ADAPTIVE HUMAN RESOURCES SELECTION TOOLS IN VIRTUAL INDUSTRIAL ENTERPRISE ENVIRONMENT

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Membrii unei echipe virtuale delocalizate ce îşi partajează competenţele specifice pe durata realizării unui proiect industrial trebuie să posede atât cunoştinţele de specialitate necesare realizării activităţilor proiectului, cât şi acele abilităţi specifice implicate de derularea proiectului în mediul virtual. Bateriile de teste pentru evaluarea abilităţilor resursei umane (CPI, MBTI) au o structură rigidă ce nu ia în considerare valorizarea diferenţiată a acelor profile relevante pentru membrii unei astfel de echipe virtuale. Pornind de la aceste premise, articolul propune un sistem multicriterial adaptiv pentru evaluarea acestor capabilităţi cerute de specificul mediului caracteristic întreprinderii industriale virtuale.

In order to successfully participate in a virtual team, human resources must be able not only to develop specific technical capacities but also to possess abilities in involving themselves in virtual industrial environment based projects. Present psychological inventory (CPI and MBTI) used to evaluate those capabilities are rigid and are not covering the specific requirements of industrial virtual environment. As the prevalence of virtual teams in industrial projects is increasing, we consider that an adaptive human resources selection system is necessary and we propose here such a tool able to differentiate the relevant profiles.

Keywords: virtual enterprise, relevant psychological profiles, psychological inventory (CPI & MBTI)

1. Introduction

In industrial enterprises environment, not only new techniques had emerged, but they had changed the entire conception and manufacturing of a mechanical product. Therefore, we consider important for those enterprises to be able to develop their ability in involving themselves in international projects, where, using their skills, they can cover specific tasks, modules of the project proposed by enterprises who are leading the field. A geographical dispersion of employees presents special challenges for the organization in processing information for organizational action, especially under conditions of high

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differentiation and interdependence. In this paper, we propose an adaptive human resources selection tool starting from two psychological inventory batteries modified in order to emphasize the specific relevant psychological profiles for industrial engineers, who must be able to work in virtual enterprise environment.

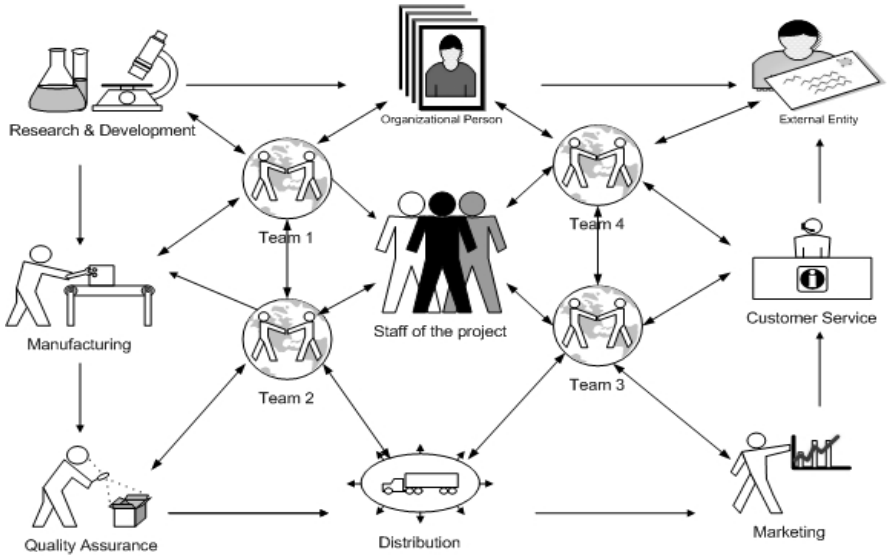

Fig. 1. Virtual Enterprise – a general view. [1]

We consider this tool as necessary, because, analyzing the requirements for virtual teams important changes in valorising CPI (California Psychological Inventory) and MBTI (Myers-Briggs) profiles are necessary.

2. The virtual industrial enterprise environment

The concept of a Virtual Enterprise (VE) has been defined as a temporary network of autonomous, diverse and geographically dispersed enterprises that share their resources to meet objectives and exploit fast-changing market trends for a project time interval [2]. This partnership concept is mostly associated with specific characteristics: sharing costs, skills and resources, supporting the necessary activities towards the exploitations of fast-changing opportunities, for product or service requests and competitiveness in a global market [3]. In global virtual enterprises, without any doubt, information and communication platforms do play a very important role (Fig. 1).

The VE is a way of inducing entrepreneurial spirit to revitalize the organization. The concept of VE was applied to many forms of cooperative business relations, like outsourcing, supply chains, or temporary consortiums. The

information system should be flexible and dynamic to fit with the ever-changing organization of the virtual construction enterprise [4].

The VE is about managing dynamic organizational and business change. Instead, social interaction in the region provides much richer social communication than information technology would allow to support. A geographical dispersion of employees presents special challenges for the organization.

3. Selecting relevant profiles from psychological inventory batteries

3.1. Selecting profiles from CPI - California Psychological Inventory

Psychometric and conceptual analyses of the CPI instrument have identified three basic dimensions underlying scores on the folk and special purpose scales [5]. The items on the inventory produce scores for 18 scales, which are divided into four classes: measures of poise, ascendancy, self-assurance and inter-personal adequacy; measures of socialization, responsibility, intra-personal values, and character; measures of achievement potential and intellectual efficiency; and measures of intellectual and interest modes. The scales of C.P.I. are structured in four dimensions (Table 1). Each scale of CPI is presented in table 2. A professional, individuated interpretation can go further than this, taking into account patterns and configurations among the scales. A decision about whether or not individual's results on an instrument are valid enough for interpretation is a professional judgment.

Table 1

Scales of CPI

I. Dealing with Others	II. Self - Management	III. Motivations and Thinking Style	IV. Personal Characteristics
Scales of interpersonal style and manner of dealing with others.	Scales pertaining to the internalization and endorsement of normative conventions, including norms related to self presentation.	Three scales pertaining to cognitive/intellectual functioning and the need for achievement in either structured or open situations.	Contains three scales that assess broadly stylistic or qualitative aspects of thinking and behaviour.
Do, Cs, Sy, Sp, Sa, Wb	Re, So, Sc, To, Gi, Cm	Ac, Ai, Ie	Py, Fx, Fe vs Ma

Table 2

Details of CPI Scales

CLASS I	CLASS II	CLASS III	CLASS IV
Do - Prosocial interpersonal power and influence	Re - Conscientiousness and follow-through	Ac - Motivation within organized settings	Py - Analytical insight into the motivations of others
Cs - Ambition for challenge and social status	So - Conformance with social norms and customs	Ai - Motivation within unstructured settings	Fx - Adaptability and comfort with change
Sy - Social participation	Sc - Cautiousness and self-regulation	Ie - Comfort with intellectual and conceptual matters	Fe vs Ma - Tough-versus tender-mindedness
Sp Comfort with attention and recognition	To - Open mindedness and respect for others		
Sa - Sense of personal worth and self-confidence	Gi - Tact and positive self-presentation		
Wb - Overall sense of health and optimism	Cm - Conventionality of behaviour and attitudes		

We propose here a system that is able to select and differentiate the relevant profiles for human resources acting in virtual teams. In order to make the selection, we used the technical capacities map that defines for each potential member of the team specific technical capabilities as considered necessary by the directory board of the VE. Starting from this map, we defined the specific psychological profile requirements for all the potential members of the virtual team according with their role in the project.

Using this methodology from the 18 scales of CPI presented above, 10 were selected (Do, Cs, Re, So, Sc, To, Ai, Ie, Py, Fx) in different combinations and differentiated (on a scale from 1 to 10) according with the technical capacities map requirements as the most relevant to the each specific post in the virtual team. Nevertheless, the selected differentiated profiles are not covering the complete post requirements for all the necessary technical tasks according with the technical capacities map. That is why we decided also to use another inventory in order to complete our adaptive selection tool.

3.2. Selecting profiles from Myers - Briggs Inventory

Developed by Katherine Briggs and Isabel Myers-Briggs in the 1920's, the Myers-Briggs Type Indicator (MBTI) is based on the work of Carl Jung. Jung's theory of psychological type makes three assumptions. First, a person's past memories and experiences and their expectations for the future greatly influence

one's behaviour and personality. Second, individuals' personalities are not static, they fluctuate over time. Finally, an individual's personality is extremely sensitive to outside inputs [6]. The MBTI results come from four dimensions with eight personality preferences or types.

In our adaptive selection tool with the application of the Myers-Briggs Type Indicator selected and differentiated profiles, evaluators became able to determine their virtual team members' major personality preference. As a result, a compatibility map of the team members' personality will be completed in order to select a team able to work together efficiently as a unit. From this inventory, in table 3, we present keywords and expressions. Those are often associated between:

- individual's source of energy and how they like to interact, **Extroversion** and **Introversion**,
- known facts and familiar terms versus possibilities or new potential, **Sensing** or **iNtuition**,
- logic and objective considerations or personal values, **Thinking** and **Feeling,**
- in a structured way, making decisions and knowing where you stand or in a flexible way, discovering life as you go along, **Judgment** or **Perception** [7].

We also considered important to make some considerations for every selected virtual team compatible differentiated profile of that inventory [8]:

Extroverts are likely to be the ones doing most of communication, as introverts are likely to be thinking about what is being communicated.

Intuitivist are valuable as they are useful in seeing other options, coming up with ideas, and helping others to see the big picture, but sensitive are also essential as they are good at gathering data and facts, bringing intuitive.

Table 3

List words associated with the scales of MBTI

Extroversion or Introversion		Sensing or iNtuition	
social	private	using	changing
expressive	quiet	realism	idealism
broad	deep	experience	novelty
interaction	concentration	present	future
outward	inward	practicality	aspiration
action before thought	thought before action	enjoyment	development
Thinking or Feeling		Judgment or Perception	
analyzing	sympathizing	close	open
objective	subjective	decide	explore
logical	personal	structure	meander
onlooker	participant	firmness	flexibility
decides on principle	decides using values	control	spontaneity

- Thinkers could be of great importance, as they keep a team aware of what their group goals and responsibilities are and can guide them to decisions that are just and fair. Feeling types are just as critical for their conflict resolution abilities and their attention to the impact that team decisions will have on people.
- Judgers tend to keep everyone organized, make sure deadlines are met, and managing schedules around these deadlines. Perceiving types help the team to adapt to changes, proceed with tasks that have no clear direction, and dealing with the unexpected in a calm manner (Fig. 2).

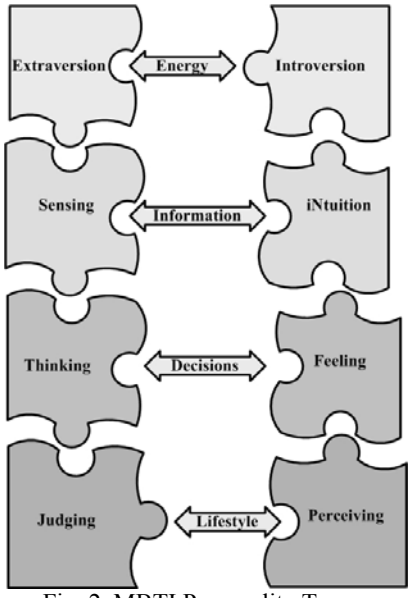

Fig. 2. MBTI Personality Types.

4. Case study – using our human resources selecting tool on the INPRO industry-research network

The case study for applying our selecting human resources tool was the Romanian INPRO – National Research Network for Integrated Product and Process Engineering, an industry - research partnership based on the association of some representative teams in integrated engineering domain of products and processes from universities and industrial partners. This network needs to select and to evaluate the human resources implicated in activities specific to the industry - research teams virtually de-located. We applied our adaptive selection tool inventory at a number of 86 students (from the Management and Engineering of Technical Systems Faculty of the University Politehnica of Bucharest) who wanted to apply for different engineering posts in this network (42 female

students and 44 male students). As a first step, one from the 16 Myers-Briggs combined profiles and 10 from 18 CPI scales were selected as relevant to the specific different industrial engineers post requirements. The profiles were differentiated according to the importance of each profile for each industrial engineer post. We also differentiated the psychological female and masculine profiles, according with the common practice in the area. If we apply only the selected 10 CPI scales (Do, Cs, Re, So, Sc, To, Ai, Ie, Py, Fx) from 86 postulants only 3 obtained satisfying results for the profiles associated with the specific technical requirements of the industrial engineer post they apply for (Fig. 3 and 4). In figure 5 we presented one of the profiles that don't cover the specific requirements. But according with our methodology the differentiated 10 scales of CPI are not enough to cover the entire requirement. If we also apply the selected differentiated MBTI that comes in additional with the selected CPI profile, we can obtain a complete evaluation result. The Myers-Briggs selected profile was INTJ - Independent, original, analytical, and determined, with an exceptional ability to turn theories into solid plans of action highly value knowledge, competence, and structure and with a very high standard for their performance, and the performance of others (Fig. 6)

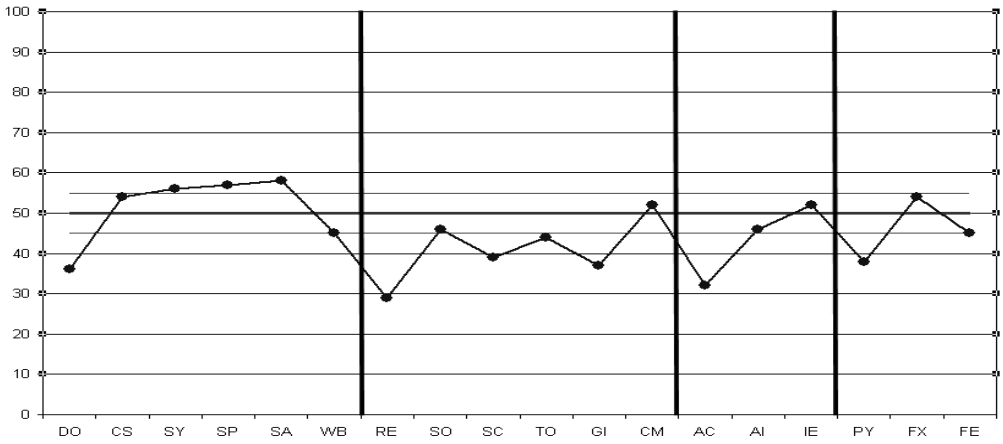

Fig. 3. Masculine profile.

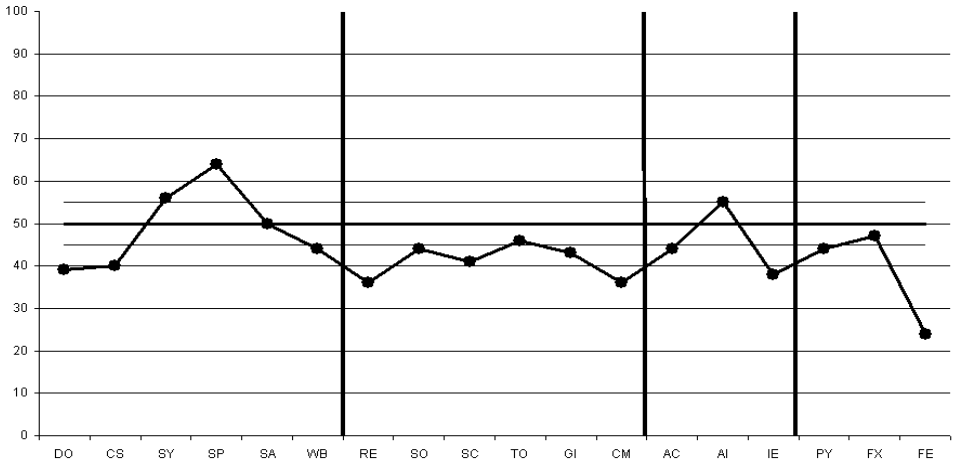

Fig. 4. Female profile.

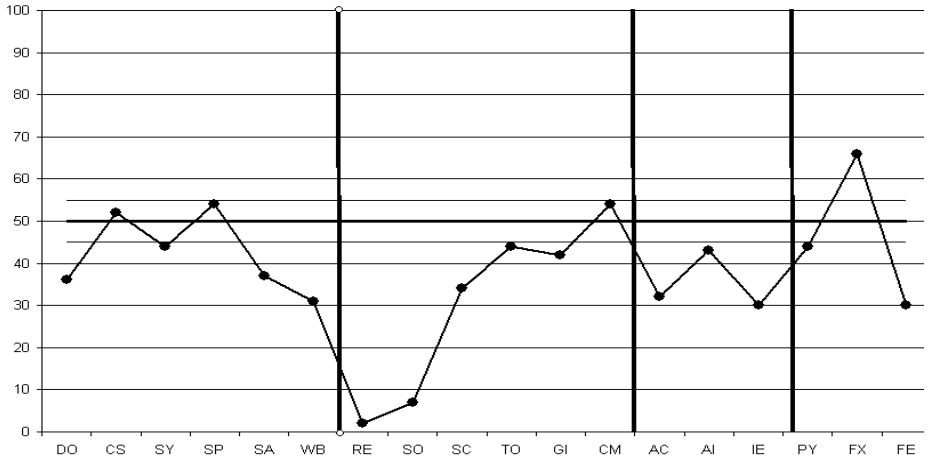

Fig. 5. Unqualified profile.

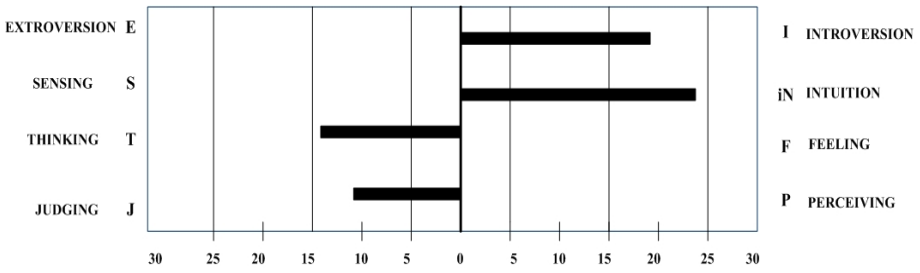

Fig. 6. INTJ profile.

5. Conclusion

Our paper propose an adaptive selection tool for choosing the better psychological profiles for human resources involved in virtual industrial enterprise teams. In order to reach this objective, considering the specific technical capabilities necessary for human resources implicated in de-located projects, we started from regarding the opportunities and limitations of the existing psychological inventories. Since the existing inventories do not cover the necessary profiles and are not able to introduce any differentiation between the existing profiles, we created our own adaptive inventory battery. Our solution is based on selecting and according differentiated importance to existing inventory profiles in order to adapt always the psychological profile with the technical capacities required by the post. We used as a case study the INPRO industry-research network. We proposed and INPRO directory board agreed to use our selecting tool for students who applied for different engineering positions in the network. The directory board, according with the industrial requirements, defined the technical capacities needed for each position of the network. Using an on-line questionnaire, each potential member of the team declares his specific technical capabilities from a list provided by the network according with the technical requirements of each engineer position. The result is a technical capacity map used for a periodical, evaluation of the professional level and according with the technical requirements for all the industrial engineers positions of the network. We established our necessary psychological profiles according with these position requirements and we applied our selection tool on 86 students. Only three of them proved to be eligible. Our tool proved to be able to combine and differentiate the importance of profiles from different inventories quantifying the compatibility between the obtained psychological profile for the evaluated person and the necessary one according to the technical capacities required.

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