

# COGNITIVE STYLES AFFECTING THE PERFORMANCE OF RESEARCH AND DEVELOPMENT (R&D) EMPLOYEES IN THE ERA OF INDUSTRY 4.0

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**Abstract:** Cognitive style is how people think, based on certain attitudes, perceptions and personality orientations. Cognitive styles are considered as basic elements for successful performance. Cognitive style is thought to predict performance in two ways: by allowing employees to quickly learn job-related knowledge and by processing information resulting in better decision making. But cognitive styles have received much less attention than they deserve, given their importance to employee's functioning. The relationship between cognitive style and performance is not completely understood in scientific research. In this context, the thinking styles and performances of people working in Research and Development (R & D) departments such as other work places are determined by these cognitive styles, and it is important to research this in the era of Industry 4.0.

**Keywords:** COGNITIVE STYLES, JOB PERFORMANCE, R & D EMPLOYEES, INDUSTRY 4.0.

## 1. Introduction

The trend of automation and data exchange in manufacturing technologies, called Industry 4.0, impacts the organizational processes as well as the role of the R & D employee. R & D companies need to identify their competence gaps and fill them efficiently. Employees can have their own aspirations regarding their lifelong professional development and plan them accordingly thanks to cognitive styles.

A proper analysis and interpretation of the big data in the R & D area can improve our understanding of learning processes as well as effectiveness, efficiency and attractiveness of learning and training at the workplace, making them more authentic and thus also more motivating, which is crucial. "Another important aspect is a better understanding of the user needs and objectives that should enable a higher quality in personalization and adaptation of learning and training experiences, as well as cultivation of metacognitive skills" [1].

Today's conditions are now being transformed into the new circumstances of the transition towards Industry 4.0, which is a big challenge. The organizational and technical changes imply regularly updated and dynamic competence profiles of employees, requiring requalification through cognitive styles directly at the workplace. This development calls for increased communication skills and performance of employees, as well as new abstraction and problem solving competences. Therefore a cognitive style might have implications for ways of learning, emotional expression, problem-solving, management and leadership styles, conflict management and stress management, or coping styles. Both successes and failures that have been attributed to abilities are often due to cognitive styles. Cognitive styles are considered as basic elements for successful performance. Memory, attention, reasoning ability, speed of information processing and knowledge are broad examples of these basic elements of performance. Cognitive style is thought to predict performance in two ways: by allowing employees to quickly learn job-related knowledge and by processing information resulting in better decision making. But cognitive styles have received much less attention than they deserve, given their importance to employee's functioning.

## 2. The Concept of Cognitive Style

Cognitive style is "widely recognized as an important determinant of individual and organizational behavior in the psychology literature, playing vital roles in individual and organizational workplace actions, processes and routines" [2].

Cognitive style is defined as "consistent individual differences in preferred ways of organizing and processing information and experience" [3]. In other words, cognitive style refers to "the information processing style of individuals and is usually seen as a dimension ranging from the analytic pole where individuals process information step-by-step to the intuitive pole where individuals process information in more holistic ways based on their feelings and wider perspectives" [2]. Cognitive style refers to the differences in perception, problem solving, learning and contact better relationships and communication.

Cognitive styles are related to the way that individuals interpret and approach the problems as well as how they learn and how they form their relationships with others. Messick, states that, "cognitive styles are usually conceptualized as characteristic modes of perceiving, remembering, thinking, problem solving, and decision making, reflective of information-processing regularities that develop in congenial ways around underlying personality trends" [4].

Individuals's cognitive style is his/her preferred way of gathering, processing, and evaluating information both in individual and organizational terms. It influences how individual's brain scans different environments for information, how he/she organize and interpret that information, and it ultimately guides his/her behavior.

There are several different cognitive styles; however, in this study, we're going to focus on two general categories: "Analytical (Thinking) and Intuitive".

**Analytical Thinkers;** Analyticals prefer logic and an ordered, linear focus on detail. The key word here is analysis. Analyticals can be split into two styles:

**Knowing Style;** This person prefers logical, impersonal information processing. They value accuracy and making informed decisions based upon a thorough analysis of facts and rational arguments.

**Planning Style;** This person is attracted to structure, searches for certainty, seeks feedback from others in more powerful positions, and prefers a well-organized environment. They like to make decisions in a structured way and are mostly concerned with process efficiency (being able to measure the degree of success of a process).

**Intuitive Thinkers;** Intuitives take a holistic approach, viewing an environment or situation as a whole. Their word is synthesis. Intuitives or Creatives tend to make decisions based

primarily on intuition, relying on objective data as a secondary approach. They often seek feedback from a broad range of sources [10].

"Humans are complex beings, and most of them are capable of both the analytical and intuitive forms of reasoning. So while most people aren't 100% one or the other, they are likely predisposed to or prefer a particular cognitive style. And even then, the degree can vary from person to person, like on a continuum. Those who fall in the middle are called adaptive thinkers" [10].

### **3. The Effects Of Cognitive Styles On Employee Performance (R&D Employees)**

Given that the core task of R & D workers is to initiate technological innovation and develop new products, their cognitive style or basic orientation to problem solving may play an important role in shaping their job perceptions, performance and turnover. Cognitive style is a "personal disposition that orients individuals towards a particular way of thinking and problem solving [5] which has critical implications for their organizational adjustment" [6]. In this regard, "one of the most widely used frameworks is Kirton's adaptation-innovation (KAI) theory". Kirton (1976) proposed that "individuals can be located on a continuum of cognitive style ranging from adaptive to innovative" [7]. This cognitive style is considered to be stable over time. Adaptors prefer to operate within consensually agreed-upon paradigms and are skilled at improving current ways of doing things. In contrast, innovators are more likely to reconstruct a problem and tend to perceive the existing paradigm as part of the problem [8].

With rapid technological developments and increasing global competition, recruitment, retention of talented, performance and productivity of R & D personnel is important agenda in many organizations, particularly in technology and research based companies.

Whereas successful R & D activities often rely on "a small number of highly capable and successful members, existing studies of R & D workers have for the most part been based on technicians or entry-level engineers who may not typically make a critical impact on the direction and outcomes of corporate R & D activities" [8].

Result of the Wang, Wu and Horng's (1999) study indicated that "creative thinking ability and cognitive type were related to their subjects' R & D performance". Accordingly their (1999) study "specifically speaking, fluency and originality of an R & D worker's creative thinking ability were related to his/her productivity on the first-authored technical report and the first-authored paper publication; whereas thinking type of cognition was related to the productivity of the first-authored service project and performance rating" [9]. These researchs may shed some light on the nature of R & D activities in this R & D institute in particular and the relation among creativity, cognitive type and R & D performance.

This research (1999) "separates the cognitive types of R & D workers in two; as feeling and thinking individuals". According to their research "feeling individuals are more sensitive to other's needs and tend to be sympathetic, relating well to most people. This link is a quality important to success in teamwork". On the other hand, thinking individuals prefer logical structures and are analytical and insensitive to personal feeling. The result of this study suggests that, "the nature of R & D works of the companies may fit better with the thinking type". The link between cognitive type and R & D performance is that thinking type individuals tend to receive higher performance ratings and have more

opportunities to be principal investigator in service projects than type individuals [9].

Thus the direct and indirect effects on the job performance of cognitive style include; "Leadership skills, interpersonal skills, how you learn, solve problems, and make decisions, ability to work within a team and with different groups of people, ability to transition from one task to the next, ability to adapt to change, especially in a fast-paced work environment, fulfillment level at work" [10]. A cognitive style is neither right nor wrong; however, there may be aspects of individual's cognitive style that help or hinder he/she at work.

Understanding individual's own cognitive style can help he/she improve his/her leadership and interpersonal skills, help he/she adapt to the challenges he/she face at work, and make he/she happier with his/her job. For employers, an awareness of the different cognitive styles can help he/she understand his/her employees better, as well as determine whether an employee (or prospective employee) is the right person for the job, or if individuals are a good fit for his/her company culture. This is also true for the culture of the R & D companies [10].

### **4. Discussion**

In this study, the effects of the cognitive styles of the professionals in R & D centers on their individual and organizational performance and productivity are discussed.

Research has shown, and it stands to reason, that the more closely related a person's cognitive style is to the task demands at work, the better their job performance will be. Understanding employees' cognitive styles can help their convey information more effectively in both individual and organizational terms. This can be very helpful for people in employee and leadership positions at the R & D centers. Cognitive style of the employees help with the demands of their position and help them be more productive – and happier – which of course benefits the organization as a whole in the workplace.

It's important to develop the skill of cognitive styles and technical styles. People who lack these abilities are more rigid in their approach and therefore unable to adapt to certain environments. This can affect individual's work life and personal life. The opportunities that cognitive styles offer to employees include: flexibility in terms of cognitive, more easily adapt to change, step outside his/her preference to see another's perspective, transition from one important task to another, problem-solve in an efficient, flexible manner, think before he/she act, adapt to a changing innovation and technological environment. Someone with cognitive styles has the ability to reason and process information using both the intuitive and analytical types and will be able to draw upon the skills necessary for a given task at the R & D centers.

Both cognitive style and ability affect performance, but researchers emphasize the importance of distinguishing the two concepts. Ability-related factors led themselves better to measurement. On one hand, "performance usually improves as the ability needed for that particular task improves or increases". Cognitive style, on the other hand "can facilitate or inhibit optimal performance of a task [13]. The relationship between cognitive style and performance need not be exclusive". If analytic information processing is strengthened as a result of exposure to situations where analytic information processing is facilitated or is experienced in effective ways, then the impact on performing a particular task requiring similar information processing may be positive. Previous exposure to situations that disclose analytic thinking may facilitate an individual's adjustment to new situations [13].

Cognitive style is generally referred to "as a dimension of individual differences including stable attitudes, choices, and habitual strategies related to an individual's style of perceiving, remembering, thinking and solving problems, but if style is a malleable feature, the division between style and ability becomes more ambiguous". [13].

Cognitive styles can be effective not only on the employee but also in the recruitment processes. Therefore, multifunctional effects of cognitive style should be preferred by all companies. Because cognitive style assessments have been claimed to be relatively fast, easy and inexpensive to conduct with the results usable for a variety of purposes, such as increasing person-job fit, improving, performance, team-building, and enhancing individual and organizational learning [13].

## 5. Conclusion

People, not products, are the major assets of innovative companies in the era of industry 4.0. Hence, the top priority for human capital in R & D organizations is the attraction and retention of talent to support product or service growth [11] because creativity is the source of innovation and is embedded in talent [12].

The cognitive style is effective in individuals' personality traits, ways of thinking and individual decisions. A cognitive style might have implications for ways of learning, emotional expression, problem-solving, management and leadership styles, conflict management and stress management, or coping styles. These elements are also determinants of the relations of individuals with the workplace. Cognitive styles are considered as basic elements for successful job performance. Memory, attention, reasoning ability, speed of information processing and knowledge are broad examples of these basic elements of performance.

Research and development are the enabler of economic growth in especially developing countries, because the creation of technology is the result of knowledge accumulation. R & D organizations must emphasize the importance of effective cognitive styles management to technical personnel in the industry 4.0 era. This can help foster creative thinking and team-oriented atmosphere. Only then will the R & D personnel be positioned to deliver better innovation performance [11]. The effectiveness of R & D, depends on both good cognitive management and technical ability.

Cognitive styles, which have a positive effect on the success and performance of the current employee, arise from external factors as well as personal characteristics. First of all, companies should identify their employees' needs and improve their learning skills.

With the increasing importance of technology and people during the Industry 4.0 period, the education and management system has changed and performance evaluation practices have improved. Today, firms should focus on the emotional and mental abilities of employees. This is possible by exploring the cognitive styles of employees.

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