Talent management and succession planning_

The sugar industry invests in an extensive Engineer in Training (EIT) programme which aims at preparing and breeding competent engineers at the end of their formal training. Once the EIT has been completed, the engineer should be capable of handling an engineer’s duties and can be placed at any of the mills or refineries. Most of the EIT graduates are placed in a production environment, with some being placed in the technical division.

However, the views on the effectiveness of the EIT programme vary. Some believe that it does not cater for leadership facets of the job, but focuses only on the technical aspects. An engineer, it is believed, has to have leadership skills as they lead a team of people, especially if they are deployed in a production environment. Even though the views differed, respondents agreed that the graduates of the programme are much more equipped and ready to take on engineering duties than external candidates without sugar experience.

It was suggested that a structure similar to EIT be adopted for leadership positions within the organisation. It need not be as extensive as the EIT programme, since the basics should be well understood at that level. It is hoped that the programme will, at the least, reduce the transition time from the common period of two years as expressed by most of the respondents to less than half of that. This programme should be formalised and be visible to all decision makers in the organisation.

It is also taken into consideration that this approach will have a financial impact on the organisation. However, if the aim is to be high performing, learning organisations, human resource development is of utmost importance to the success of the company. A cheaper and possibly slightly less effective version of the training programme would be to utilise the opportunity when the EIT is acting as an engineer during their training programme to pull the engineer out and train them in leadership positions. This training should not be biased to only a particular engineer in an organisation, as identification of talent and potential will be hindered. The availability of engineers’ super-numeraries will allow training of engineers for leadership positions.

The human resources component acknowledges that there are pros and cons associated with the performance management system, and see a need for a multi-rater system (e.g. 360° feedback). A comment made at a training workshop held during the 2009 SASTA Congress was that the industry is excellent at measuring process performance but poor at measuring human performance (see SASTA Training Workshop Follow-up Report).
Dual ladder system
Not every engineer is cut out to be a leader, but is motivated by other factors to pursue this route. It is also true that the best performing engineer will be more likely to be promoted to a management position than their less technically inclined colleagues. This can be detrimental in that not only will it frustrate that particular individual but it will also leave a void in the technical expertise available. Talent/interest identification of engineers is necessary to determine the ‘best fit’. The individuals can then be channelled onto the correct path to bring out the best in them. Information obtained through informal conversations with engineers revealed that a number of them would prefer to be experts rather than senior executives in the company, if there were attractive packages available to pursue that route.

The viability of a dual ladder system can be explored in order to preserve the technical expertise. This notion can begin at engineer level, where there could be an engineer that attends to day to day operations (production engineer), while another focuses on the process and quality of the product (process engineer). Likewise, a maintenance engineer could be someone with a fair amount of hands-on experience and focus on the daily maintenance of the plant, with another engineer concentrating on plant improvements and sustainability. The expertise must be retained where the action is taking place. With that said, transition to leadership should not be viewed negatively as leaders are required to draw on their technical skills occasionally.

The organisation therefore has to devote enough time and thought to the development of a suitable career path for engineers. It needs to be ascertained whether it is ideal for the organisation to promote engineers to leadership positions purely for the financial gain of the individual. Companies must be careful not to create a division between the different paths by viewing one as superior to another through remuneration or otherwise.

Mentorship
A strong support structure is required during the transition phase. This can include pillars such as human resources, financial, technical and personal support in the form of a mentor/coach. Other support systems highlighted are constant feedback through Key Performance Area (KPA) sessions, modules on business principles and individual development plans to assist in monitoring progress.

Most respondents were not allocated mentors during the transition period, or at least not formally so. Even those who had mentors were not necessarily offered them by the organisation for transition purposes. Those that were lucky enough to have superiors that offered them personal mentorship found it easier to adjust to their new yet demanding (and sometimes confusing) positions.

This trend, however, has changed when compared to more than ten years ago when the concept of mentorship was almost foreign to organisations. Organisations to some degree now recognise both mentorship and coaching as crucial parts of the business. This concept is nevertheless still in the early stages and needs to be fully developed and utilised for the benefit of the ‘new’ leaders and for the organisation. A setback that was encountered with one individual was that the mentor allocated did not provide a valuable contribution during the transition period because of a lack of leadership experience. Mentorship/coaching are facilitated by an organisation, but must be driven by an individual to be successful.
Tertiary institutions’ role/responsibility

The views of respondents varied on the impact and role that the tertiary institutions can play in ensuring that engineers are better skilled to take on leadership positions later in their careers. Some believe that it is too early to introduce leadership at tertiary level while others believe that it is that foundation that is lacking with engineers. Newport and Elms (1997) explain how the engineer’s role has changed. Nowadays, engineers are expected to combine technology, economics, social consciousness, environmental awareness and safety into one context in their engineering work. This widening of the scope prepares them for management and leadership roles. This scope change must be recognised by tertiary institutions to ensure that they produce effective engineers who will subsequently be effective leaders. Partnerships need to be formed between organisations and tertiary institutions, where organisations can clarify their expectations and supply the required assistance.

Most tertiary institutions and business schools offer post-graduate courses and programmes on leadership. These include but are not limited to Management Development Programme, Master of Business Administration, Master of Business Leadership and Master of Commerce (Leadership Studies). They can also run customised courses for organisations.

Conclusions

Through the research the author has learnt that the challenges faced during the transition period from engineer to leader are not unique to an individual. It emerged that structured programmes to prepare engineers for the next level are a necessity. Formalised training, which can be adopted from the current Engineer in Training programme, can be beneficial to both personnel going through transition and the organisation itself. Investment in the human resource is vital for business success and motivation of the people to excel in their field. The current practice of the Engineer in Training programme can be adopted at higher level to ensure sufficient supply of personnel at a higher leadership level.

In the current work environment that places emphasis on employee and food safety, and is strongly unionised, engineers are already exposed to responsibilities other than technical or production matters which might assist in preparing them for senior leadership roles.

There are varying views on the amount of contribution that tertiary institutions can provide. While some think that leadership courses should be introduced towards the end of curriculum to provide foundation, others tend to think that leadership qualities are inherent in a person and a lot can be picked up through practise. A suggestion would be for organisations to form partnerships with tertiary institutions for training of leaders or potential leaders when they have gained working life experience through customised courses.

While it may be more difficult to quickly adjust in a complex organisation, the more complex organisation can broaden one’s horizons and provide more opportunities for growth and expansion. A less complex organisation on the other hand, will allow a deeper but narrower focus. Most importantly, it ultimately remains the sole responsibility of the individual to take an initiative towards his or her own development, whilst the organisation offers support and conditions that are conducive to the development of engineers.
REFERENCES


APPENDIX 1

QUESTIONNAIRE

1. Please specify your engineering background, e.g. chemical, mechanical, industrial, electrical, etc.
2. How many years working experience do you have?
3. How many of those years have you spent in a leadership role?
4. What is your level of management in the organisation?
5. Would you say you were well equipped to take on your first leadership role? Elaborate.
6. How was the transition period? List some of the challenges encountered during this period.
7. Did you have/were you allocated a mentor during this period?
8. What support structures would you say are required by an engineer during the transition period?
9. Do you think that leadership should form part of the curriculum at tertiary institutions?
10. Do you think the difficulty/ease of the transition period is influenced by the size and complexity of the organisation?
11. What quality traits/skills can be of an advantage for an engineer towards becoming a leader?
12. How does your engineering background affect your thinking/behaviour as a leader?
13. How can the organisation contribute towards ensuring that the transition period for the engineers towards senior leadership is less bumpy?
14. What is the role of the individual going through the transition?