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Procedia Engineering 122 (2015) 172 – 180

Procedia
Engineering

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Operational Research in Sustainable Development and Civil Engineering - meeting of EURO working group and 15th German-Lithuanian-Polish colloquium (ORSDCE 2015)

Intelligent Decision Support System for Leadership Analysis

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Abstract

An Intelligent Decision Support System for Leadership Analysis (IDSS-LA) was offered as an example for demonstrating the integration of advisory, negotiation and decision support systems. Development of the IDSS-LA database was by providing a comprehensive assessment of alternative versions from economic, legal/regulatory, technical, technological, organizational, managerial, quality of life, social, cultural, political, ethical, psychological and other perspectives. IDSS-LA enables a user to analyze alternatives quantitatively (by a system of criteria, units of measure, values and weights) and conceptually (textually, by a formula, scheme, graph, diagram, video tapes). The Case Study presented illustrates the efficiency of this System.

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Peer-review under responsibility of the organizing committee of the Operational Research in Sustainable Development and Civil Engineering - meeting of EURO working group and 15th German-Lithuanian-Polish colloquium

Keywords: Leader, Model, Intelligent Systems, Integration

1. Introduction

Various systems are being developed globally for leadership analysis. These systems include information, intelligent, knowledge, expert and decision support.

The aforementioned systems analyze their managerial, organizational, technical, technological, economic, legal/regulatory, innovative and similar aspects. However, neither the integrated economic, legal/regulatory, technical, technological, organizational, managerial, quality of life, social, cultural, political, ethical nor psychological aspects are generally paid hardly any attention at all.

It is commonly agreed that a better integration of advisory, negotiation and decision support systems would significantly improve the value of decisions made. The objective for integrating advisory, negotiation and decision support systems is to improve the quality and efficiency of decision-making support. An Intelligent Decision Support System for Leadership Analysis will be considered as an example to demonstrate the integration of advisory, negotiation and decision support systems.

The research object is a leadership life cycle, interested parties striving to attain their goals and micro, mezo and macro environment making an integral whole. A comprehensive research into the above object required the development of new methods of project multiple criteria analysis enabling the user thoroughly assess its qualitative and quantitative aspects. The diversity of the factors being assessed should correspond to the various ways of presenting the data needed for decision making. The four kind of leadership reflect differing views of the world and therefore different ways of seeing and solving problems, based on the work of Heifetz et al. [1]: technical, cooperative, adaptive and generative problems. All above kinds of leadership is the subject of analysis.

The structure of this paper is as follows: Section 2, which follows this introduction, describes the Leader Model for quantitative and qualitative analyses. Section 3 analyses the Intelligent Decision Support System for Leadership Analysis. Section 4 contains a case study. Certain concluding remarks appear in Section 5.

2. Leader Model for Quantitative and Qualitative Analysis

The Leader Model for quantitative and qualitative analyses was developed on the basis of an analysis of worldwide leadership models. A description of this model could be as the life cycle of a leader and the parties involved in this leader's life cycle as well as the micro-, meso- and macro-environments with impact on making an integral whole. Application of multiple criteria, project analysis methods aided the complex analysis for the formulation of the research object. These methods included CODEC (COMplex DEtermination of Criteria weight method including quantitative and qualitative characteristics), COPRAS (COMplex PROportional ASsessment Method), DUMA (Defining a project's Utility degree and MARKET value method) and DAM (multiple criteria multivariant Design of Alternatives Method).

The goal for developing this Model was to integrate the managerial, organizational, technical, technological, economic, legal/regulatory, innovative, social, cultural, ethical, psychological, religious, ethnic and other aspects of the process over the life of a leader. This six-stage model is presented below in brief.

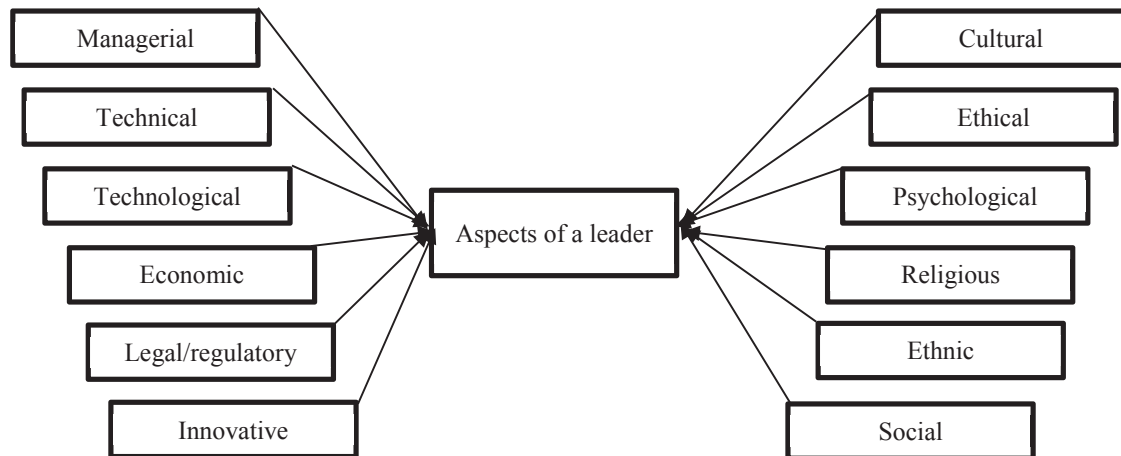


Fig. 1. Aspects of a leader – quantitative and qualitative analyses

Leadership is both a research area and a practical skill, regarding the ability of an individual or organization to "lead" or guide other individuals, teams, or entire organizations. Controversial viewpoints are present in the literature, among Eastern and Western approaches to Leadership, and also within the West, on US vs. European approaches. In US academic environments Leadership is defined as a process of social influence in which a person can enlist the aid and support of others in the accomplishment of a common task [2]. Leadership is a holistic spectrum that can arise from: (1) higher levels of physical power, need to display power and control others, force superiority, ability to generate fear, or group-member's need for a powerful group protector (Primal Leadership), (2) superior mental energies, superior motivational forces, perceivable in communication and behaviors, lack of fear, courage, determination (Psychoenergetic Leadership), (3) higher abilities in managing the overall picture (Macro-Leadership), (4) higher abilities in specialized tasks (Micro-Leadership), (5) higher ability in managing the execution of a task (Project Leadership), and (6) higher level of values, wisdom, and spirituality (Spiritual Leadership), where any Leader derives its Leadership from a unique mix of one or more of the former factors [3]. Above spectrums describe efficient leadership and some aspects are follows.

2.1. Emotions and leadership

Emotions in the workplace influence a number of critical cognitive tasks including information processing and decision-making. Moreover the effect of emotions on these operations is often emotion-specific. Given these unique effects, leaders may need to learn how to manage the discrete emotions of subordinates, not just general effect. A laboratory experiment by Thiel et al. [4] examined the effects of leaders suggesting different regulation strategies after subordinates experienced anger or pessimism. Effects of these emotions under different leader-facilitated regulation strategies were evaluated with respect to planning, a critical organizational task, and perceptions of leader *effectiveness*. The findings imply that leaders should understand the differential effects of discrete emotions and be prepared to help subordinates manage emotions accordingly [4].

The purpose of the Rajah et al. [5] review is to unify and integrate research conducted in the past decade that links emotionality with leadership style, behavior and *effectiveness*. The Rajah et al. [4] review observed four running themes: emotional competencies of leaders (e.g., emotional expressiveness and emotional intelligence), stress in leadership, contagion of positive and negative effects and the effects of leaders' emotions on outcomes like burnout and performance [5].

Bono and Ilies [6] examine the role of positive emotions in the charismatic leadership process in a series of studies. Results suggest that mood contagion may be one of the psychological mechanisms by which charismatic leaders influence followers. A positive link between a leader's emotions and a follower's mood was found. Results also indicate that both leaders' positive emotional expressions and followers' moods influenced ratings of leader *effectiveness* and attraction to the leader [6].

2.2. Social elements

The qualities of social perceptiveness and behavioral flexibility are based upon well-organized and sophisticated knowledge structures or cognitive representations of social elements (e.g., organizational members, work behavioral settings, problem scenarios, organizational goals, expected interaction rituals) residing in organizational domains. Five propositions are offered regarding differences between leaders and non-leaders in the nature of these social knowledge structures. Several implications of these arguments are discussed, including (a) viewing leaders as experts in the operations of complex social systems, (b) considering social intelligence as part of a network of leader attributes and (c) examining differences between leaders and non-leaders in their cognitive qualities and representations.

Seyranian and Bligh [7] used computerized content analysis for testing communication tactics in temporal sequence on a large sample of US presidential speeches with an expanded measure of presidential charisma. Charismatic leaders, when compared to non-charismatic leaders, emphasized their similarity to followers in Phase 1 and used negation in Phase 2 [7].

Those in positions of organizational leadership and authority have a number of resources at their disposal (e.g., rewards and punishments, surveillance, persuasion) to ensure compliance with organizational policies and procedures by subordinates. However, leaders cannot afford to overlook the role of social identity processes when choosing strategies that will maximize their capacity to influence [8].

Charismatic leaders can be powerful agents of social change due to their unique relationship with followers. Current theories of charismatic leadership have primarily emphasized the personality and behavior of leaders and their effects on followers, organizations and society. Empirical exploration of the proposed model suggests that charismatic leaders employ a set of consistent communication strategies for effecting social change [9].

Moreover the research can be extended to the experimental field by the use of the laboratory of Practice Management in which it is also possible to analyse leadership effects in a simulated environment and in the work group involved in the organization start up [10].

2.3. Culture, religious, traditions and leadership

Mittal and Dorfman [11] analyze the degree to which five aspects of servant leadership –Egalitarianism, Moral Integrity, Empowering, Empathy and Humility – are endorsed as important for effective leadership across cultures. The study finds that each of these dimensions associates with effective leadership. Nevertheless, there are considerable variations in the degree of endorsement of servant leadership components across different GLOBE culture clusters. Nordic/European cultures endorse the dimensions of Egalitarianism and Empowering more strongly than Asian and similar cultures do. On the other hand, Asian cultures more strongly endorse the servant leadership dimensions of Empathy and Humility than European cultures do. Furthermore significant relationships are found between several societal cultural values and aspects of servant leadership that help in understanding why nations differ in endorsing this leadership construct [11].

The research by Chen and Li [12] examines several determinants under consideration to influence the effectiveness of *spiritual leadership* (SL). These include one motivational mediating factor regarding self-concept and two conditional factors, i.e., culture as a *macro*-level factor among followers and managerial position as a *micro*-level factor.

Dorfman et al. [13] also find that some leadership behaviors are universally effective, such as charismatic/value-based leadership. Others are much more culturally sensitive, such as participative leadership. Finally Dorfman et al. [13] identify truly superior (and also truly inferior) CEOs by the degree to which their behaviors exceed (or fail to meet) their society's expectations. Overall, understanding a national culture gives us a heads-up as to which kinds of leadership will likely be enacted and prove effective in each society [13].

Leadership is an important management function helping to maximize efficiency and achieve organizational goals. Contemporary leadership theories concur that an organization needs to create an empowerment culture to improve the performance of a workforce and its leadership [14].

Use of archival data from Canada, Hong Kong, New Zealand, South Africa, the United Kingdom and the United States examine perceptions of which facets of organizational culture are related to leadership and personal *effectiveness*. Organizational culture is strongly perceived as relating to both leadership *effectiveness* (explaining 40% of the variance) and personal *effectiveness* (24% of the variance). Aspects of organizational culture that promote employee fulfillment and satisfaction are uniformly viewed as positively related to leadership and personal *effectiveness*. The perceived relationship across samples was stronger between organizational culture and leadership *effectiveness* than it was between organizational culture and personal *effectiveness* [15].

Personal and national cultures derive from people's personal values and pervade the role of effective management leadership and successful firm performances. Effective leadership style is now the single most important antecedent in maintaining competitive advantage and in supporting firm performances [16].

The purpose of the Kriger and Seng [17] research is to create a foundation for a contingency theory of leadership based on the inner values and worldviews of five major religious traditions: Islam, Christianity, Judaism, Hinduism and Buddhism. Kriger and Seng [17] identify similarities and differences in the implicit leadership models among these five religious traditions. Kriger and Seng [17] also explores the implications of this model for organizational leadership in an increasingly uncertain and evolving global economy, where not only cultures but also religions, their belief systems and their values are in increasing contact and interaction.

2.4. Ethical leader behaviors

Kalshoven et al. [18] develop seven ethical leader behaviors, which are fairness, integrity, ethical guidance, people orientation, power sharing, role clarification and concern for sustainability.

The necessity of carrying out all organizational activities within the framework of the code of ethics brings the ethical leadership fact into question. It becomes crucial to develop competitive strategies within the framework of the codes of ethics when the influence of the organizational leader upon the company image, identity and prestige is taken into account.

The determinants of employee turnover, which have significant effects on organizational performance, have been studied extensively. One of the important antecedents of the intentional turnover of employees is leadership and work related stress. This study intends to understand the effects of ethical leadership and leadership effectiveness on the intentions employees have regarding turnover. Work related stress is examined as a mediator of the relationship between ethical leadership, leader effectiveness and turnover intention. The study, which used a sample of 1093 employees in 70 firms operating in nine different industries, found that work related stress had a positive effect on employee turnover intentions, whereas ethical leadership and leadership *effectiveness* negatively affected the turnover intention of employees [19].

The performed survey (see Case Study), above and other aspects are used as a basis to develop the IDSS-LA Database (Initial Data Tables, Leader Assessment Tables (see Table 1 and <http://iti.vgtu.lt/imitacijosmain/simpletable.aspx?sistemid=518>), Multivariant Design Tables, E-Self-Assessment Questionnaire and Self-Assessment Tables).

3. Intelligent Decision Support System for Leadership Analysis

First, the existing different intelligent systems were analyzed [20-25, 27]. It included information, intelligent, knowledge, expert and decision support systems, plus developed multiple criteria methods [26] (CODEC, COPRAS, DUMA and DAM). The purpose was to determine the most efficient Intelligent Decision Support System for Leadership Analysis (IDSS-LA) to analyze a leader's life cycle. This developed support system consists of a database, database management system, model-base, model-base management system and user interface (Figure 2).

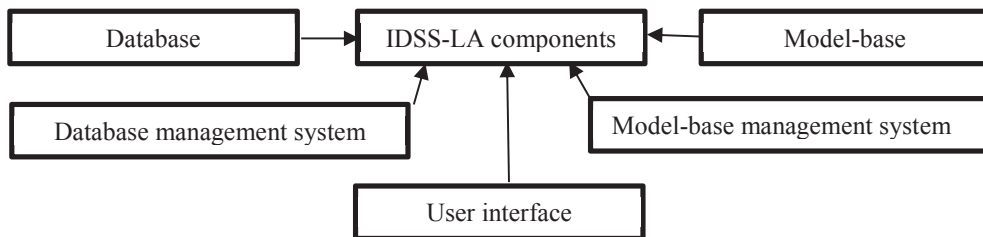


Figure 2. IDSS-LA components

4. Case Study

This section describes the use of the IDSS-LA in practice.

The Get Web Company seeks to recruit a chief executive. This multinational company has prefigured a set of competencies it needs from its leaders now and in the next five years in light of its regulations, key corporate goals and strategy. To determine the competencies a chief executive needs and the significance of such competencies, a survey was carried out.

The survey consisted of interviews with 57 experts (27 from Lithuania and 30 from abroad). The expert survey was conducted in 2012; it comprised four stages: the preparation (an informational analysis of the forthcoming survey, setting the goals and objectives, a targeted selection of experts, and drawing up the questionnaire), the communication (preparing the text for personal communication), the survey (communication, feedback, summarising the results), and the analysis (analysing/processing the results, interpreting the results, making

conclusions and recommendations, and practical systematic modelling). The survey involved executives and other representatives from the state and nongovernmental sector, associations, private businesses, academic institutions, and international organisations; 27 of the surveyed experts (nine from Lithuania and 18 foreigners) successfully defended their dissertations in the past, and there were 12 professors (six from Lithuania and six foreigners) among them. The plan was to assess chief executives based on ten tables of competencies comprising a system of criteria (competencies) with specific weights. For that purpose the experts were asked the following questions:

- What in your opinion are the 5 most important leaders competences of 21st century determining next 5 years of success?
- What are the most important organization competencies of knowledge workers, seeking main goals of organization?
- What changes are you planning for implementation of competence development strategy of your organization during the next 5 years?
- How does your organisation encourage creativity of competent knowledge employees?
- Describe what creates "organizational competence" most efficiently?
- Please select and indicate 5 most important leaders' competences of information sector, which ones determines their leded organizations' success at the upcoming 5 year.
- How do you evaluate your own work in your organization?
- Please, select 5 most important characteristic of knowledge workers, which may ensure successful activity of contemporary organization
- What are the 5 most important factors, encouraging knowledge employees to learn?
- How does your organization encourage innovation and creativity?

Each expert had to choose five competencies from all available options. The processing of these answers from experts was meant to identify the significance and weight of the competences. The greater the weight, the more important is the named competence. The system of criteria (competences) presented by experts herein also integrates the recommendations/suggestions and respondent comments from the survey. For instance, the criterion “digital competence” appears with the comment, “A holistic and integrated approach is important; it shouldn’t be restricted to digital complexity alone. One must be aware that technologies, the environment, energy resources and other things are related, and they necessarily shape lifestyles and business models and other things.”

The survey produced ten tables of competencies and Get Web Company used the tables to choose the most efficient chief executive. The ten tables of competencies are available in the website in Lithuanian and in English (see <http://iti.vgtu.lt/imitacijosmain/simpletable.aspx?sistemid=518>). Two persons with top professional expertise applied for the chief executive position. The aforementioned IDSS-LA helped in assessing the competencies of each potential candidate. We shall look at “Most important competencies for 21st century leaders in the knowledge society that lead to success in the next five years” (Table 1, X₁), the first of the ten tables of competencies, as an example.

Table 1. Input data for a multiple criteria analysis of key competencies of 21st century, knowledge society leaders

Quantitative and qualitative information pertinent to alternatives					
Criteria describing the alternatives	*	Measuring units	W eight	Compared alternatives	
				Leader No. 1	Leader No. 2
Leadership and ability to lead	+	Points	0.18	27	23
Openness to new ideas and the courage to	+	Points	0.17	25	20
The ability to do global and dynamic insights	+	Points	0.11	17	14
Self-reflection and motivation	+	Points	0.1	13	16
Perception of digital complexity	+	Points	0.1	12	16
...

This competence table comprises such key subcriteria/competencies as “leadership and an ability to lead” (X_{11} , $q_1=0.18$) and “openness to new ideas and boldness” (X_{12} , $q_2=0.17$). A look at Leader 1 and Leader 2 offers a brief review of these two subcriteria.

Leader 1 was found to have substantial competencies of leadership and an ability to lead in terms of the subcriterion/competence, “leadership and an ability to lead” (X_{11} , $q_1=0.18$). This leader is always proactive and ready to seize an opportunity. Additionally this leader is highly achievement-oriented who inspires and motivates the staff to deliver results, conveys expectations and ensures performance. This leader also anticipates, recognizes and meets customer needs, assures product quality and meets requirements regarding ordered quantities, agreed price and established deadlines. Furthermore this person manages time efficiently, ensures productivity and assures delivery of all goals, objectives and results without strain or fatigue. This is a leader with several years of executive experience. There is a track record of producing perfect financial reports and control, adhering to business and financial plans and ensuring a fine corporate structure.

Leader 2, however, finds it harder to manage persons and groups and has poorer persuasion and motivation tactics. Furthermore this leader sometimes lacks proactiveness, is less achievement-oriented and spends more energy on a task. Nonetheless, Leader 2 is a skilled manager, who is up to par in producing financial reports and controlling, and usually adheres to a business and financial plan. There are no noticeable corporate troubles, though a need for unplanned money appears at times.

The competence “openness to new ideas and boldness” (X_{12} , $q_2=0.17$) revealed that *Leader 1* was more disposed to ignore new ideas when they come from a team member who is not considered an authority. However, this leader seeks new challenges, quickly adopts innovations, exhibits boldness but manages risk in decision-making and vigorously introduces innovations. This competence is less predominate in *Leader 2*, implying that Leader 2 never seeks challenges, is a more inert and conservative leader but is open to new ideas suggested by others.

IDSS-LA performed the multiple criteria analysis of the two alternative chief executives by using the data from Table 1 (plus nine more competencies tables in the IDSS-LA website <http://iti.vgtu.lt/imitacijosmain/simpletable.aspx?sistemid=518>). IDSS-LA determined the priority of each alternative. The higher the Q_j , the more efficient is the chief executive, i.e., having the higher priority. A generalized/reduced criterion Q_j produced by the system depends, directly and proportionally, on the relative impact that the values x_{ij} and weights q_i of the compared criteria have on the end result.

It is further important to determine the utility degree of each chief executive along with the market salary rate of the leader under analysis. This way a more accurate assessment is made of the positive and negative traits of the leaders under analysis. A comparison of these traits with the organization’s goals follows along with the establishment of a potential salary.

5. Conclusions

The development of the Leader Model for quantitative and qualitative analyses began with the goal of integrating managerial, organizational, technical, technological, economic, legal/regulatory, innovative, social, cultural, ethical, psychological, religious, ethnic and other aspects involved in the process of a leader’s life cycle. The need to determine the most efficient life cycle of a leader led to the development of the Intelligent Decision Support System for Leadership Analysis (IDSS-LA). IDSS-LA has some innovative elements (application advantages).

For example, IDSS-LA include models enabling a decision-maker to multiple criteria (economic, legal/regulatory, technical, technological, organizational, managerial, quality of life, social, cultural, political, ethical, psychological and other factors) analyze the available variants comprehensively and arrive at a suitable choice by using such modules: Recommender Model, DUMA Model (Defining a Project’s Utility Degree and Market Value Method), DAM Model (Multiple Criteria, Multivariant Design of Alternatives Method), Ne-DSS Model (Negotiation Decision Support), Self-Assessment Model, Stress Management Advisory Model, Text Analytics, etc.

The objective of the authors of this work for integrating text analytics, advisory, negotiation and decision support systems is to improve the quality and efficiency of intelligent decision-making regarding a leader’s life cycle. This IDSS-LA consists of an intelligent database, database management system, model-base, model-base management

system and user interface. A six-stage model and case study is presented in brief. In the future, the authors of this paper intend to integrate HUSSAR with the Web-based Refurbishment, Construction, Facilities Management and Pollution Analysis, Decision Support Systems.

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