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TRAITS OF HIGHLY INNOVATIVE PEOPLE

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Purpose: The aim of the paper is to analyze the most important traits of highly innovative people.
Design/methodology/approach: Critical literature analysis. Analysis of international literature from main databases and polish literature and legal acts connecting with researched topic.
Findings: The publication concentrate on problems connected with various aspects of traits of highly inventive people. In the paper there is an analysis of the very important role of cognition in innovativeness. In the paper there is an analysis of various aspects of the role of cognition like: general intelligence, genius, cognitive abilities and observer judgments of intelligence. On the basis of the analysis following main traits of highly innovative peoples can be distinguished: sensitive, not motivated by money, sense of destiny, adaptable, tolerant of ambiguity, observant, perceive world differently, see possibilities, question asker, ability to synthetize, able to fantasize, flexible, fluent, imaginative, intuitive, original, ingenious, energetic, sense of humor, self-actualizing, self-disciplined, self-knowledgeable, specific interests, divergent thinker, curious, open-ended, independent, severely critical, non-conforming, confident, risk taker.
Originality/value: Detailed analysis of all subjects related to the problems connected traits of highly innovative people.

Keywords: Industry 4.0; innovation, industrial enterprise, innovative traits, highly innovative people.

Category of the paper: literature review.

1. Introduction

Creative and innovative persons are often referred to as indication of creative potential in general. Proper innovation management needs highly innovative people. Organization which wants to be innovative should find those people and manage them properly. In times of Industry 4.0 implementation in industry there is important to analyze traits of the highly innovative people which can increase the potential of organization.

The aim of the paper is to analyze the most important traits of highly innovative people.

2. Cognition in innovations

The very important problem is also to identify what traits very innovative people have (Wolniak, 2016; Czerwińska-Lubszczyk et al., 2022; Drozd, Wolniak, 2021). According to some research, personality, intelligence, knowledge, thinking style, motivation and environment are examples of important factors associated with creativity (Costa et al., 2015; Gajdzik, Wolniak, 2021, 2022; Gębczyńska, Wolniak, 2018; Grabowska et al., 2019, 2020, 2021). Many researchers have found relations between innovation potential and intelligence. We can divide this concept into five categories described in table 1.

Table 1.
The role of cognition in innovativeness.

Attribute	Characteristic
General intelligence	Early research claimed that creativity was equivalent to high intelligence. The best known researcher in this field is Guilford. In his theory of the Structure of Intellect (SI) published in the 1950s, he claimed that creative thinking was a mental ability, involving divergent production as 'thinking that goes off in different directions'. Other investigations have tested the possibility of a curvilinear relationship between intelligence and innovation where intelligence would potentially become less influential as the level of intelligence increases beyond a certain point.
Genius	Some researchers have suggested that genius, as the most obvious manifestation of high intelligence, is closely tied to the propensity for innovation. However, there has been a substantial lack of evidence to support a direct relationship between innovation and intelligence. Many, including Eysenck himself, have concluded that intelligence is a necessary, but not a sufficient, condition for innovation. Recent studies conclude that intelligence and innovation potential are moderately related, but once IQ scores go over 115 the relationship is near zero. This finding has been described as 'threshold theory'.
Cognitive abilities	Ward and Smith suggested that in order to understand the role of cognitive abilities in idea generation, we must draw upon current models in cognitive psychology, and use experimentally based observations of the processes that underlie generative tasks. The model proposes that many creative activities can be described in terms of an initial generation of ideas or solutions followed by an extensive exploration of those ideas. Initial ideas are referred to as 'pre-inventive', in the sense that they are incomplete solutions, but offer promise in terms of originality and utility. The model assumes that one would alternate between generative and exploratory phases, refining the structures according to the demands or constraints of the specific task. This 'creative cognition' approach emphasizes that generative capacity is a property of normative human cognition.
Observer judgments of intelligence	Innovative individuals are often perceived and rated by others as more intelligent than less innovative individuals. For example, in MacKinnon's studies of architects in the 1960's, supervisors rated innovative architects as more 'intelligent' than less innovative individuals. MacKinnon described the innovative architects to have high 'effective intelligence', and argued that traditional measures of intelligence (e.g. IQ) do not fully explain this 'real-world' intelligence.

Source: On basis: (Patterson et al., 2021; Guilford, 1967; MacKinnon, 1978; Lysenck, 1994; Jauk et al., 2019; Gaur, 2016).

3. Personality in innovations

The next very important set of factors connected with innovativeness is knowledge. Almost all researchers conducted analysis about innovativeness have assumed that knowledge is a very important variable in both innovativeness and creativity. Immersion in domain specific knowledge is very important to boast innovativeness. Domain-relevant knowledge reflects how much an individual knows about a given area. An individual who wants to make an innovative contribution must not only work within a system, but must also reproduce that system in his or her mind. Personal mastery and an accurate sense of domain are necessary factors for innovations (Patterson et al., 2021; Habek, Wolniak, 2013, 2016; Hys, Wolniak, 2018).

Next important factor boasting innovativeness is motivation. High levels of motivation are required for innovation and innovative people are viewed as displaying devotion and very bug absorption in their work (Harrison et al., 2006). While intrinsic motivation is Clearly a prerequisite for innovation, the very role of extrinsic motivation is less clear (Jonek-Kowalska, Wolniak, 2021, 2022; Jonek-Kowalska et al., 2022; Kordel, Wolniak, 2021). The evidence suggests that constructive evaluation in an organization can enhance innovation. Some researchers suggest that intrinsic and extrinsic motivation might serve different functions; whilst intrinsic motivation might be linked to work on a task, extrinsic motivation might affect choice of task, field or implementation strategy (Mumford et al., 2002; Kwiotkowska et al., 2021, 2022; Orzeł, Wolniak, 2021, 2022; Ponomarenko et al., 2016; Stawiarska et al., 2020, 2021; Stecuła, Wolniak, 2022; Olkiewicz et al., 2021). Sagerman and Cohen have found that intrinsic and extrinsic motivation affected both individual effort and the overall quality of the innovative endeavors. They have found that extrinsic rewards, such as pay, were not as important as certain aspects of intrinsic motivation such as the desire for individual change in the process of enhancing motivation (Sauremann, Cohen, 2008).

Many researchers have found relations between innovation and personality and from those analyses a consistent set of characteristics has emerged. The Five Factor personality model (openness to experience, agreeableness, conscientiousness, extroversion, neuroticism) was used to analyze relations between innovativeness and personality. Those relations are described in table 2.

Table 2.
The role of personality in innovativeness

Attribute	Characteristic
Openness to Experience	There is good empirical evidence of a positive association between various characteristics associated with innovation and those used to depict openness (e.g. imaginative, original, flexible, unconventional). Research suggests that openness enhances an individual's intrinsic motivation towards novelty and therefore works in a multiplicative way to produce innovation. Although there are some inconsistencies in the findings - with recent findings suggesting that the relationship may be moderated by contextual factors - openness is perhaps the most important personality dimensions to predict the propensity for innovation.
Agreeableness	Several studies have demonstrated a negative association between agreeableness and Innovation. In other words, being more disagreeable is linked to innovation. Empirical studies have confirmed the negative association between innovation and agreeableness by showing that innovators have high social rule independence. These findings are consistent with Eysenck's emphasis on the potentially negative dispositional characteristics of innovators, where innovators are often outspoken, uninhibited, quarrelsome, and sometimes asocial. Related to these findings are results showing that agreeableness is negatively associated with creative achievement but not with creative thinking. Thus, agreeableness is likely to be important in the implementation process of innovation but not for idea generation. This affords intuitive sense in that the implementation of new ideas is likely to be a group effort which involves social processes and activities. Such findings have important repercussions for the selection and management of employees.
Conscientiousness	The vast majority of research has demonstrated that lack of conscientiousness is associated with innovation. Defined by terms such as fastidious, ordered, neat and methodical, the evidence shows that individuals high on conscientiousness are more resistant to changes at work, and are more likely to comply with current organizational norms. A recent study reported that the negative association between conscientiousness and creativity is likely to be moderated by contextual factors, such as lack of autonomy and support.
Extroversion	With regard to the relationship between Extroversion and innovation, findings are not clear cut. Introversion is positively associated with innovation. Similarly, many have argued that isolation and withdrawal are necessary conditions for generating new ideas. However, there is little evidence from organizational contexts and more recent research indicates that extroversion is a positive predictor of innovation. In meta-analytic studies of occupational work performance in general, extroversion has been shown to be a positive predictor for many occupations. This is particularly the case in large organizations where interpersonal factors are likely to be important for effective job performance (e.g. sales, managers and other professional occupations). The association between extraversion and innovation seems to be context dependent. Introversion is likely to be related to real-life artistic endeavor whereas extraversion seems to predict performance measures of creativity and innovation.
Neuroticism	King and colleagues found no association between neuroticism and creative thinking or innovation. Conversely, other research literature suggests a positive relationship between neuroticism and innovation. One explanation for these inconsistencies is likely to be that the association between neuroticism and innovation is domain-dependent. A more thorough investigation in this area is necessary, particularly in organizational settings with a broader range of occupations. Some suggest a curvilinear association between emotional stability and performance, (where too much or too little anxiety is detrimental to innovation) and moderate levels of anxiety, for example, can enhance innovative potential.

Source: On basis: (Patterson et al., 2021; Harrison et al., 2006; Baer, Oldham, 2006; Wolfradt, Pretz, 2001; George, Zhou, 2001; Furnham, Bachtiar, 2008; Mg, Yeung, 2013; Raviv, 2008).

4. Main innovative traits

We can distinguish many important factors we should expect from creative people (Sułkowski, Wolniak, 2015, 2016, 2018; Wolniak, Skotnicka-Zasadzień, 2008, 2010, 2014, 2018, 2019, 2022; Wolniak, 2011, 2013, 2014, 2016, 2017, 2018, 2019, 2020, 2021, 2022). The most important of them we have described in table 3. There are extensive characteristics of those traits encouraging creativity.

Table 3.
Traits encouraging creativity

Trait	Characteristic
Recognition and appreciation	Because the results of creative work are often postponed for a long time (many geniuses in history received no recognition in their lifetimes), creative people stand in special need of encouragement and appreciation. The recognition of the value or worth of their contribution is especially important to them, particularly if it comes from those whose opinions they respect.
Freedom to work in areas of greatest interest	While the predominantly analytical person concentrates and focuses down, the creative person wanders in every possible or feasible direction. Freedom to move is the necessary condition of creative work. A creative person tends to be most effective if allowed to choose the area of work, and the problems or opportunities within that area, which arouses deep interest. Clearly within an innovative organization this freedom has to be bounded by its definition of general purpose and by the consequent parameters of its broad strategies.
Contacts with stimulating colleagues	Creative people need conversation with colleagues in order to think, not merely for social intercourse. In the social sense they may be inclined to be 'loners', but they cannot intellectually be 'loners' all the time. Organizational structure should facilitate these formal and informal interactions. Buildings, especially the position and character of rooms where people congregate for coffee, tea or meals, play an important part. Random meetings with colleagues and visitors in such meeting places may spark off new ideas or suggest new avenues of thought.
Encouragement to take risks	Innovation is a gamble. If you have never worked on the edge of failure, you will not have worked on the edge of real success. Creative people respond well to an organization which encourages them to take calculated risks.
A willingness to accept risk	The potential downside of freedom given to a colleague or team, as we have seen, includes mistakes, failures or financial loss. As delegation should not mean abdication, you as the leader may well have been a party to the risk. You may at least have understood the consequences of things not going as intended or planned. You have to be willing to accept an element of risk, for without freedom there would be no mistakes. But to eliminate freedom is the biggest mistake of all: freedom alone breeds innovation and entrepreneurial success. Mistakes are a by-product of progress.
An ability to work with half-baked ideas	Ideas seldom leap into the world fully-formed and ready to go. They are more like new-born babies, struggling and gasping for life. They hesitate before dismissing an ill-formed idea or an imperfect proposal, for it may contain the germ of something really useful. It follows that team creativity in groups and organizations calls for listening leaders.
A willingness to bend rules	Rules and systems have their place, but they can obstruct the process of innovation dreadfully. A leader, as a member of the management team, should respect rules and procedures but he or she should not think like a bureaucrat. Sometimes creative dyslexia – the inability to read rules – is a strength rather than a weakness. Rules can sometimes be stretched where they cannot be broken. Without this you end up being bogged down in organizational treacle.

Cont. table 3.

An ability to respond quickly	The innovative organization must have leaders who are able to commit resources and not have to defer everything to committees or upwards to Higher Authority. To be able to allocate or obtain small resources now may be far better than being able to summon mighty resources in a year's time when it is too late.
Personal enthusiasm	Only leaders who are highly motivated themselves will motivate others. Enthusiasm is contagious. Moreover, enthusiastic leaders and colleagues tend to be intellectually stimulating ones.

Source: On basis: (Adair, 2021).

Another conception of highly creative people's traits gives us more information of their potential characteristics (Wolniak, Sułkowski, 2015, 2016; Wolniak, Grebski, 2018; Wolniak et al., 2019, 2020; Wolniak, Habek, 2015, 2016; Wolniak, Skotnicka, 2011). We put those traits into the table 4 with brew characteristics of them. We should remember that creative characteristics can vary according to tasks within the domain (Wolniak, Jonek-Kowalska, 2021; 2022). But there can be distinguished typical creative traits that can be useful in the case of almost every type of creative activities.

Table 4.
Traits of highly creative people

Trait	Characteristic
Sensitive	Being sensitive helps creativeness in many ways: a. it helps with awareness of problems, known & unknown b. it helps people sense things easier c. it helps to cause people to care and commit themselves to challenges or causes
Not motivated by money	As important as money is in most societies or economies it is not a driving force for a creative person. Generally, they have an intuitive sense of the amount of money they basically need and once that need is fulfilled then money stops affecting or driving them.
Sense of destiny	Intuitively creative people know that they have a purpose, a destiny or they realize that they can choose or create one to drive them to reach greater heights of skill, ability, or talent.
Adaptable	Without the ability to adapt people could not become creative. But rather than adapt to something they choose to adapt things to suit them, their needs or the goals they are striving towards
Tolerant of ambiguity	Two or more things or ideas being right at the same time challenges the thinking of a creative person. They love to be ambiguous to challenge other people and ideas. Ambiguity helps them see things from many different perspectives all at the same time.
Observant	Creative people constantly are using their senses: consciously, sub-consciously and unconsciously, even non-consciously.
Perceive world differently	Thoreau talked about people drumming to a different drum beat. Creative people thrive on multiple ways of perceiving: seeing, hearing, touching, smelling, tasting, sensing things. These different perspectives open up their minds to unlimited possibilities.
See possibilities	Average people, people who don't believe they are creative, people who are fearful or resistant to creativeness or creative thinking prefer to work within limits with limited possibilities. Creative people love to see many, even infinite possibilities in most situations or challenges
Question asker	Creative people, especially highly creative people, probably came out of their mothers' wombs asking questions. It's in their nature to question. Question yes, not actually criticize. Their questioning nature often mistakenly appears as criticism when it is simply questioning, exploring, examining, playing with things as they are or might be.
Can synthesize correctly often intuitively	This is the ability to see the whole picture, see patterns, grasp solutions with only a few pieces, even with major pieces missing. Creative people trust their intuition, even if it isn't right 100% of the time.

Cont. table 4.

Able to fantasize	Highly creative people love to wander through their own imaginary worlds.
Flexible	Creative People are very flexible when they are playing with ideas. They love to look at things from multiple points of view and to produce piles of answers, maybe, almost, when other people are content with the or an answer or solution.
Fluent	It could be a door stop, a boat anchor, a weapon, a prop, a weight for holding down papers, etc., etc., etc. This is what a creative person would say about the possible uses of a brick.
Imaginative	Creative people love to use their imagination to play to make it seem real to experiment.
Intuitive	The more creative a person is, the more they tap their intuition skills; the ability to see answers with minimum facts, to sense problems even when they aren't happening.
Original	Being original is a driving force for creative people. They thrive on it.
Ingenious	Doing the unusual. Solving unsolvable problems. Thinking what has never been thought of before. These are all traits of a creative person that make them be ingenious at times.
Energetic	Challenges, problems, and new ideas once committed by a creative person truly excite them and provide them with seemingly unlimited amounts of energy; such as Sherlock Holmes once he grasps a sense of the mystery.
Sense of humor	Laughter and creativity truly go together. Many experts believe that creativity can occur without a touch of humor believing that seriousness tends to squelch creativeness or creative thinking.
Self-actualizing	The psychologist Abraham Maslow created this term in the 1960s representing the ultimate motivator of people: the need or desire to be all you can be, to be what you were meant to be.
Self-disciplined	This is one trait that appears to be ambiguous in highly creative people. They can appear disorganized, chaotic at times while at the same time they are highly self-disciplined. At the same time, they greatly resist the discipline of other people who do not have a creative mind.
Self-knowledgeable	One of the few things highly creative people had in common is that they all kept some form of journal and were constantly striving to better understand themselves.
Specific interests	This is still another ambiguous trait of creative people. They appear on the surface to be interested in everything, while at the same time they have very specific interests that they commit their true energies and efforts to. By being willing to be exposed to seemingly unlimited interests they discover more about their particular specific interests.
Divergent thinker	Creative people love to diverge from the norm, to look at things from multiple positions, to challenge anything that exists. Because of this they are seen at times to be off-key, deviant, atypical, irregular, or uncharacteristic.
Curious	Creative people are continuously curious, often child-like.
Open-ended	In order to explore many possibilities creative people, tend to stay open-ended about answers or solutions until many have been produced.
Independent	Creative people crave and require a high degree of independence, resist dependence but often can thrive on beneficial inter-dependence.
Severely critical	Creative people challenge most every-thing, every idea, every rule. They challenge, challenge, and challenge some more to the point that most other people see their challenging as severe criticism.
Non-conforming	Conforming is the antithesis, the opposite of creativeness and in order to be creative, creative people must be non-conforming and go against the norm, swim upstream.
Confident	This is another ambiguous trait in creative people. When they are at their most creative they are extremely confident. When they are in a stage of frustration when nothing seems to be working they often lack confidence. After much positive experience they begin to trust themselves and know that they will become depressed, frustrated, nearly devastated but their internal subconscious confidence keeps them moving or at least floating until they experience or discover an aha! (a breakthrough idea or piece of information).
Risk taker	This trait is a general misunderstanding of many non-creative people or people who fear the creativeness of creative people. Highly creative people are not really risk-takers because they do not see what they are doing as a risk. They simply see it as a possible solution or path towards a solution. They have other possible solutions, often many others in their head or their notes to use if a particular idea or solution does work.
Persistent	Creative people do not give up on things that mean a lot to them.

Source: On basis: (Alan, 2021).

5. Conclusion

The publication concentrate on problems connected with various aspects of traits of highly inventive people. In the paper there is an analysis of the very important role of cognition in innovativeness. In the paper there is an analysis of various aspects of the role of cognition like: general intelligence, genius, cognitive abilities and observer judgments of intelligence. On the basis of the analysis following main traits of highly innovative peoples can be distinguished: sensitive, not motivated by money, sense of destiny, adaptable, tolerant of ambiguity, observant, perceive world differently, see possibilities, question asker, ability to synthetize, able to fantasize, flexible, fluent, imaginative, intuitive, original, ingenious, energetic, sense of humor, self-actualizing, self-disciplined, self-knowledgeable, specific interests, divergent thinker, curious, open-ended, independent, severely critical, non-conforming, confident, risk taker.

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