Autonomy, motivation, knowledge and individual absorptive capacity as promoters of innovative behavior at work

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Abstract

Purpose – This study aims to evaluate the effect of diversity of knowledge and intrinsic motivation on individual absorptive capacity, its effect on innovative behavior at work, as well as the moderating effect of autonomy at work.

Design/methodology/approach – Data collection was carried out at the Companhia do Metropolitano de São Paulo – Metrô – obtaining 192 valid questionnaires, which were analyzed using descriptive statistics and structural equation modeling with partial least squares estimation.

Findings – Intrinsic motivation and diversity of prior knowledge have a direct effect on individual absorptive capacity (IAC) and an indirect effect on innovative work behavior (IWB). The relationship between IAC and IWB is strengthened as work autonomy increases (moderating effect).

Research limitations/implications – The results are not generalizable as this is a nonprobabilistic sample with respondents from the public sector who have job stability.

Practical implications – To encourage innovative behavior at work, the organization can implement practices that promote autonomy at work, and consider personal experiences that are not directly related to work during the selection and hiring process.

Social implications – By valuing life experience and autonomy at work and promoting innovative behavior at work, a working environment in which people feel good must be created.

Originality/value – The main highlights are the operationalization of the diversity of prior knowledge as a three-dimensional construct that promotes IAC, in addition to the moderating effect of autonomy at work.

Keywords Individual absorptive capacity, Innovative behavior at work, Autonomy at work, Structural equation modeling

Paper type Research paper

1. Introduction

Individual absorptive capacity (IAC) can be understood as the micro level of absorptive capacity (AC) and is defined as a process that begins with the organization members, who learn from the external environment: identifying and acquiring knowledge external to the

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organization and, in sequence, assimilating and applying it in the internal environment (Cohen & Levinthal, 1990; Lane, Koka, & Pathak, 2006; Zahra & George, 2002).

Investing in studies on this concept is relevant as it responds to the problematization of efforts to understand how organizations would survive in dynamic, complex and expanding scenarios, with increased accessibility to knowledge, in addition to the need to obtain competitive advantage (Lane et al., 2006; Yildiz, Murtic, Klofsten, Zander, & Richtnér, 2020; Zahra & George, 2002).

To obtain significant corporate results, organizations depend on people, who are the primary actors in the creation and replacement of knowledge (Cohen & Levinthal, 1990; George & Zhou, 2001; Lane et al., 2006; Majhi, Snehvrat, Chaudhary, & Mukherjee, 2020; Tian & Soo, 2018). Despite this, before IAC was highlighted as a possible answer to understanding corporate successes, studies focused on the organizational level, that is, AC was studied with the exact dimensions as IAC (Cohen & Levinthal, 1990; Lane et al., 2006).

Based on studies by Zahra & George (2002) and Lane et al. (2006), researchers began to understand that these capabilities are inherent to individuals, not organizations. Thus, this article reinforces studies at the individual level and proposes the expansion of future studies along these lines.

In light of the above, this research goes in this direction by operationalizing the IAC in two dimensions: the potential individual absorptive capacity (PAC-ind) and the individual absorptive capacity of realization (RAC-ind), and by including it in a nomological network with diversity of prior knowledge (DPK) and intrinsic motivation (IM) as antecedents, innovative behavior at work (IBW) as dependent variable and autonomy at work (AW) as moderating variable.

Thus, this research aims to evaluate the effect of diversity of knowledge and intrinsic motivation on IAC, its effect on innovative behavior at work and the moderating effect of autonomy at work.

Based on the results of this research, we hope it will be possible to think about hiring criteria and other people management practices that consider the background of IAC and IBW; we also hope that the availability of validated scales will contribute to the continuity of studies.

2. Theoretical background

This section defines the constructs and justifies the hypotheses that make up the conceptual model.

2.1 Individual absorptive capacity

IAC is an offshoot of the concept of CA, advocated by Cohen and Levinthal in 1989. CA was initially defined at the organizational level as the ability of an organization to acquire and assimilate external knowledge, transform it and apply it in the internal environment of that organization (Cohen & Levinthal, 1990).

However, a corporation does not have its own capacity for these skills, but its members do; it cannot act or exist independently of its members (Yildiz et al., 2020). In another work, Yildiz, Murtic, Zander, & Richtnér (2019) reinforce that if a company wants to obtain innovative capacity (organizational level), it will depend on individuals, as they are the ones who play the crucial role via IAC. In studies by Zahra & George (2002), IAC is clearly defined and divided into two dimensions: individual potential absorptive capacity (PAC-ind) and individual realized absorptive capacity (RAC-ind), which will be detailed below.

2.1.1 Individual potential absorptive capacity (PAC-ind) and individual realized absorptive capacity (RAC-ind). PAC-ind deals with the potential capacity that an individual must have to acquire new knowledge, i.e. to acquire and assimilate knowledge external to the organization in which they are inserted.

Acquiring knowledge in the context of PAC-ind is the ability that an individual has to seek, identify, evaluate and recognize new knowledge generated externally to the company, coming from suppliers, customers, markets, cultures, new technologies or any opportunities that may be potential or relevant in favor of the company (Lowik, Kraaijenbrink, & Groen, 2016, 2017; Majhi et al., 2020). *Assimilating* means analyzing, interpreting, understanding external information, processing the acquired knowledge and evaluating whether it matches or adapts to the organizational context in which it is inserted (Flatten, Engelen, Zahra, & Brettel, 2011; Lowik et al., 2016, 2017; Zahra & George, 2002). In this dimension, it must also be clear whether the knowledge is transferable and understandable to other organization members (Lowik, Kraaijenbrink, & Groen, 2012, Lowik *et al.*,2017).

RAC-ind deals with the ability to transform and apply acquired and assimilated knowledge in the organization's internal processes or leverage new knowledge learned in the previous stage, for purposes beneficial to the organization (Zahra & George, 2002).

In the context of RAC-ind, the *knowledge transformation* dimension combines or integrates new knowledge with existing knowledge to create new ideas, products, services and processes (Lowik et al., 2012, 2016, 2017; Zahra & George, 2002). Flatten et al. (2011) say it means developing possibilities to adjust existing and new knowledge. The *apply* dimension is the incorporation of knowledge acquired, assimilated and transformed into the individual's daily operations or routines at work or even for the creation of new products, services and processes (Lowik et al., 2012, 2016, 2017; Majhi et al., 2020; Zahra & George, 2002). For Flatten et al. (2011), it is the ability to improve or transform existing knowledge into something new based on the transformed knowledge.

2.2 Diversity of prior knowledge

Individuals recognize the quality of new knowledge, understand its contexts, explore it, understand where and how it can be incorporated for innovation to the extent and based on prior knowledge and diversity of experiences (Martinkenaite & Breunig, 2016; Ojo, Raman, & Chong, 2017; Smith, Collins, & Clark, 2005).

Lowik et al. (2017, p. 1328) defined DPK from three sources: "the variety of knowledge that an individual possesses, resulting from education, work experiences and life experiences." The greater and broader this diversity, the greater the possibility of learning new and different information domains and understanding others (Lowik et al., 2012; 2017).

Cohen & Levinthal (1990), Lowik et al. (2012, 2017), Ojo, Raman, Chong, & Chong (2014) and Ojo et al. (2017) only analyzed experiences in the workplace, that is, previous experiences related to work. As there is an influence of DPK not related to the work domain – life experiences – which also influence the work context *but are not yet operationalized in the literature*, the development of a scale for its measurement is one of the contributions of this research.

2.3 Intrinsic motivation

Motivation concerns aspects of activation and intention, such as energy, direction and persistence to do something. It is what makes the individual produce something, but for this purpose, there are two types of triggers or impulses: internal and external.

According to Li et al. (2018), IM facilitates the willingness to take risks and challenges, mobilizes efforts and evokes perseverance. In this way, intrinsically motivated people do not

work for the reward but for the pleasure of the activity because it is interesting for the person. IM takes the person to greater levels of effort to sustain the willingness to obtain necessary skills such as PAC-ind (Yildiz et al., 2019).

2.4 Innovative behavior at work

To maintain an advantage in the market, organizations must have employees who develop and implement new ideas, approaches or procedures, that is, they need to have innovative behavior at work (Majhi et al., 2020).

De Jong & Den Hartog (2010, p. 24) define the CIT construct based on four dimensions, which will be used in this research: *exploration of ideas*, which means seeking opportunities for problems that arise in the work environment; *idea generation* means the creation of new ideas, such as new products, services or processes; *promoting ideas* means making the explored and generated idea relevant in the work context; finally *implementation of ideas* concerns bringing the explored, generated and promoted ideas to happen.

2.5 Autonomy at work

Autonomy at work (AW) can be characterized by making decisions independently or flexibly and with a certain degree of freedom in the individual's work activities (Majhi et al., 2020). Studies on AW have been unfolding since 1976, with the research of Hackman and Oldham, who analyzed the amount of freedom and independence an individual has in carrying out their duties in their work environment (Morgerson & Humphrey, 2006).

Morgerson and Humphrey (2006) developed and adapted a questionnaire (Work Design Questionnaire – WDQ) based on previous studies, where autonomy means "a job that allows freedom, independence and discretion to schedule work, make decisions and choose the method for perform tasks" (Hackman & Oldham, 1976, p. 258).

2.6 Research hypotheses and conceptual model

Figure 1 presents the conceptual model of the research, whose hypotheses are justified below.

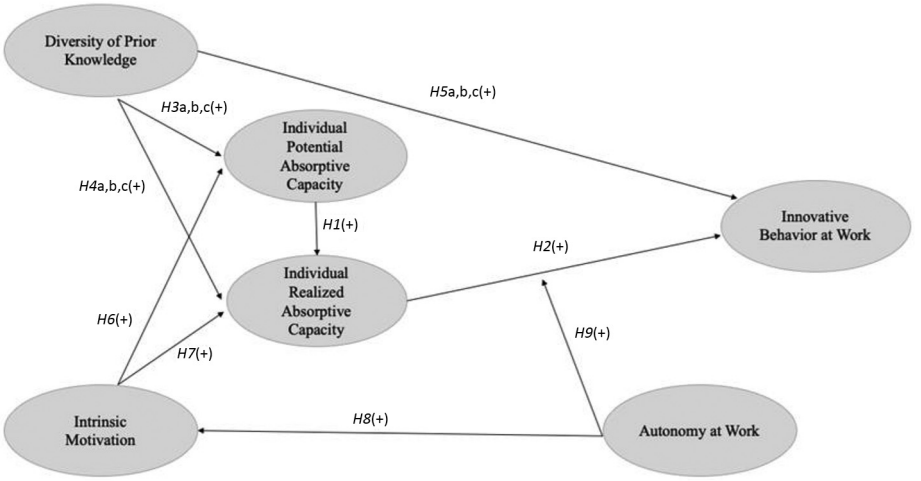
The first hypothesis is not new, as the relationship between PAC-ind and RAC-ind has already been researched by Majhi et al. (2020), Ojo et al. (2017) and Lowik et al. (2012, 2016, 2017), that is:

H1. PAC-ind positively influences RAC-ind.

It is possible to understand that the creation of knowledge by individuals can originate from the internal environment; however, Van Wijk, Van den Bosch, & Volberda (2011, p. 274) state that "relevant and valuable knowledge is generally located outside the boundaries of companies." In studies by Zou, Ertug, & George (2018), IAC is positively related to IBW regarding different sizes of organizations, contributing to the following hypothesis of this research:

H2. RAC-ind is positively related to IBW.

The third hypothesis is new, as is the operationalization of the DPK construct, as defined in this research. The relationship between DPK and IAC was proposed in studies by Cohen & Levinthal (1990), Lowik et al. (2012, 2017) and Ojo et al. (2017) but did not include the life



Notes: Diversity of prior knowledge is three dimensions, so there are three hypotheses in each arrow (a; b; c: done this way to keep the figure simple)
Source: Prepared by the authors

Figure 1.
Conceptual model

experience dimension; despite this, their results support that individuals with high DPK (education, work experiences) also have a high level of IAC.

Studies by George & Zhou (2001), Malmendier, Tate, & Yan (2011), Newton & Shreeve (2002), Pandya (2020) and Su et al. (2020) deal with the influences of life experiences not related to work but which impact the work environment and there are no studies relating them to IAC. It is possible to conceive that both work-related and nonwork-related experiences can positively influence IAC.

Thus, the following hypotheses are established for this research, considering that the DPK construct is three-dimensional (education, work experience and life experience) and that it can influence IAC in its two dimensions (PAC-ind and RAC-ind):

H3a. DPK (education) positively influences PAC-ind.

H3b. DPK (work experience) positively influences PAC-ind.

H3c. DPK (life experience) positively influences PAC-ind.

H4a. DPK (education) positively influences RAC-ind.

H4b. DPK (work experience) positively influences RAC-ind.

H4c. DPK (life experience) positively influences RAC-ind.

DPK provokes learning and problem-solving, which produces innovation (Cohen & Levinthal, 1990). According to Smith et al. (2005), knowledge diversity can increase innovation and creativity since new ideas and insights emerge from combinations of existing knowledge.

According to George & Zhou (2001), people with more life experiences also have a greater capacity for creative behavior if they receive positive supervisor feedback. Thus, the following hypotheses are declared:

H5a. A DPK (education) is positively related to IBW.

H5b. A DPK (work experience) is positively related to IBW.

H5c. A DPK (life experience) is positively related to IBW.

IM moves the individual to engage in activities such as generating new ideas (creativity), which is analogous to learning (Ojo et al., 2014). For Li et al. (2018), individuals with high IM have strong desires to seek challenges and learning opportunities (which is a CAI context).

Similarly, Yildiz et al. (2019) mention that the individual would be more or less willing to develop their IAC skills according to their level of motivation. In this way, it is possible to hypothesize that:

H6. IM is positively related to PAC-ind.

H7. IM is positively related to RAC-ind.

Autonomy is essential for IM to carry out challenging activities in different contexts, such as between teachers and students, parents and children and generalized in other domains – the person is intrinsically motivated, but if it is interesting for them (Gagné & Deci, 2005). Therefore, it is hypothesized that:

H8. AW is positively related to IM.

It is also possible to conclude that AW is an important variable to be analyzed in this research because, on the one hand, a person may have a high IAC (RAC-ind), but if they do not have AT, they will not behave innovatively (IWB) or their innovative behavior will be limited; on the other hand, if the person has high IAC and high AW, they will probably have high IWB. Thus, it is hypothesized that:

H9. The higher the AW, the stronger the relationship between RAC-ind and IWB (moderating effect of AW).

3. Methodological procedures

This section describes the procedures for preparing instruments, collecting and analyzing data.

3.1 Instrument development

The instrument consists of five scales, one for each construct: IAC, DPK, IM, IWB and AW. Due to space limitations, the items were not included as an appendix, but can be obtained from the first author.

For scales that required translation, we followed the recommendations of Cha, Kim, & Erlen (2007), semantic validity (translation, back translation and equivalence check). Face validation was carried out by four people from HR and the corporate University of Metrô, as well as six other people belonging to the target audience of the research.

The DPK construct has three dimensions: education, work experience and life experience. The education dimension was measured by two training indicators:

(1) duration (in years) of formal education; and

(2) average number of days spent on professional training per year.

The items in this dimension were subjected to translation and face validation.

For the work experience dimension, we adopted the three items from the studies by Ojo et al. (2017). All of these items were subjected to translation and face validation. The dimension was measured using a five-point Likert scale, with 1 being "totally disagree" and 5 "totally agree," according to the original scale.

From the literature review, 11 items were created to measure life experience, but after a pilot test, some with low factor loadings were deleted, leaving five items in the final version. The dimension was measured on a scale of 1 to 5, with 1 being "never" and 5 "always". For this dimension, they were also subjected to content validation with experts.

According to Zahra & George (2002), CA was divided into two sets: PAC-ind with the dimensions *acquire* (4 items) and *assimilate* (3 items) and RAC-ind with the dimensions *transform* (4 items) and *apply* (3 items). The translation into Portuguese of Agostineto's (2019) dissertation was used, and even so, it was submitted for content validation to adapt to the context of this research. A five-point Likert scale was used, with 1 being "totally disagree" and 5 "totally agree".

The IWB construct was measured as a second-order latent variable with four dimensions: *exploration of ideas* (2 items), *generation of ideas* (3 items), *promotion of ideas* (2 items) and *implementation* of ideas (3 items). The version translated by Barbarini (2015) was used, with face validation to adapt to the context of this research. The items measure the frequency of actions or behaviors adopted by the respondent in the work environment, on a five-point scale with 1 being "never" and 5 "always".

The scale adopted to measure IM was based on studies by Gagné et al. (2010), who built an instrument to measure motivation at work with four dimensions. We adopted only the IM dimension of this instrument, which has three items (for example: "Because I like this job"), and was subjected to validation content because it comes from the original instrument in English. The respondents had to answer the question, "To what degree do the following reasons apply to your work?", with 5 options: 1 = nothing; 2 = a little; 3 = moderately; 4 = strong; 5 = very strong.

The scale to measure AW was taken from the work design questionnaire developed by Morgerson and Humphrey (2006). TA was modeled as a second-order latent variable with three dimensions: *autonomy in work planning* (3 items), *autonomy in decisions* (4 items) and *autonomy in achievement* (2 items). Regarding the items, the respondent should agree/disagree (five-point Likert) about the autonomy the company provides.

An emerging method marker variable was included to evaluate and control common method bias (CMB), which had no relationship with the model constructs: six items related to sustainable attitude (Braga, Merlo, & Silva, 2016). This procedure is recommended by Chin, Thatcher, Wright, & Steel (2013).

The pre-test was carried out in the Metro itself and received 53 valid responses, which was enough to estimate the complete model in SmartPLS. The sole objective was to identify items that could have content problems (visible by low or negative factor loadings). At the end of this pre-test, items were excluded, and new ones were inserted in the education dimension; five items in the life experience dimension were excluded; the complete scale of the work autonomy variable was replaced since there were only four items and two had low loadings.

3.2 Data collection and analysis

The Companhia do Metropolitano de São Paulo – Metrô, a large company with around 8,500 employees, agreed to participate in this study, providing a declaration of consent for the research and dissemination of results, with the support of the HR sector, making the demands of this study available. The state-owned company, controlled by the Government

of the State of São Paulo, Brazil, was considered an excellent research choice because it has actions to train its employees for innovation, envisioning a learning opportunity.

After the pre-test and respective analyses and adjustments to the instrument, the HR sector applied the final version of the instrument to around 200 employees with positions of supervisors and area coordinators via email, with the survey link and initial explanatory text; the survey was developed on the Google Forms platform.

The minimum sample size of 153 participants was determined by the GPower software, as Ringle, Silva, & Bido (2014) indicated, but a higher number was obtained: 192 participants.

The techniques used to process the collected data were descriptive statistics and structural equation modeling, with convergent and discriminant validity and reliability analyses, followed by the evaluation of structural coefficients. The software used for data analysis was SmartPLS 3.3.2 (Ringle, Wende, & Becker, 2015).

4. Results

Participants have the following profile: in terms of age, an average of 50 years; all have leadership positions with an average of 54.6 subordinates; an average of 6.09 years in the same position; and an average of 30 years of professional experience (regardless of being in that corporation). Most respondents have completed higher education (44%), and 53% have a postgraduate degree.

To assess CMB, an exploratory factor analysis without rotation was performed with all items (Harman test). The first principal component did not extract more than 50% of the total variance, it extracted 23.4%, and there were 13 principal components with eigenvalue > 1. Therefore, according to the Harman test, the CMB is not a problem. In addition to this analysis, the structural model was compared with and without the method's emerging marker variable (Chin et al., 2013), which resulted in differences smaller than 0.08 in the structural coefficients, confirming that the bias of the method is negligible in the present model.

Figure 2 presents the factor loadings and structural coefficients. Given their complexity, it was necessary to reduce their size, which can make reading difficult, but the results are presented and commented on in the following tables.

Table 1 presents the correlation matrix between the first-order variables. The values on the highlighted diagonal are the square root of the average variance extracted (AVE) and are higher than the correlations between the latent variables (values outside the diagonal); therefore, there is discriminant validity (Hair, Hult, Ringle, & Sarstedt, 2017).

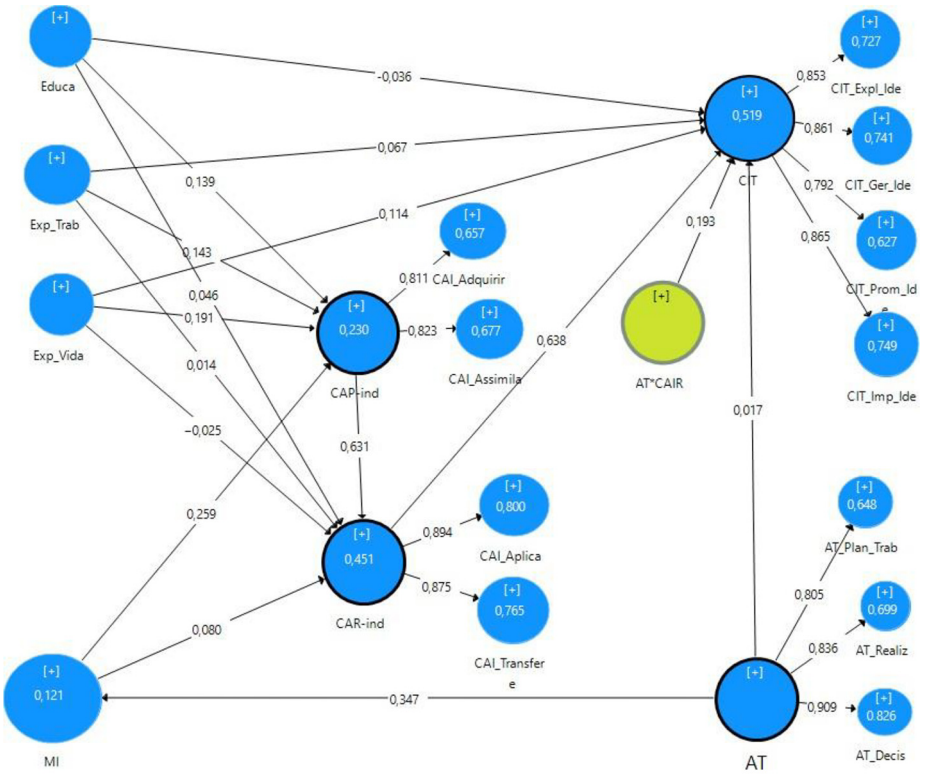
The AVE values all have values greater than 0.5, which means that they have high convergent validity when related to themselves. The composite reliabilities (CR) of the latent variables are all above 0.7, as mentioned in the literature (Hair et al., 2017); therefore, they are adequate.

Next, Table 2 presents the matrix of correlations between the constructs of the structural model and second-order latent variables. Convergent validity and composite reliability are adequate, that is, AVE ≥ 0.5 and CR ≥ 0.7 (Hair et al., 2017).

Table 3 presents the results of evaluating the structural model, with six out of the nine hypotheses confirmed (*H1*, *H2*, *H3*, *H6*, *H8* and *H9*).

According to Table 3, the coefficients of determination (R^2) were evaluated. High effects were obtained for the endogenous variables according to Cohen (1988): RAC-ind (43%), IWB (50%), PAC-ind (21%), less, but still a high effect, and IM (11%) with medium effect.

We also assessed whether the relationships were significant (p-value), and for this, the bootstrapping function was used with a significance level of 5% (Hair et al., 2017). Considering the model's goodness-of-fit indicators, the predictive validity (Q2) was analyzed,



Notes: Second-order latent variables are: CAR-ind, CAR-ind, AT, CIT. AT = AW = Autonomy at Work; CAP-ind = PAC-ind = Potential Individual Absorptive Capacity; CAR-ind = RAC-ind = Absorptive Capacity for Individual Achievement; Educa = Education; CIT = IBW = Innovative Behavior at Work; MI = IM = Intrinsic motivation; Exp_Vida = Life experience; Exp_Trab = Work experience

Source: Prepared by the authors

Figure 2.
Structural model

which must be greater than zero, according to Hair et al. (2017). Regarding the relative importance of the predictors (f^2), the relationships PAC-ind – RAC-ind and RAC-ind – IWB can be considered to have a large effect. Only AW-IM showed a medium effect, and the others a low effect, according to Cohen's reference (1988).

The moderator variable AW*RAC-ind-IWB (*H9*) analysis was initially run in SmartPLS 3.3.2 using the bootstrap function, 10,000 repetitions, to assess whether the relationships are significant. It turned out that detecting bimodality made it impossible to use these results, so Kock's standard error (2018) was used instead. Thus, moderation became significant, resulting in 0.193 ($p = 0.005$); f^2 of the moderator (0.075) is considered high according to the professor Kenny's classification (Hair et al., 2017).

Figure 3 helps to understand the moderating effect: on average, the relationship between RAC-ind and IWB is positive (0.638), but when considering the moderating effect of AW, AW increases and strengthens the relationship between RAC-ind and IWB (dotted line).

Table 1.
Correlation matrix between first-order latent variable

First-order latent variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 - AW_Decision	*0.807*														
2 - AW_Work_Plan	0.553	*0.843*													
3 - AW_Achievement	0.692	0.527	*0.893*												
4 - IAC_Acquire	0.028	0.165	0.023	*0.732*											
5 - IAC_Apply	0.151	0.110	0.176	0.48	*0.751*										
6 - IAC_Assimilation	0.188	0.242	0.303	0.366	0.447	*0.835*									
7 - IAC_Transfer	0.093	0.262	0.114	0.482	0.565	0.443	*0.732*								
8 - IBW_Exploration_Idea	0.097	0.104	0.058	0.554	0.552	0.372	0.451	*0.819*							
9 - IBW_Generation_Idea	0.134	0.125	0.149	0.556	0.577	0.310	0.418	0.706	*0.816*						
10 - IBW_Implem_Idea	0.120	0.170	0.096	0.460	0.536	0.391	0.510	0.642	0.655	*0.859*					
11 - IBW_Promotion_Idea	0.162	0.142	0.133	0.468	0.505	0.410	0.457	0.480	0.574	0.629	*0.791*				
12 - Education	−0.013	0.059	0.049	0.166	0.123	0.142	0.153	0.125	0.087	0.070	0.036	*F*			
13 - Work experience	0.077	0.227	0.118	0.309	0.159	0.214	0.254	0.177	0.154	0.222	0.192	0.134	*0.785*		
14 - Life experience	0.156	0.171	0.183	0.291	0.191	0.250	0.195	0.251	0.271	0.235	0.226	0.105	0.264	*0.721*	
15 - Intrinsic motivation	0.301	0.335	0.237	0.360	0.256	0.223	0.303	0.349	0.397	0.348	0.382	−0.013	0.343	0.306	*0.83*
Composite reliability	0.882	0.880	0.887	0.821	0.795	0.874	0.776	0.891	0.856	0.894	0.870	F	0.828	0.842	0.869
Average variance extracted	0.651	0.711	0.797	0.536	0.564	0.698	0.536	0.671	0.665	0.737	0.626	F	0.616	0.521	0.690

Notes: Values on the diagonal are the square root of the average variance extracted. Subtitle: AW_Decision = Autonomy at Work, decision-making autonomy dimension; AW_Work_Plan = Autonomy at work, work planning dimension; AW_Achievement = Autonomy at work, achievements dimension; IAC_Acquire = Individual absorptive capacity, acquire dimension; IAC_Apply = Individual absorptive capacity, apply dimension; IAC_Assimilation = Individual absorptive capacity, assimilation dimension; IAC_Transfer = Individual absorptive capacity, transfer dimension; IBW_Exploration_Idea = Innovative behavior at work, ideas exploration dimension; IBW_Generation_Idea = Innovative behavior at work, idea generation dimension; IBW_Implem_Idea = Innovative behavior at work, idea implementation dimension; IBW_Promotion_Idea = Innovative behavior at work, promotion of ideas dimension; F = Formative measure = Average of standardized scores of: (i) level of education (2nd degree. . .) and (ii) average number of days/year with training

Source: Prepared by the authors

Construct of the structural model	1	2	3	4	5	6	7	8
1 - Autonomy at Work	*0.851*							
2 - PAC-ind	0.215	*0.817*						
3 - RAC-ind	0.195	0.666	*0.884*					
4 - IBW	0.172	0.661	0.676	*0.843*				
5 - Education	0.030	0.199	0.155	0.096	*F*			
6 - Work experience	0.158	0.302	0.232	0.222	0.134	*0.785*		
7 - Life experience	0.196	0.329	0.219	0.291	0.105	0.264	*0.721*	
8 - Intrinsic motivation	0.345	0.372	0.315	0.437	−0.013	0.343	0.306	*0.830*
Composite reliability	0.887	0.800	0.877	0.907	F	0.828	0.842	0.869
Average variance extracted	0.724	0.667	0.782	0.711	F	0.616	0.521	0.690

Notes: Diagonal values are the square root of the EMV. Subtitle: F= formative; PAC-ind = Potential individual absorptive capacity; RAC-ind = Absorptive capacity for individual achievement; IBW = Innovative behavior at work
Source: Prepared by the authors

Table 2. Matrix of correlations with the construct *formative education*

The representation of the confirmed hypotheses in Figure 4 made it more explicit that IAC and the sequence of relationships fully mediate the effects of intrinsic motivation and diversity of prior knowledge and that the effect of PAC-ind is also fully mediated by RAC-ind, which makes much sense. These total mediations were not noticed only by analyzing Table 3.

Structural relations	Hypothesis	Effect size (f^2)	Path coefficient	Standard error	*t*-value	*p*-value	Q^2 predict	R^2 ajust.
PAC-ind → RAC-ind	*H1(+)*	0.558	0.631	0.063	9.89	0.000	0.078	0.436
Educa → RAC-ind	*H4a(+)*	0.004	0.046	0.071	0.64	0.520		
Work Exp → RAC-ind	*H4b(+)*	0.000	0.014	0.071	0.19	0.845		
Life Exp → RAC-ind	*H4c(+)*	0.001	−0.025	0.072	0.34	0.730		
IM → RAC-ind	*H7(+)*	0.009	0.080	0.071	1.12	0.260		
Educa → PAC-ind	*H3a(+)*	0.024	0.139	0.070	1.97	0.047	0.177	0.214
Work Exp → PAC-ind	*H3b(+)*	0.022	0.143	0.070	2.03	0.041		
Life Exp → PAC-ind	*H3c(+)*	0.041	0.191	0.069	2.74	0.006		
IM →PAC-ind	*H6(+)*	0.072	0.259	0.068	3.77	0.000		
Educa → IBW	*H5a(+)*	0.002	−0.036	0.072	0.49	0.620	0.181	0.503
Work Exp → IBW	*H5b(+)*	0.008	0.067	0.071	0.94	0.346		
Life Exp → IBW	*H5c(+)*	0.023	0.114	0.070	1.61	0.106		
RAC-ind → IBW	*H2(+)*	0.751	0.638	0.063	10.0	0.000		
AW*CAR-ind → IBW	*H9(+)*	0.075	0.193	0.069	2.77	0.005		
AW → IM	*H8(+)*	0.137	0.347	0.067	5.14	0.000	–	0.116

Notes: VIF < 1.3, therefore, multicollinearity is not a problem for interpreting the relative importance of predictors. *t*-values and *p*-values were estimated from Kock's (2018) standard error. Subtitles: AW = Autonomy at Work; PAC-ind = Potential individual absorptive capacity; RAC-ind = Absorptive capacity for individual achievement; Educa = Education; IBW = Innovative behavior at work; IM = Intrinsic motivation; Life Exp = Life experience; Work Exp = Work experience; Q^2_predict = Predictive validity; R^2 adj. = Adjusted R square
Source: Prepared by the authors

Table 3. Structural model results

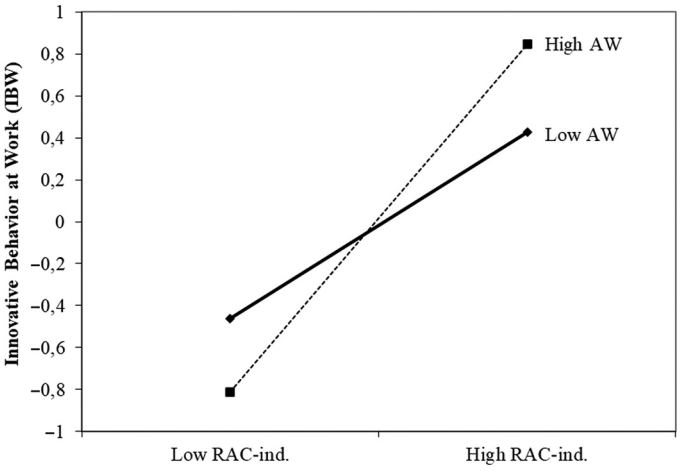


Figure 3.
Moderator effect

Source: Prepared by the authors

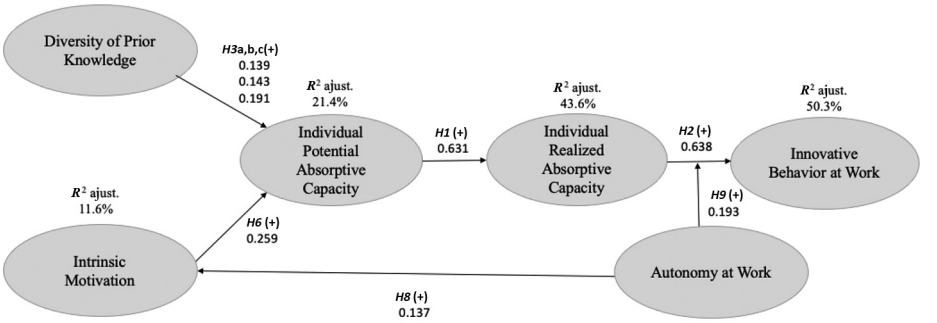


Figure 4.
Structural model with confirmed hypotheses

Source: Prepared by the authors

5. Results and discussions

After investigation and analysis of the structural model, six out of nine hypotheses were empirically confirmed.

H1(+), where PAC-ind influences RAC-ind, was supported (0.631; $p < 0.05$), demonstrating significance in this relationship. In the context of this research, the hypothesis suggests that Metrô employees use their absorptive capacities for achievements, which means transforming and applying new knowledge in the organization's internal processes, driven by their own potential absorptive capacities, i.e. the ability to acquire and assimilate new knowledge. The same conclusion can be drawn from the literature, as already mentioned in the studies by Majhi et al. (2020), Ojo et al. (2017) and Lowik et al. (2012, 2016, 2017).

H2(+) is supported (0.638; $p < 0.05$), in addition to the effect demonstrated in (f^2 of 0.751). This means the strong influence of the RAC-ind variable on innovative behavior at work. Metro managers expect the IWB, but more importantly, they need to understand that the dimensions of RAC-ind are fundamental to this event. It is necessary to consider the indirect

influences on the IWB by PAC-ind, IM and DPK, as they all contribute to this strong correlation, as demonstrated in the study. The background that influences the CIT is covered in the literature, as already verified by Lowik et al. (2017), Smith et al. (2005) and Zou et al. (2018). Therefore, this research reinforces the bibliographic review.

H3(+), subdivided into (a) education (0.139; $p < 0.05$); (b) work experience (0.143; $p < 0.05$) and (c) life experience (0.191; $p < 0.05$), which were hypothesized to influence PAC-ind, were all supported. In this way, the dimensions of acquiring and assimilating new knowledge by Metrô employees stand out. The three dimensions of DPK proved to be influences in this study.

H4(+) is also subdivided into (a) education (0.046; $p > 0.05$), (b) work experience (0.014; $p > 0.05$) and (c) life experience (−0.025; $p > 0.05$), which was hypothesized to influence RAC-ind; nevertheless, it was not supported. Although some studies confirm the influence of the education and work experience dimensions on IAC (Cohen & Levinthal, 1990; Lowik et al., 2012, 2017; Ojo et al., 2017), no such influence was detected in this research. It is possible to understand that these diversities may influence other variables, such as the one supported in *H3*, and therefore, not necessarily disregard future studies, as there was some interference in the structural model impacting in some way on the IWB.

Regarding *H5*(+), which has the same influences, but now in IWB: (a) education (−0.036; $p > 0.05$); (b) work experience (0.067; $p > 0.05$) and (c) life experience (0.114; $p > 0.05$), none were directly supported. No hypothesis like this was found in the literature, which motivated this analysis. Even though this hypothesis was not supported, it confirmed that the DPK dimensions can indirectly influence the IWB of Metro employees.

H6(+), where it was hypothesized that IM is positively related to PAC-ind, was supported (0.259; $p < 0.05$), in addition to having been proven in previous studies such as Yildiz et al. (2019) and Tian & Soo (2018). Our study confirms that the IM of Metrô employees influences potential absorptive capacities; however, this does not occur with *H7* (+), where IM does not influence the absorptive capacities of achievements.

H8(+) is the AW variable that is positively related to IM and was supported (0.347; $p < 0.05$). Therefore, the greater Metrô employees' autonomy in their work environment, the greater their intrinsic motivation. *H9*(+) as a moderator of the structural model was supported (0.193; <0.05), thus confirming that the more AW increases, the greater the influence of achievement absorptive capacities on innovative behavior at work. The study of AW was not found as a moderating variable in the literature, and, therefore, the contribution of this research in this sense is unprecedented, even though studies of AW were found directly relating to innovation processes in the internal environment (Welter, Sausen, & Rossetto, 2020).

6. Conclusions

The proposal of this study to analyze the effects of IAC on IWB was achieved, as expected: it was possible to analyze an unprecedented conceptual structure, although with some relationships already proven in the literature, and based on these results, we created a diagnostic instrument to analyze the learning capabilities of individuals in organizations, to find out whether employees can achieve innovative work behavior, and to obtain sufficient corporate results to keep the corporation competitive in the market.

The influence of IAC on IWB is verified in the literature but not in the complex way this study demonstrates; thus, this research reinforces the existence of this relationship in another context: a public institution in São Paulo, Brazil. Although the greatest effect and significance, in addition to the high correlation of this study, was observed between the variables RAC-ind and IWB, it is noteworthy that there is an indirect influence of the

constructs that precede RAC-ind, such as PAC-ind, DPK and IM. In this vein, the hypothesis that RAC-ind strongly influences the IWB can be reinforced with actions in all dimensions of the IAC and its antecedents. The antecedents of the IWB, carried out in this study, as they stand, are unprecedented and will not be found in the literature but can be pointed out in isolation in the studies already mentioned.

The dimensions of PDK, education, work experience and life experience, were confirmed in this research but only partially confirmed by the literature (Cohen & Levinthal, 1990; Lowik et al., 2012, 2017; Ojo et al., 2017), as the life experience dimension was a scale created for this research, so it will not be found elsewhere. Education is the only dimension that can be intentionally improved if there is an interest in interfering with PAC-ind. Despite the successful measurement, the *H4* and *H5*, which have the DPK dimensions as influences on RAC-ind and IWB, were not supported.

MI positively relates to IAC in the literature, as verified by Yildiz et al. (2019) and Tian & Soo (2018); however, the same does not happen when checked more thoroughly as in this study, when the influences of IM on PAC-ind and RAC-ind are separated. Therefore, it is possible to understand that the IM of Metrô employees has some indirect interference in their IWB. As for the AW that Metrô employees have in their work environment, it has been proven that the more it is granted, the greater the intrinsic motivation of employees will be; that it will impact PAC-ind directly and indirectly on IWB, in addition to the moderating impact. The AW construct in a conceptual model moderating IAC and IWB will not be found in the literature; therefore, this analysis is also unprecedented.

After the conclusions of this study and the creation of this instrument, it is possible to apply the scales herein, wholly or in part, to obtain results at other organizational levels or specific departments of the Metro and other organizations from different segments. The results of this research for the Metro can also be considered a diagnosis to outline possible people management strategies, such as training and development for area coordinators and supervisors, if they want to intensify their IWB, despite demonstrating satisfactory results. Given the influence of this moderating variable, it is possible to think about improving autonomy management at work, which strengthens the relationship between IAC and IWB. For example, the IM of these employees can be improved by managing work autonomy.

This research can be the basis for future studies, as potential possibilities for analysis with other structural models were observed, using some or all the scales supported here. The following is a possible research agenda:

- relate IM with IAC with the moderation of the organizational commitment construct;
- test the relationships supported in this research in other corporate segments; and
- carry out analysis at the departmental level to diagnose the influences of IACs on IWB performance, for example.

This research also presents limitations. Since the applicability of this instrument in other contexts was suggested, it is necessary to emphasize that this research was applied to an audience with preselected positions. Thus, for a nonprobabilistic sample, it is considered that there is no possibility of generalizing the results, even if this same study is applied to a similar audience (coordinators and area supervisors) in another segment. Since our sample comes from a public institution, where employees have job stability, this may interfere with the results compared to a private institution. Another limitation is that the research data is cross-sectional, which means that it is a result obtained from the current state of management and should not be considered immutable.

Hopefully, the creation of this instrument can bring academic contributions to research and corporate practices: to develop training focused on enhancing capabilities as well as strategies in people management, such as careers, promotions, motivations, leadership styles, among others.

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Further reading

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