THE INFLUENCE OF TECHNOLOGY READINESS IN ORGANIZATIONAL LIFE. A STUDY WITH AEROSPACE INDUSTRY SPECIALISTS

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Abstract. *During the last decades, automatization gained a lot of attention in organizational studies. Usually defined as the performance done by a technological agent of a function previously done by a human agent, automatization's main aim is to increase the quality of products and services, by reducing waste to a minimum with zero errors. In the current study, we have selected technology readiness, defined as people's propensity to embrace and use new technologies to accomplish goals in home life and at work, as a specific predictor for both work performance and work engagement in the highly specialized space industry. The study was conducted in the framework of the SESAME project (Smart European Space Access through Modern Exploitation of data science - H2020-EU.2.1.6.1.) using a convenience sampling method. Because access to highly specialized employees in the aerospace industry is extremely difficult, we received responses from 30 highly specialized aerospace employees from the Guiana Space Center in Kourou. The data were collected through the following structured questionnaires: Technology Readiness Index, Work Performance, and Utrecht Work Engagement Scale. Data analyses were performed in SPSS 26.0. The analysis of the relationships between variables showed that technology readiness positively correlates with work performance and engagement. Current findings are supported by previous studies highlighting positive correlations between positive attitudes and motivation for use, actual system usage, and work performance. Practical implications of the recent study are discussed as some directions for future research in the area.*

Keywords: *technology readiness; work performance; work engagement; aerospace; SESAME.*

Introduction

Since the late 20th century, a large emphasis has been placed on automatization, defined as a process that controls a function or a task without the intervention of a human factor

(Billings, 1991). Parasuraman and Riley (1997) describe automatization as the performance of a technological agent (usually a computer) of a function previously done by a human agent. A more recent definition of the term has been provided by Lee and See (2004) who consider it the technology which selects and actively transforms data, makes decisions, or manages different operations.

One of the main benefits of automatization is its capability to perform complicated, repetitive tasks quickly and without errors (Hoff & Bashir, 2015). It enhances the quality and speed of operations, productivity, reliability, and sustainability, even under uncertain or risky conditions or for dangerous tasks (Frenc et al., 2018). Moreover, Friedmann (2006, p.144) demonstrated that automatization may increase the quality of products and services, by reducing waste to a minimum. This is because automatization may perform tasks with fewer errors than human operators or without errors, provided the automated system is correctly calibrated.

Literature review

Technology readiness

Previous empirical studies have shown that individuals have different personality traits that can influence their attitudes toward the use of technology (Rogers, 2003). According to Parasuraman (2000), technology readiness (TR) represents "people's propensity to embrace and use new technologies to accomplish goals in home life and at work" (Parasuraman, 2000, p. 308). In Parasuraman and Colby's (2001) opinion, this tendency to embrace and use new technologies might be explained by some personality traits such as openness to experience, dispositional optimism, innovativeness, tolerance to ambiguity (as facilitators to accept new technologies), and discomfort, risk adversity and insecurity (as inhibitors).

The four dimensions proposed by Parasuraman and Colby (2014) are:

"Optimism—a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives; Innovativeness—a tendency to be a technology pioneer and thought leader; Discomfort—a perceived lack of control over technology and a feeling of being overwhelmed by it; Insecurity—distrust of technology, stemming from skepticism about its ability to work properly and concerns about its potentially harmful consequences" (Parasuraman & Colby, 2014, p. 2).

Out of those four dimensions, optimism and innovativeness are considered to be drivers of technology readiness and are positively correlated with higher adoption rates of cutting-edge technology (Parasuraman & Colby, 2014), and, according to the well-known TAM model (Marikyan & Papagiannidis, 2021), more intense usage of technology (Lin & Chang 2011), and greater perceived ease in doing so (Massey et al., 2007). On the other hand, discomfort and insecurity, are considered to act as inhibitors of technology readiness.

According to Blut and Wang (2020), people having a high level of discomfort will consider using new technologies ad being unpleasant and overwhelming, and those scoring high on the insecurity dimension will express general safety concerns and worries about possible negative outcomes of technology usage, therefore, trying to avoid it (Blut & Wang, 2020).

Work engagement

Work engagement is usually defined as an independent, persistent, pervasive, positive, and fulfilling work-related affective–cognitive and motivational–psychological state (Schaufeli et al., 2002). This definition aligns with a series of studies that operationalize work engagement as a motivational–psychological state with three dimensions: vigor, dedication, and absorption (Schaufeli, Bakker, & Salanova, 2006; Bakker & Demerouti, 2008; Salanova & Schaufeli, 2008).

The first dimension, Vigor represents the energy levels and mental resilience of employees, together with the willingness to invest effort in the workplace and persistence when facing difficult tasks or demanding deadlines (González-Romá et al., 2006). The second dimension, Dedication, measures the employee's involvement in his/her work, and psychological identification with it, along with strong feelings of significance, enthusiasm, inspiration, pride, and challenge. The third characteristic is called Absorption, which describes an employee's immersion, high level of concentration, and engagement in work such that he/she loses track of time and has difficulties detaching from work (González-Romá et al., 2006).

The core dimensions of work engagement, namely Vigor, and Dedication (González-Romá et al., 2006), are considered to be the opposite of exhaustion and cynicism, the well-known dimensions of burnout. Moreover, a series of studies (Salanova et al., 2005; Xanthopoulou et al., 2009) have shown that work engagement correlates with task performance and contextual, extra-role performance (Bakker et al., 2004).

Engaged employees can access additional internal resources, positive emotions, and dispositional optimism and display better health, energy, and focus (Bakker & Demerouti, 2008). Also, an engaged employee manifests enthusiasm about his/her job and pursues and achieves challenging tasks, pushing themselves to extra effort (Schaufeli & Bakker, 2004; Leiter & Bakker, 2010), all of which lead to higher work performance (Bakker & Demerouti, 2008).

Work performance

According to Borman and Motowidlo (1993), workplace performance consists of two main factors. The first of the two factors identified by Borman and Motowidlo (1993) as part of the concept of work performance is the performance of the task, which describes the basic responsibilities of an employee and is reflected both in the specific results of work, but also in quality and quantity of these (Borman & Motowidlo, 1993). Also, according to Borman and Motowidlo (1993), the second factor that makes up work performance is contextual performance, which involves overcoming formal responsibilities associated with the job and is reflected in activities such as coaching and training colleagues. , strengthening social networks set up at the organizational level, or making additional efforts for the organization's benefit.

Moreover, Motowidlo and Van Scooter (1994) noted that, as a rule, employees are engaged in two types of performance: in-role and extra-role. For the two authors, in-role performance is defined as official outcomes and behaviors that directly serve organizational goals and objectives (Motowidlo & Van Scooter, 1994).

In addition to these behaviors, Bakker, Demerouti, and Verbeke (2004) also mention that "employees exhibit extra-role behaviors" (Bakker et al., 2004, p. 85). The examples proposed by Bakker, Demerouti, and Verbeke (2004) refer to the willingness to help colleagues whose workload is increased, volunteering for tasks, and defending the organization, or the behavior aimed to avoid problems in relationships with colleagues (Bakker, Demerouti, & Verbeke, 2004). As stated by Allen and Rush (1998), these behaviors are important for achieving organizational performance, especially long-term success (Allen & Rush, 1998).

Referring to the elements of job performance identified by Borman and Motowidlo (1993), Koopmans et al. (2001) identify as “prescribed in-role behavior” what Borman and Motowidlo (1993) call “task performance”. The same Koopmans et al. (2011) call, in the cited article, "extra-role discretionary behavior" what Borman and Motowidlo (1993) called in their work "contextual performance".

Griffin, Neal, and Neale (2001) noted that the two distinct dimensions of workplace performance, task, and contextual performance, are likely to contribute independently to organizational effectiveness (Griffin et al., 2001). According to a series of authors (Van Scotter & Motowidlo, 1996), ``task performance'' refers to the core technical behaviors and activities involved in the job, and ``contextual performance'' refers to behaviors that support the environment which the technical core operates. In the research carried out, the authors highlighted the fact that the importance of contextual performance is special because it represents a type of behavior that is under the direct motivational control of individuals the majority of the time, emphasizing, at the same time, the small number of studies focused on how the opportunity to engage in contextual behaviors might be restricted by situational demands (Griffin et al., 2001).

Reilly and Aronson (2009), describe those activities - which are not specific to tasks or objectives, but in the presence of which individuals, teams, and organizations, as a whole, register a high level of efficiency and success - known generically as contextual performance, as including behaviors such as: cooperating with and helping others, volunteering for extra-role activities, persevering with enthusiasm and extra determination to complete assignments, defending organizational goals, and following organizational policies even when this is inconvenient (Reilly & Aronson, 2009).

Moreover, contextual performance incorporates key aspects of o series of non-job-specific constructs (Borman & Motowidlo, 1993). Constructs such as organizational citizenship behavior (Bateman & Organ, 1983), extra-role behavior (Katz & Kahn, 1966), and prosocial organizational behavior (Brief & Motowidlo, 1986), often overlap with contextual performance.

Methodology

In this study, we aim to investigate the relationship between Technology Readiness, Work Performance, and Work Engagement. The objective is to identify how the Technology Readiness of employees might influence their Work Performance and Work Engagement.

Research questions

Starting from the previous findings in similar studies having different types of respondents and/or different methodological approaches, we have developed the following research questions:

RQ1: What relations can be identified between Technology readiness dimensions and Work performance?
RQ2: What relations can be identified between Technology readiness dimensions and Work engagement?

Sample and procedure

The study was conducted in the framework of the SESAME project (Smart European Space Access through Modern Exploitation of data science - H2020-EU.2.1.6.1.) using a convenience sampling method. Because access to highly specialized employees in the aerospace industry is extremely difficult, we have responses from 30 highly specialized aerospace employees from the Guiana Space Center in Kourou. The average age of the respondents was M=38.10 (SD = 10.93) and 83.3% (n=25) were male. The average tenure in the organization was 14.20 years (SD = 9.29). The respondents belonged to various hierarchical and functional levels: management (n=23, 76.7%), and execution (n=7, 23.3%). The questionnaire was implemented in the Google Forms platform together with the informed consent. The study meets all the criteria established within the ethical guidelines of the SESAME project.

Measures

The questionnaire comprised 74 questions over four sections and was adapted from the corresponding literature. The first section covered the demography of the respondents, the second section was about technology readiness containing 36 items (Parasuraman, 2000), the third section was about self-reported work performance containing 16 items (Goodman, & Svyantek, 1999), and the last one about work engagement with 17 items (Schaufeli & Bakker, 2004).

*Technology Readiness Index (*TRI, 2000) consists of 36 items to be responded to on a 6-point-Likert format from (1) Strongly disagree to (6) Strongly agree. Parasuraman and Colby (2001) chunk the Technology Readiness construct into four variables: optimism, innovativeness, discomfort, and insecurity. Examples of TRI construct items: *optimism* contains items such as "Technology makes you more efficient in your occupation", *innovativeness* includes items such as "You keep up with the latest technological developments in your areas of interest", *discomfort* includes items such as "Many new technologies have health or safety risks that are not discovered until after people have used them" and *insecurity* with items such as "If you provide information to a machine or over the Internet, you can never be sure it really gets to the right place". Reliability reported for the total score is α = .74 and ranges from α = .68 to α = .86 for single scales.

Work Performance was assessed with the 16 items scale developed by Goodman and Svyantek (1999) on a scale ranging from (1) Strongly disagree to (4) Strongly agree. The questionnaire comprises two dimensions: contextual performance (7 items) and task performance (9 items). An example of a Task performance item is: "You demonstrate expertise in all job-related tasks", the scale having a very good reliability of α = .92. Contextual performance was measured with items based on Smith, Organ, and Near's (1983) organizational citizenship behavior measure. An example item is: "You help other employers with their work when they have been absent" and the scale has excellent reliability of α = .94. The reliability obtained for the total score is α = .96.

Work Engagement was measured using Utrecht Work Engagement Scale developed by Schaufeli and Bakker (2004), a scale that measures work engagement on three dimensions: vigor, dedication, and absorption. Example items are: "At my work, I feel bursting with energy" (vigor), "At my work, I always persevere, even when things do not go well" (dedication), and "When I am working, I forget everything else around me" (absorption). All items were scored on a seven-point rating scale ranging from 0 ('never') to 6 ('always'). The reliability was very good for the composite score (α = .94) and for individual subdimensions (Vigor α = .84, Dedication α = .92, Absorption α = .85).

Results

Data analyses were performed in SPSS 26.0 (IBM Corporation, 2019). Moreover, because the present study is based on self-report questionnaires, we performed Harman's single-factor test to detect the possible impact of common method bias (Tehseen, Ramayah, & Sajilan, 2017). As prior research (Podsakoff et al., 2003) recommended, all items corresponding to selected variables were loaded into an exploratory factor analysis to check whether one factor can explain the majority variance. The results indicated that the first factor accounted only for 22.47% of the variance and, therefore, the common method bias is not a pervasive issue in this study.

The conceptual model can be seen in Figure 1.

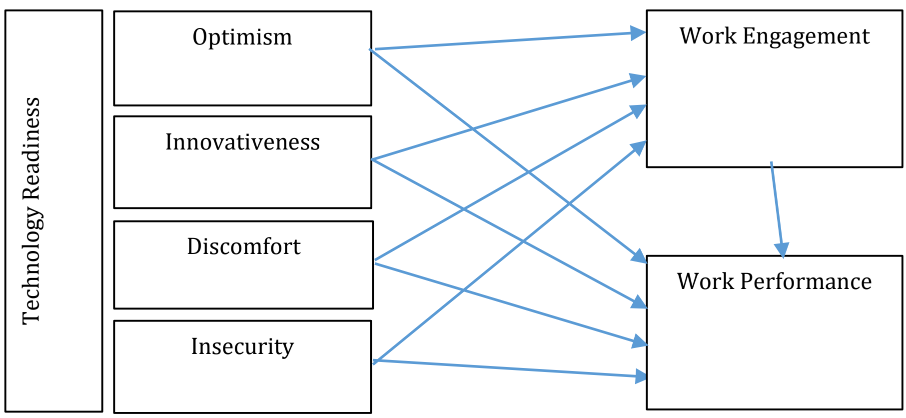

Figure 1. The proposed research model (Author's Own Source)

Descriptive Statistics

Means, standard deviations, and bivariate correlations for all the study variables are presented below. Regarding the Technology Readiness scores, in Table 1 it can be observed that the composite score of the TRI is M=3.39, SD=.33. The highest score on the subdimensions was obtained for Optimism (M=3.81, SD=.61), followed by Innovativeness (M=3.46, SD=.78), Insecurity (M=3.27, SD=.54) and Discomfort (M=3.01, SD=.45). The analysis of the skewness and kurtosis scores reveal a normal distribution of data.

Table 1. Technology Readiness Descriptive Statistics (Author's Own Source)

	N	Mean	Std. Dev.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Optimism	30	3.8167	.61649	-.349	.427	-.769	.833
Innovativeness	30	3.4617	.78435	-.395	.427	.158	.833
Discomfort	30	3.0187	.45351	.159	.427	-.158	.833
Insecurity	30	3.2730	.54541	.307	.427	-.344	.833
TRI	30	3.3923	.33364	.924	.427	.604	.833

Moving further with the analysis, it was observed (Table 2) that self-reported job performance also got high scores both on the composite score – general performance (M=3.96, SD=.44) and the two subdimensions, namely Contextual (M=3.78, SD=.82) and Task performance (M=3.84, SD=.95). The analysis of the skewness and kurtosis scores display an abnormal (nonparametric) distribution of data. Therefore, the Spearman rho correlation will be used in the following analysis.

Table 2. Job Performance Descriptive Statistics (Author's Own Source)

	N	Mean	Std. Dev.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Contextual	30	3.7803	.82390	-1.920	.427	5.150	.833
Task	30	3.8473	.95141	-1.634	.427	3.380	.833
PERFORMANCE	30	3.9640	.44912	.132	.427	.215	.833

The last construct selected for analysis was work engagement. The scores showed (Table 3) a very good level of work engagement for the selected sample (M=4.13, SD=.74). Moreover, all three subdimensions of work engagement also indicate high levels of vigor (M=4.15, SD=.70), dedication (M=4.18, SD=.96) and absorption (M=4.07, SD=.81). The analysis of the skewness and kurtosis scores display a normal data distribution.

Table 3. Work Engagement Descriptive Statistics (Author's Own Source)

	N	Mean	Std. Dev.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Vigor	30	4.1507	.70331	.687	.427	.412	.833

Dedication	30	4.1867	.96123	-.280	.427	.475	.833
Absorption	30	4.0777	.81326	.803	.427	-.030	.833
ENGAGEMENT	30	4.1350	.74754	.672	.427	.730	.833

Inferential statistics

In order to answer the previously mentioned research questions, the Spearman and Pearson bivariate correlation was calculated, both between the composite scores of the selected variables and between the corresponding sub-dimensions of each scale.

RQ1: What relations can be identified between Technology readiness dimensions and Work performance?

As can be observed in Table 4, Task performance positively correlates with Optimism (rho=.605, p<.01) and Innovativeness (rho=.507, p<.01) dimensions of the Technology readiness scale.

The second type of performance, contextual, correlates only with the Optimism (rho=.394, p<.05) dimension of the Technology readiness scale. Similarly, the composite score of work performance positively correlates with the Optimism (rho=.460, p<.05) and Innovativeness (rho=.451, p<.05) dimensions and negatively with the Insecurity (rho=-.369, p<.05) dimension of the Technology readiness scale.

Table 4. Spearman's correlation matrix between Work Performance and Technology Readiness (Author's Own Source)

		Optimism	Innovativeness	Discomfort	Insecurity
Contextual	Correl. Coeff.	.394*	.295	-.171	-.061
	Sig. (2-tailed)	.031	.113	.366	.748
Task	Correl. Coeff.	.605**	.507**	-.180	-.354
	Sig. (2-tailed)	.000	.004	.340	.055
PERFORMANCE	Correl. Coeff.	.460*	.451*	-.326	-.369*
	Sig. (2-tailed)	.010	.012	.079	.045

RQ2: What relations can be identified between Technology readiness and Work engagement?

Similarly, the Pearson correlation coefficients (table 5) show a positive correlation between the composite score of work engagement and both positive dimensions of Technology readiness, Optimism (r=535, p<.01), and Innovativeness (r=540, p<.01).

Table 5. Spearman's correlation matrix between Work Performance and Work Engagement (Author's Own Source)

		Optimism	Innovativeness	Discomfort	Insecurity
Vigor	Pearson Correl.	.485**	.470**	-.253	-.353
	Sig. (2-tailed)	.007	.009	.178	.056
Dedication	Pearson Correl.	.578**	.623**	-.353	-.216
	Sig. (2-tailed)	.001	.000	.056	.253
Absorption	Pearson Correl.	.403*	.386*	-.004	-.285
	Sig. (2-tailed)	.027	.035	.983	.127
ENGAGEMENT	Pearson Correl.	.535**	.540**	-.219	-.308
	Sig. (2-tailed)	.002	.002	.245	.097

The Vigor dimension of work engagement also correlates with the two positive scales of technology readiness, namely Optimism (r=485, p<.01) and Innovativeness (r=470, p<.01). Furthermore, the Dedication dimension of work engagement shows a strong positive correlation with the same two dimensions of technology readiness, Optimism (r=578, p<.01) and Innovativeness (r=623, p<.01).

Furthermore, in an explorative approach, we have calculated the correlation matrix (table 6) between work performance and work engagement. The results showed significant correlations between the work performance composite score and work engagement composite score (rho=.424, p<.05). The same positive correlations were observed also for the work performance composite score and Vigor (rho=.416, p<.05) and Dedication (rho=.502, p<.01) dimensions of work engagement.

Table 6. Spearman's correlation matrix between Work Performance and Work Engagement (Author's Own Source)

		Vigor	Dedication	Absorption	ENGAGEMENT
Contextual	Correl. Coeff.	.108	.112	.251	.206
	Sig. (2-tailed)	.569	.556	.182	.275
Task	Correl. Coeff.	.274	.265	.172	.210
	Sig. (2-tailed)	.142	.158	.362	.265

PERFORMANCE	Correl. Coeff.	.416*	.502**	.348	.424*
	Sig. (2-tailed)	.022	.005	.059	.020

Results show that the readiness of people to embrace technology could predict how much they will perform and how engaged they will be in their job. In particular optimism and innovativeness are supporting this relationship. At the same time, we notice that the composite work performance score correlates negatively with the insecurity (rho=-.369, p<.05) dimension of the Technology readiness scale. Thus, our research shows similar results (Parasuraman & Colby, 2014) stating that optimism and innovativeness are considered drivers of technology readiness and are positively correlated with higher adoption rates of cutting-edge technology, and more intense usage of technology (Lin & Chang, 2011). However, these results don't touch upon performance, either contextual or task or any type of engagement.

Conclusions

Although the results cannot be generalized beyond the current sample, they point to the fact that companies should understand that employee performance and engagement are strongly related to their attitude toward new technologies. Being aware of that, companies should pay much more attention to attitudes and beliefs that people manifest in relation to technology (Parasuraman & Colby, 2001).

Despite the valuable findings of this study, it is not without limitations. One of this study's main weaknesses is that the questionnaires were self-reported, and the tendency is to investigate and report attitudes, rather than behaviors (Hughes et al., 2018). Another issue to be considered when evaluating the results is the small sample, which makes the results difficult to generalize. However, it is almost impossible to access in the aerospace industry, especially at Guiana Space Center.

Future research directions offer the opportunity to expand the topics addressed in this study by adding new variables in the analysis, such as Attitude Towards Technology, Trust in Automation, perceived usefulness, and perceived ease of use of specific technologies (in our case algorithms).

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