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The importance of innovation and leadership education in civil engineering discipline

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Abstract
The term, 'innovation' is derived from the Latin term, 'innovatus'. The term is defined in several sources as the adoption of new techniques and methods. In an administrative approach, it represents the adoption or development of new methods. Rogers and Shoemaker (1971) have identified the components of innovation with an equation: Innovation = Theoretic Concept + Technical Advancement + Commercial Expansion. Considering the civil engineering education in Turkey under current conditions, we can see that the leadership skills of the engineers who undertake the management of innovative projects which are increasing in demand in the recent years are limited due to theoretic and numerical education provided by the engineering department. It is important to take immediate steps to develop such skills and to keep up with the innovative approach of our era. This study involves recommendations for the ways these skills may be included in the curriculum of the civil engineering discipline and for the measures to be taken accordingly.

Keywords: Innovation, leadership, civil engineering, research & development

1. Introduction and literature review

The number or research and development projects is increasing as a result of the conditions of our era and the needs of the globalized world. However, the number of such projects in Turkey has been increasing due to the government incentives provided in the last decade. Despite the increase, the number of patents taken in line with the results of these studies and their translation into production were rather limited. One of the most important reasons behind this situation is the lack of good management of these projects in terms of knowledge and innovation. Knowledge is being considered as a replacement product as it reduces the need for inputs such as raw material, labor, time, space and capital, thus becoming central for the advanced economical systems [1]. Therefore, it is of utmost importance for those companies and/or institutions which desire to manage their R&D projects in the best manner possible to select the most suitable project leader. As it is the case for all the other disciplines, this applies for the research and development projects held under the civil engineering discipline. The way to a successful project is through better leadership and an innovative approach.

Many of the universities located in Turkey offer classes on project management as part of their civil engineering curriculum. However, these classes focus on subjects which are deemed fundamental for the industry such as cost calculations, quantities, unit cost analyses and planning instead of focusing on developing leadership skills in graduates.

Today, many companies are focusing on the development of leadership behavior in their employees with an engineering background. Researchers reported that transformational leadership behavior increases organizational performance under uncertain working conditions [2]. Efficient internal knowledge and experience communication contributes to learning in a company and facilitates cooperation which in turn contributes to the innovativeness [3].

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The concept of leadership is the sum of behavioral adaptations made in order to reach goals which are in line with the demand of the organization and the individual. Thus, project managers are selected or rejected for a project [4]. According to Barret [5], Müller and Turner [6] leadership can be assessed in 6 categories: Visionary, Coaching, Affiliative, Democratic, Pacesetting and Commanding. Kerzner (2009) added two new leadership styles to the aforementioned concepts, namely, bureaucratic and unrestricting [7]. Commanding leaders are unsuccessful in motivating people who report to them. Democratic leaders, on the other hand, updates the working system regularly listening to the people who report to them. Visionary leaders motivate the people who report to them sharing their visions for the future. Coaching leaders prepare for the possible challenges with constantly having the people who report to them practicing for that moment [8]. A project leader who is in charge of the management of a construction project needs to translate the technical and characteristic aspects mentioned above into changing and developing conditions.

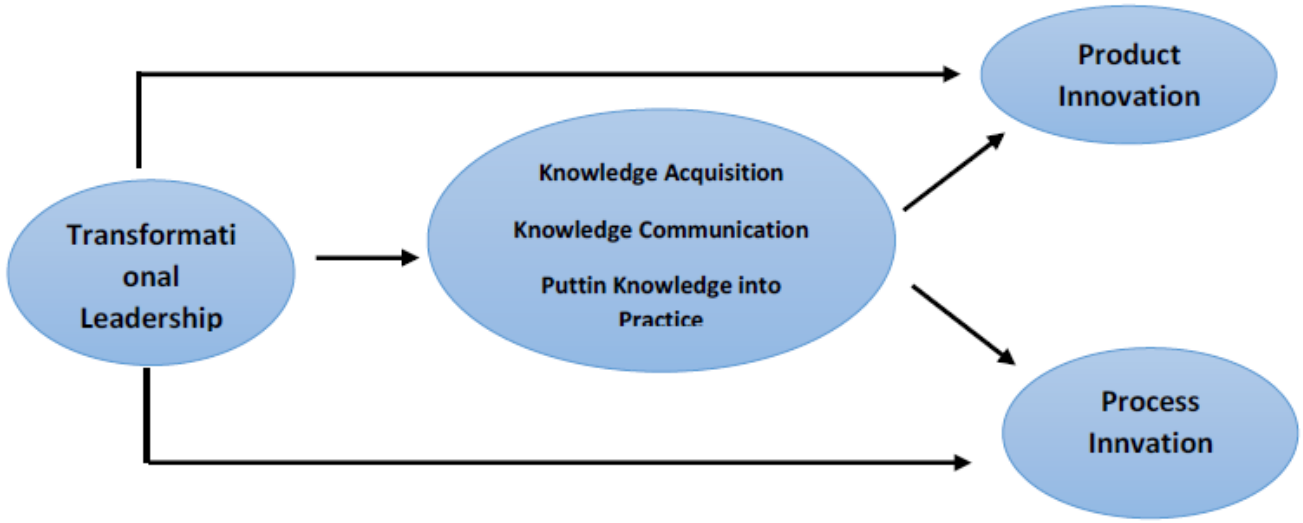

Figure 1. Transformational leadership model [2].

2. Recommended models

2.1. Transformational leader education model

Several studies have been conducted on the transformational leader theory since the 70s [9]. It is important to apply the results of these studies to the civil engineering discipline, first explaining the difference between a leader and a manager to the leaders of the future. It would be beneficial to arrange study groups in order for students to participate proactively in scenarios created for the curriculum according to the possible project types to be managed. Thus, it will be possible to impart leadership behavior to a person who is not naturally showing a leader's potential. The objects of this education which is designed to acquire leaders who can quickly adapt to the environment and market conditions, are as follows:

- A leader who can have the people who reports him/her to be excited about a project,
- A leader who can choose the right staff for the job in question,
- A leader who allocates time and resources for the self-development of his/her employees,
- A leader who allows for the necessary flexibility for his/her top employees to perform at the highest level,
- A leader who eliminates the resources and manpower when they are not compatible with the system,
- A leader who can set the course under any and every condition,
- A leader who provides guidance for coordinated work,
- A leader who is consistent in terms of his/her words and actions.

With the provision of such an introductory education covering the subjects mentioned above, it will be possible to increase the suitability of graduates to managerial and organizational positions they assume. In this context, it is important to seek the guidance

and support of sociologists, anthropologists, and psychologists.

2.2.Innovative Leader Education Model

Administrator candidates for innovative projects is a follow-up education model which is aimed at the people who have successfully completed the first model introduced in this study. Engineers who have the fundamental knowledge with the first program will have the opportunity to develop themselves on subjects such as corporate encouragement, promotion of innovativeness and teamwork and building an innovative atmosphere. The aims of the education program which will be administered by a specialized person are as follows;

- An innovation leader who adds value,
- An innovation leader who is inquisitive,
- An innovation leader who develops ideas,
- An innovation leader who sees through his/her ideas coming to life.

Thus, it will be possible to have strong-minded project managers with direct and indirect influences in the civil engineering field.

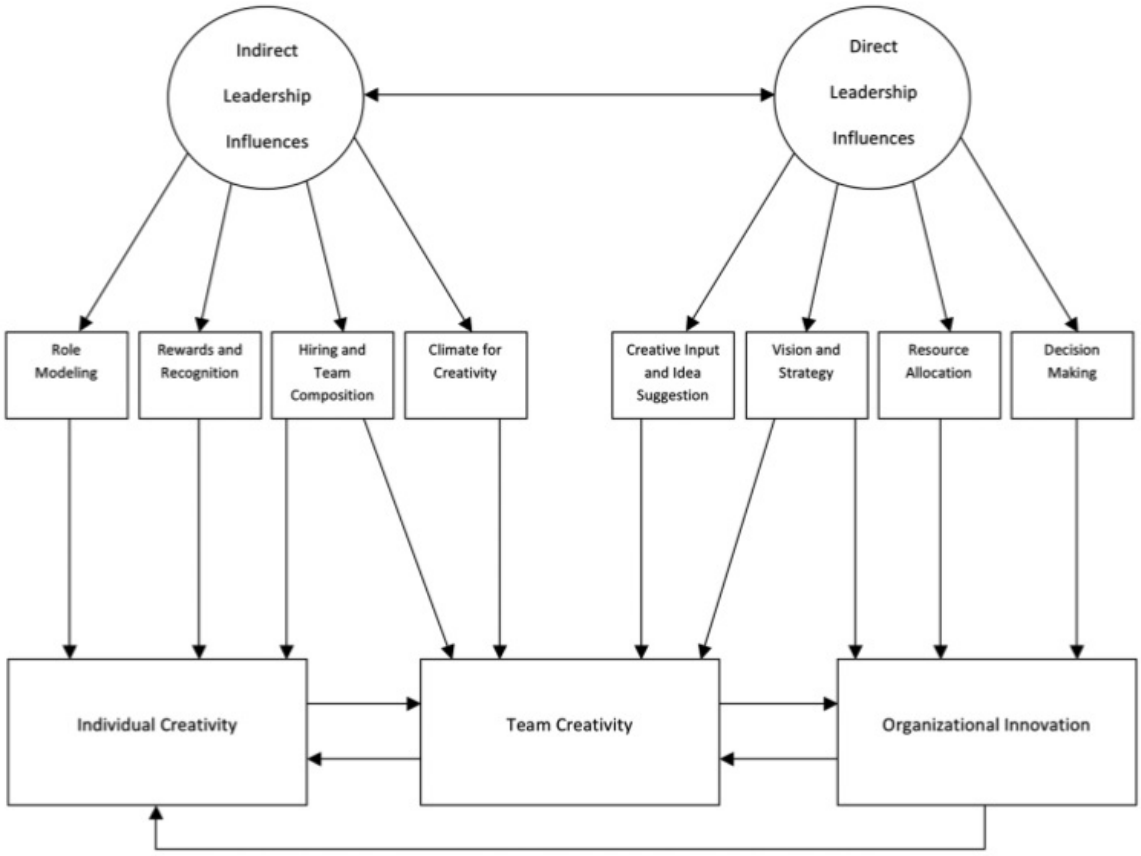

Figure 2. The model for the influence of direct and indirect leadership concepts on the innovation process [10].

3.Results

Constituting of numerical education in its every step, the civil engineering discipline requires the coverage of the leadership and innovation management concepts along with the occupational information as a result of the competitiveness of our time. Among the measures to be taken are the support of the Faculty of Science and Letters for classes in question, and their addition to the curriculum as compulsory classes in order for the civil engineering graduates in Turkey to play an important role in the globalized world. The second step involves postgraduate programs such as R&D and innovation

management in Faculty of Science and Letters which will contribute to the development of the engineers and engineering candidates who are committed to self-development in this field.

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