

Advancing Leadership Careers with Leadership Competences

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Abstract. In this paper, we focus on the effects and outcomes of enhancing the careers of engineers and various technical specialists with leadership competences. It is quite clear that engineers and experts possessing technical knowledge who intend to advance their careers must be able to lead teams effectively and to handle human resources in an efficient way according to the principles of modern management science. Therefore, it appears that professionals of all kinds should be interested in investing into advancing their leadership and management roles and in enhancing their “soft” skills.

Our results demonstrate that for the technically minded people, there might be some personality areas that are worth investing their time and effort and concentrating on developing them accordingly. Among these features are personality growth as well as such areas as team management, public speaking, or learning the principles of modern management, just to name the most important ones. Our results might be useful not only for human resource managers operating at industrial enterprises but also for management professionals that have to deal with people from the technical background in their everyday jobs.

1 Introduction

Technical leadership in engineering creates environmental conditions conducive to good performance and supports shared understanding, innovation, problem solving, resilience and learning (Emison 2011). Therefore, leadership is becoming a complement to management that directs certain activities to achieve results (Ahn et al. 2014). For instance, an engineer can lead a team of other engineers for a project or program or be the only system engineer in a team of different members involved in a project or program (e.g. other engineers, IT staff, or, for example, service providers).

One should focus on how engineers experience their first change of leadership which can be probably described as the phenomenon when for the first time in their lives they are switching from individual work to a position that requires the management of subordinates (see e.g. Rottmann et al. 2015; Kalyugina et al. 2015; or Trofimov 2017). For this reason, one can use the qualitative study that interviewed engineers to explore their journey, to identify helpful abilities during such transition, and to identify overlaps between their practices and behaviors in transformative leadership literature (Litau 2018). In the midst of uncertainty, it was common practice to imitate the behaviors of role models like former leaders.

Some engineers tend to have a very different job than the team members and lead larger teams (D’Innocenzo et al. 2016). The line manager and the team manager report to the middle or high management. Many companies put their talented engineers together to create active and consistent teams, with one single technical leader in charge. The team sizes vary (they can even be in a league of one person), but the general rule is that a team consists of three members, including the technical director. It is relatively easy to maintain relationships with two people who solve the same problems, but once someone is asked to maintain a third,

fourth, or fifth relationship, the permutations of communication potential increase dramatically. Of course, larger teams can also work effectively, but the rule of three seems like a good place to start.

Transaction management is tightly linked to management, focusing on defined task results and motivating employees to follow instructions by rewarding and punishing (Kark et al. 2015; Cabelkova et al. 2015; Halkos and Skouloudis 2016; or Metaxas 2016). Transformational leadership is about achieving outcomes through people development (team building), building trust, developing a shared vision, motivating, cultivating relationships, and sharing knowledge. Both types of leadership have value, but transformative leadership is required for the development of corporate culture to ensure such qualities as security, adaptability, learning, and enhancement, and is usually considered the most valuable form of leadership (Strielkowski and Chigisheva 2018).

In this paper, we will briefly explain why engineers and various technical specialists need leadership competences and where they can use these competences. We also want to show that leadership skills (even though they are often seen as “soft” skills by technically minded people) might become very important and useful even in sophisticated technical professions.

Our paper is structured as follows: Section 2 discusses leadership and management roles. Section 3 talks about engineers advancing their careers and contemplates how this can be achieved. Section 4 contemplates technical leadership. Finally, Section 5 concludes with some discussions and policy implications.

2 Leadership and management roles

In general, various engineering teams are made up of members from different disciplines with different interests (Norris et al. 2016). This is what makes them very diverse but also effective. While working in such teams or managing these teams, it becomes important to know how to deal with people or how to lead teams in various ways (Bordea et al. 2017). Here is where leadership skills come handy.

Technical professions are becoming more popular nowadays. Figure 1 that follows shows the numbers of technicians in R&D professions (per millions of people) in Central Europe, Russia, and Turkey. One can immediately see the rise in numbers for the Central European region but also a decline in Russia. This can be explained by the massive brain drain from Russia in the 1990s and 2000s since many brilliant Russian engineers moved to the Western countries. It can be said with a little exaggeration that Silicon Valley was built upon Russian know-how. For example, not many people know that Google was founded by Sergey Mikhailovich Brin (known as Serge Brin) who was born in Moscow in a family of Soviet mathematicians and later moved to U.S. with his family to become one of the world’s leading figures.

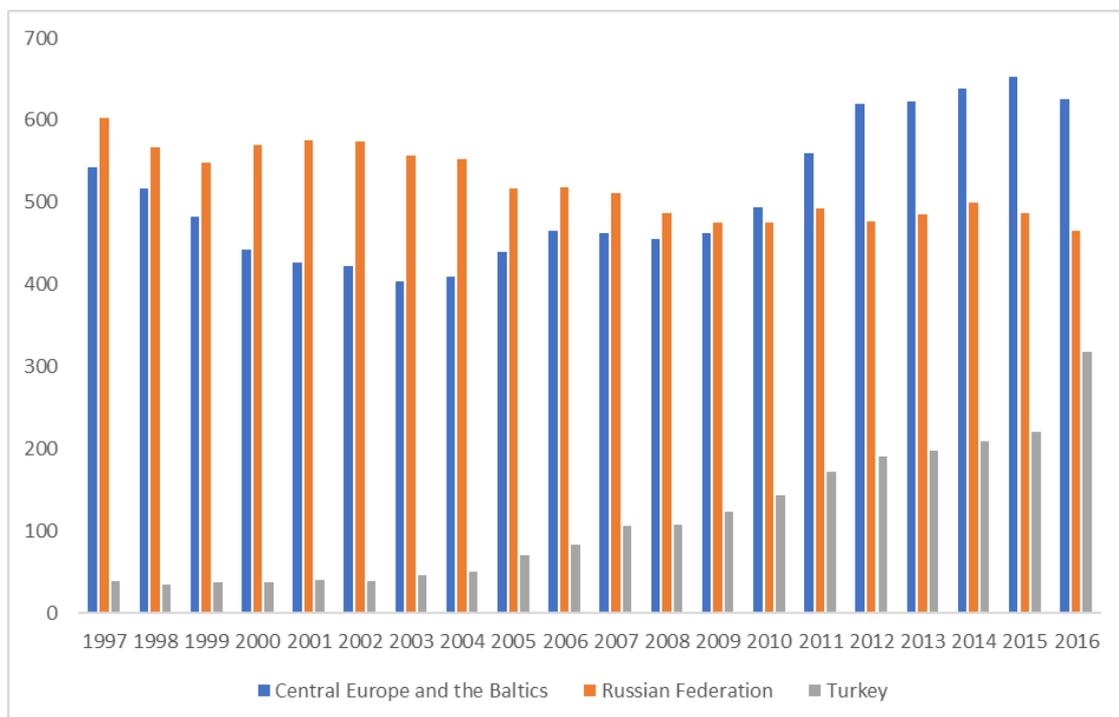


Fig.1. Technicians in R&D (per millions of people) in Central Europe, Russia, and Turkey
Source: World Bank (2019)

One would probably agree that leadership learning is an integral part of a many Master's degree in engineering that prepares students for leadership in the engineering industry. Successful technical leadership is to help individuals achieve team and business goals. To support teamwork, great leaders provide communication, motivation, guidance, and more.

As people evolve as technologists in their careers, they focus on improving their technical skills (Cascio and Montealegre 2016). They are promoted based on concrete and measurable achievements, such as learning a new language or learning new technology. As good managers, their success is largely based on muddy, abstract attributes such as teamwork, leadership, and communication skills. When it comes to leadership, anyone's effectiveness largely depends on how the managers, team members, and employees perceive others and can work with them (Amanchukwu et al. 2015). If one's career goals involve deeper, more specialized technical knowledge, she or he will work with other technical specialists and therefore need strong communication, networking and possibly project management skills. Alternatively, one's goal could be to further develop her or his career and take on more responsible positions in technical management. It becomes clear that important skills such as decision-making, leadership, public speaking, financial and business skills will be of great benefit (Redmond and Dolan 2016).

Most engineers who switch to project management roles go there via the on-the-job-training (OJT) path. The study of project management employed me for up to fifteen years in my career as an engineer. In order to improve one's professional skills, advanced tools such as PMP (Project Management Professional) course can be applied. This might help one to realize that her or his skills in OJT project management are inadequate in terms of the processes, procedures, and common colloquial language required for successful projects.

An electrical project manager responsible for commissioning and supervising the execution of tasks for engineers, programmers, and other technical personnel. Project managers must be strong employees who can work closely with professionals at all levels of technical knowledge. Thence, one should be able to manage schedules and budgets and keep projects in line with the existing policies and regulations. Traditionally, a director is a manager of both managers and individual contributors. The responsibilities of technical directors range from defining the direction of a technical department to directing the entire technical organization. A director of a technical department (i.e. Director of Quality Assurance, Director of Core Technology, etc.) is also a manager of managers and individual contributors who are, in turn, responsible for an area or function of the technical organization.

3 Engineers advancing their careers

The exposure to technical professions provides insights into computer careers and is a valuable life experience. Civil Engineering degrees, for example, can prepare one for a career in construction, economics, management and finance. Civil engineering professions are both rewarding and challenging, and can include design, design and management according to your interests and expertise. Civil engineers need a good knowledge of design and construction, health and safety. However, they also need to know how to manage people, since this is the most valuable tool.

Good managers are best suited for those who are trained in the latest software tools, especially for computer-aided design and simulation. With such tools, engineers and designers can move a project from concept to finished product without the need for prototypes. Mechanical engineering students, who can learn to create virtual simulations before they begin construction, construction, and testing, may be in high demand from companies, as these capabilities enable companies to shorten product development cycles. Mathematical and technical skills are also very important.

For example, technical designers work with complex CAD software to design their products and specialized equipment for prototyping (Sokolowski 2019). A thorough understanding of these tools can help a designer better understand their raw materials, design products, and processes. Designers work with complex CAD software to design their products and specialized equipment for prototyping. A thorough understanding of these tools can help a designer better understand their raw materials, design products, and processes. It is predicted that mechanical engineers will see above-average growth in engineering services as companies continue to award contracts from these companies.

Mechanical engineers can continue to work in various manufacturing industries, particularly in the automotive industry. However, the decline in employment in some manufacturing industries will dampen the overall employment growth of mechanical engineers. There are few women in robotics, but a postgraduate degree allows the student to study a subject in greater depth and develop his or her own career or academic niche (Kuzhabekova et al. 2019).

All in all, all of the above means that technical professions, especially the ones related to engineering and related fields, are still very important and desirable. However, it also holds true that in order to advance one's career in technical fields, management skills are required. It is important to develop and cherish those skills in order to achieve success in one's profession.

Transformational leadership can improve a key criterion of team effectiveness through its relationship to this important emerging state. Due to the great potential of the transformational leadership style, organizations could take measures to select and develop their leaders. The main goal of this research was to examine the impact of the affective dimension of engagement on the overall effectiveness of the team when it is influenced by the transformational leadership style of the direct team leader. According to everyone's knowledge, transformational leadership affects the quality of the group experience both directly and indirectly through affective team engagement (Moskalenko and Yevsieieva 2015).

In addition to team performance, affective team engagement may be a mediator between transformational leadership and other dimensions of team effectiveness. When team members are emotionally attached to their team, their followers are encouraged by transformational leaders to implement innovative working methods (improving team processes), to experience teamwork better (quality of group experience) and to work together over time (teamwork). Therefore, in this study we investigate whether the transformational leadership through affective team engagement has both a direct and an indirect relationship, and that to the three results of team effectiveness: teamwork, team process innovation and quality of the team experience. Transformational leaders ensure that team members are more committed to the team and consequently work together over time, implement new ways of working and have a better work experience.

In general, transformational leadership can be effectively trained through targeted training programs. Therefore, such programs should be implemented in organizations when it comes to team effectiveness. In addition, affective team engagement that is shaped by leaders in transition can play a crucial role in organizational teams and improve the quality of social relationships within the team. In order to increase team engagement and thus the quality of the group experience, team leaders should also start team building when new teams are formed. More research is needed to understand the benefits of transformational leadership and how it affects team function and team outcomes, and to understand the advantages and disadvantages that organizations may face.

Transformational leadership is a theory that the leader works with the team to determine what changes are needed to improve conditions. Together they create a guide and then execute it together. It is believed that transformational leadership increases motivation, morale, and work performance. In addition, the transformational leadership encourages the teams to take on more responsibility for their work. Transformational leaders create a vision for their followers and guide change through inspiration and motivation. They are great role models and their followers imitate many of their actions.

The main dimensions of transformational leadership and explain the characteristics that distinguish transformational leaders from managers who use a transactional leadership style. Finally, we give recommendations on how best to cultivate a culture in which leadership changes and highlight some of the shortcomings of leadership and how to address them. Unlike transformational leadership, transactional leadership styles focus on using rewards and punishments to achieve adherence to rules.

Transformational approach leads to significant changes in the lives of people and organizations. Transformational leaders strive to change the future to inspire followers and achieve goals, while transactional leaders try to maintain the status quo without aiming for progress. Transactional leaders often get results from employees using authority, while transformational leaders have a real vision for their business, are able to inspire people, and are fully dedicated to their work.

In summary, transformational leadership differs from transactional leadership in that it targets innovation, while the latter focuses on planning and execution. In addition, transactional management focuses on rewards and punishments to achieve goals. Another differentiator between the two styles is that transformational leadership aims to motivate people, while transactional management focuses on manipulating power and authority. The intrinsic characteristics of transformational leaders are the main drivers of effective behavior.

4 Technical leadership

Leadership can come from anyone and all engineers should develop their leadership skills. Leadership skills for system engineers should therefore be seen as a distributed skill that must be developed by all engineers. For example, as part of its Systems Engineering Leadership Development Program (SELDP), NASA is pursuing a system approach to developing leadership skills.

Overall, technical leadership includes broad expertise, engineering spirit, problem solving, creativity, and the leadership and communication skills required to develop new missions and systems. Technical leadership in systems engineering creates the environmental conditions that are conducive to good performance and supports mutual understanding, innovation, problem solving, resilience and learning. Leadership is therefore a complement to management, which focuses certain activities on achieving results (Cai et al. 2018). A systems engineer can lead a team of system engineers for a project or program, or be the only system engineer in a team of different members who are involved in a project or program (e.g. other engineers, IT staff, service providers) (see e.g. Munir et al. 2018).

In general, complexity management differs from managers as individuals because in some cases leadership is more a function than a person. In a technical situation like that of a system engineering team, this is an important consideration because different people have technical expertise and must be leaders in areas such as understanding, challenge and communication. System engineering teams consist of members from different disciplines with different interests. The supportive leadership style was associated with performing tasks that were associated with better project results. Engineers who show a supportive leadership style typically value management skills and spend more time communicating. Such leadership styles are associated with more integrated teams and a better technical definition. Transaction management is closely related to management, focuses on defined task results and motivates employees to follow instructions by rewarding and punishing.

All in all, transformational leadership is concerned with achieving results through the development of people (team building), building trust, developing a common vision, motivation, maintaining relationships and sharing knowledge. Both types of leadership have value, but transformative leadership is required to develop corporate culture to ensure qualities such as security, adaptability, learning, and improvement, and is usually considered the most valuable form of leadership.

5 Conclusions

Overall, it appears that engineers also need to boost their competencies and leadership skills that involve personality growth and investment into such areas as team management, public speaking, learning the principles of modern management and alike.

It appears that developing “soft” human skills might be a business worth investing for many engineers and technically minded people. Such skills as team management, public speaking, or learning the principles of modern management seem to be crucial when dealing with subordinates at work and therefore worth investing time and effort into.

All in all, various types of leadership (including, for example, transformational leadership) are important and need to be developed. Technical specialists need to focus on developing these types of skills in addition to their advances in math and science. To make it short, handling human resources requires lots of skills and it should be a balanced mixture of all available ones.

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