“Impact of educational process innovation on the satisfaction of higher education students in Ecuador”

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IMPACT OF EDUCATIONAL PROCESS INNOVATION ON THE SATISFACTION OF HIGHER EDUCATION STUDENTS IN ECUADOR

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Abstract

Innovation in educational processes is a key factor for student satisfaction, as it guarantees quality, academic retention, and institutional competitiveness in higher education. This study aimed to evaluate the impact of innovation in educational processes on student satisfaction in higher education institutions in Ecuador. A quantitative approach was used, with a non-experimental, cross-sectional, and explanatory design. The sample consisted of 388 university students from Guayaquil, one of the largest cities in Ecuador, who completed a structured, online, Likert-scale questionnaire after providing their informed consent between September and October 2024. Innovation in educational processes was conceptualized through two core dimensions: structure and process management. Student satisfaction was analyzed through three dimensions: trust and security, tangible elements, and motivation to participate. To ensure the validity and reliability of the constructs, exploratory and confirmatory factor analyses supported by structural equation modeling (SEM) were conducted using SPSS version 26 and AMOS version 22. The results showed that process structure had a significant effect on trust and security ($\beta = 0.65$, $p < 0.001$), tangible elements ($\beta = 0.37$, $p < 0.001$), and motivation ($\beta = 0.77$, $p < 0.001$). Similarly, process management significantly influenced trust and security ($\beta = 0.65$, $p < 0.001$), tangible elements ($\beta = 0.62$, $p < 0.001$), and motivation ($\beta = 0.72$, $p < 0.001$). In conclusion, innovation strategies in educational processes substantially affect student satisfaction, highlighting the importance of effective and progressive academic management in Ecuadorian higher education.

Keywords student satisfaction, innovation, higher education, academic services

JEL Classification I23, O31, O15, M53

INTRODUCTION

In the current context of profound educational transformation, one of the most significant differentiators among Higher Education Institutions (HEIs) lies in their capacity to innovate educational processes (Guo, 2023), positioning them as highly attractive environments for students pursuing academic excellence (González-Castellano et al., 2021). From a systemic perspective, Sipe (2020) defines innovation as a dynamic process of generating, adopting, assimilating, and utilizing knowledge that holds value across both academic and economic domains. When strategically integrated into institutional management systems, such innovation enables the optimization of services, diversification of academic offerings, and access to emerging educational markets (Elzinga et al., 2023).

Student well-being, considered a fundamental objective of HEIs (Dežan & Sedmak, 2023), requires the integration of complementary factors that shape a holistic academic experience (Timotheou et al.,

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2023). In this regard, effective management of educational process innovation, led by institutional leaders, is a key driver in consolidating inclusive, relevant, and sustainable learning environments (Costa et al., 2023). Moreover, the intersection between institutional communication and student services serves as a strategic axis to foster student engagement, motivation, and the construction of meaningful professional pathways (Sá, 2023; Bellare et al., 2023).

Given that student dissatisfaction has emerged as a critical indicator of educational quality (Cho et al., 2023; Langan & Harris, 2024), the need to innovate and align educational processes with the demands of a changing market is paramount (Barrenechea et al., 2023). Despite growing interest in educational innovation, empirical research in developing countries remains limited (Woltering et al., 2009).

1. LITERATURE REVIEW AND HYPOTHESES

Student satisfaction in Higher Education Institutions (HEIs) is closely linked to how innovation is managed within institutional operations, as highlighted by Al Maani and Shanti (2023). This relationship seeks to validate the effectiveness of strategic initiatives aimed at enhancing educational quality and student engagement (Zambrana et al., 2023). Caccamo et al. (2023) emphasize that management and innovation function as complementary elements that foster dynamic, pedagogical processes capable of converting information into meaningful educational outcomes. Similarly, Mendioroz et al. (2022) and Chirumalla (2021) define innovation management in HEIs as a strategic cycle of planning, development, and evaluation of core institutional activities. Within this framework, three critical components interact: the use of information technology in educational services, the role of the student body, and the structural configuration of HEIs (Li et al., 2023).

The interrelationship of these components supports the operational development of knowledge-based actions, their dissemination through research programs, and professional certification following the completion of academic training – key indicators of innovation in institutional processes. This innovation is vital not only for effective learning transfer but also for fostering continuous professional development among faculty members, who lead and renew knowledge within each academic discipline (Chapman et al., 2021). As a result, innovation in educational processes is positioned as a strategic mechanism for institutional transformation, academic relevance, and sustained student satisfaction within contemporary Higher Education Institutions (HEIs). Brew and Saunders (2020) emphasize that effective management of such processes relies on setting clear goals that promote systemic balance. This perspective requires all institutional areas to be fully engaged in designing, implementing, and evaluating pedagogical and organizational strategies (Alenezi, 2023; Ejigu & Desalegn, 2023).

At a deeper level, Pantzos et al. (2023) propose integrating variables related to ideologies, values, attitudes, and motivations shared by academic and administrative staff into institutional objectives. This axiological and cultural alignment not only strengthens organizational commitment but also acts as a strategic facilitator for achieving results oriented toward student success. In this sense, the innovative management of educational processes cannot be separated from a holistic vision that articulates structures, resources, and human capital based on the well-being and overall satisfaction of students.

According to the Organization for Economic Cooperation and Development (OECD), innovation is the main action that organizations apply through the management of internal and external processes with the aim of modifying attractive products, services, organizational identity, and marketing items. Changes that occur at the level of internal and external processes are also known as technological and non-technological innovations (Arevalo et al., 2023). Pihlajamaa (2023) considers it important to describe the changes that must be applied in an organization to apply a type of innovation appropriate to the problem, such is the case of open innovation, which uses a holistic methodology, the results of which in institutions lead to the strengthening of internal actions as a starting point before the application of innovation with external characteristics.

Based on this criterion and transformation process, this reference is taken as a significant antecedent in the present research to internal innovation as the referring conceptualization for the effective analysis in the structure of the innovation processes applied by the organization (Rotondo et al., 2023).

While the application of the external innovation criterion is identified through the management of the processes, where the treatment of the economic resources available to the educational establishment is managed based on the influence of external factors (Wilden et al., 2023). Bortagaray and Aguirre-Bastos (2021) consider two dimensions that explain how innovation management is measured in an organization: processes and systems. Regarding the characteristics of systems, these are explained by the characteristics present in the environment in which the organization operates, where their factors can influence the promotion or the degree of difficulty in carrying out the organization's innovative activities. Wei et al. (2023), for their part, indicate that the processes are shown through the actions executed in the development of tasks previously outlined in a management model approved by management. Fontalvo et al. (2021) explain that innovation development can be applied through three development channels: the internal part, with the execution of models, and the external part, with the influence of factors specific to the environment.

From another perspective, Arias et al. (2024) define innovation management as a concept of dynamic activities that identify alternatives to respond to situations where, in addition to providing the service, value is generated for the student within the institution. For the organization to offer services oriented to student satisfaction, Akimov et al. (2023) describe that it is important that the perception of the service be considered as one of the objectives on which the interaction and feedback applied to the staff in each of the institution's operational processes are planned. Bhagat et al. (2023) describe that there is a model that allows identifying key aspects to guarantee the coverage of student needs, such as trust and security, tangible elements, and motivation to participate. In general, the student satisfaction variable can be described as a set of activities and processes established and redirected towards the objectives of an organization, where the new panorama seeks to guide the operation towards fully covering the needs and perspectives of the student (Scherer et al., 2021). Hanaysha et al. (2023) explain that there is an efficient management model that includes dimensions capable of measuring student satisfaction and innovation. These are listed through seven criteria that attempt to outline the organization's actions, primarily in the identification of innovation activities implemented by the institution's management. The dimensions are described as strategic planning, leadership, human talent competitiveness, processes, satisfaction level, organizational structure, and social responsibility.

By identifying these criteria as a measurement model, there is an opportunity to understand which areas require greater attention within service management, in order to improve the quality of services offered and meet student needs. Goh and Sigala (2020) consider that in changing and highly competitive environments, processes related to service operational innovation can persist and even change due to their flexibility in responding to changing needs. Faced with this criterion, which highlights the importance of innovation as an adaptive component to changing environments, it becomes a strategy for efficient development. It includes setting goals that allow for the inclusion of creativity and the establishment of objectives that significantly impact processes. Sacoto-Loor et al. (2023) affirm that the effects of implementing an innovation in processes aid decision-making for the development of new services, measurement methods, and techniques that subsequently evaluate student reactions. Finally, for Estrada et al. (2021), the combination of internal factors that shape the scope of service innovation processes in an organization guarantees a successful management process for the services offered because all efforts, including the use of technology, processes, planning systems, and project management, are directed toward meeting student expectations.

The exposition of the background based on the results of different authors of the subject allows us to foresee a positive result in the management of process changes mainly in the modification of services coupled with the changing demands on the needs of students in terms of higher education services, however, to understand how to achieve efficient changes it is necessary to establish a system of equations that demonstrates the causal relation-

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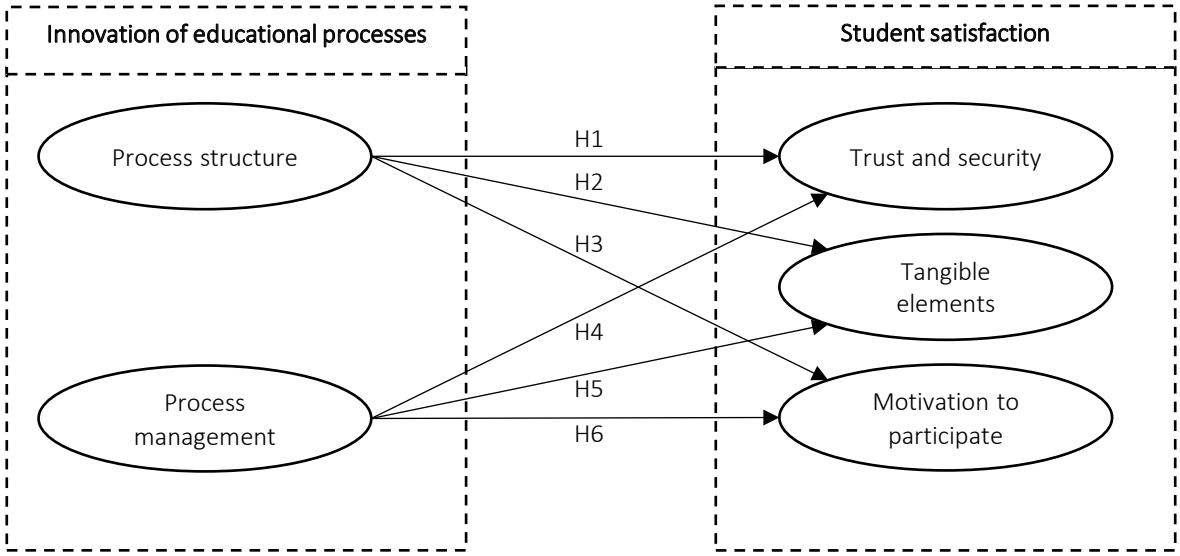

Figure 1. Theoretical model of hypothetical research scenarios

ship between two variables present in the environment and with criteria of significance of changes between them.

Therefore, the present research work aimed to measure the impact of the innovation of educational processes on student satisfaction from the perspective of EES in Ecuador. These theoretical relationships allowed us to create the theoretical model presented in Figure 1.

From the literature review, six hypotheses were derived, which are expected to be tested, these are:

H1: The structure of the processes maintains a positive relationship with trust and security.

H2: The structure of the processes maintains a positive relationship with the tangible elements.

H3: The structure of the processes maintains a positive relationship with the motivation to participate.

H4: Process management maintains a positive relationship with trust and security.

H5: Process management maintains a positive relationship with tangible elements.

H6: Process management maintains a positive relationship with the motivation to participate.

2. METHOD

In the methodological planning of this study, the Lucas classification (Lucas, 2003) was applied. Regarding the type of research, it is empirical in nature due to the need to show conclusions based on a concrete and verified analysis of the relationship between variables that lead to the verification of hypotheses. Regarding the study criterion, it is identified as associative, since the study is based on demonstrating a relationship between two variables investigated in scientific articles, such as student satisfaction and innovation management. Finally, as a statistical analysis technique, a structural equation model (SEM) was used through a latent variable design.

The sample consisted of students from a higher education institution located in the city of Guayaquil, Ecuador. The universities in this city were selected because they are among the most important in the country. Regarding the sample treatment, a non-probability sampling technique was used due to the identification of the members as students of the higher education institution. Its size was defined as 388 students, whose characteristics were based on the selection of students enrolled in the different areas, without differentiating their age, economic situation, or academic level. The sample was characterized by students between 18 and 25 years old, the most representative being 21 years old (28.4%), 20 years old (17%), and 19 years old (12.9%). 52.1% were male and 47.9%

were female. Students of business (26.5%), social studies (20.6%), and engineering (21.1%) stood out. Regarding the years of study, the most notable were 3 years (31.2%), 2 years (27.1%), and 1 year or less (22.2%) (Table 1).

Table 1. Main characteristics of the participating sample

Sample control variables		f	%
Age	18	46	11.9
	19	50	12.9
	20	66	17.0
	21	110	28.4
	22	40	10.3
	23	35	9.0
	24	28	7.2
	25	13	3.4
Gender	Male	202	52.1
	Female	186	47.9
Professional career	Business	103	26.5
	Social	80	20.6
	Health	60	15.5
	Engineering	82	21.1
	Law	46	11.9
	Other	17	4.4
Years of study	1 year or less	86	22.2
	2 years	105	27.1
	3 years	121	31.2
	4 years	63	16.2
	5 years or more	13	3.4
n	388		

The data collection process was carried out in a rigorously systematic manner, framed within the ethical and methodological principles of scientific research. Initially, the study objectives and the content of the questionnaire were clearly communicated to the sample members, guaranteeing the anonymity and confidentiality of their responses. Voluntary participation, the academic purpose of the study, and the secure storage of the collected data were emphasized. To safeguard the identity of the participants, no personal data that could allow their direct identification were requested. The data collection tool was structured based on the dimensions corresponding to the variables proposed in the hypothetical scenarios. The variable "innovation in educational processes" was operationalized through two dimensions: process structure (evaluated with six items) and process management (with three items). Student satisfaction was addressed through three dimensions: trust and security (10 items), tangible elements (4 items), and motivation to participate (2 items). Each item was rated using a five-point Likert scale, ranging from "strongly disagree" to "strongly agree" (see Appendix A).

The questionnaire was adapted from González-Zamar et al. (2020), who validated a 30-item instrument aimed at assessing the relationship between innovation and student satisfaction, showing adequate psychometric properties in university contexts. The questionnaire was administered digitally using Google Forms, distributed via a WhatsApp link. Data were collected over a month and a half (September-October 2024) because students were attending classes during these months, with an average duration of 20 minutes per participant. To analyze the results obtained in this study, psychometric properties of the instruments used were first assessed to ensure the quality, validity, and reliability of the measures used to adequately represent the variables within the university setting analyzed. Construct validity was addressed through the combined application of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), complementary methodologies that allow examining the internal structure of the scales and verifying their theoretical-empirical fit.

In the EFA, data adequacy was assessed using the Kaiser-Meyer-Olkin (KMO) index, accepting values greater than 0.70 as indicative of substantial correlation between items. Bartlett's test of sphericity was also applied with a statistical significance of $p < 0.05$, which demonstrates the non-randomness of the correlations between items and justifies the use of factor analysis. The estimation methodology was performed using the unweighted least squares (ULS) method, recommended for ordinal scales and moderate samples. The decision regarding the number of factors was based on a comparison of empirical and random values, supported by the scree plot and the eigenvalue greater than one rule. To optimize factor interpretation, direct oblique rotation (Oblimin) was used, and a minimum acceptable factor loading of 0.40 was established, as indicated by Izquierdo et al. (2014).

Subsequently, the Weighted Least Squares Means and Variance Adjusted (WLSMV) estimation method was used in the CFA, which is appropriate for samples with non-normal data and ordinal

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scales, offering greater robustness to the results. To assess model fit, multiple goodness-of-fit indices were used, including: the relative chi-square index (χ^2/df), accepting values less than 5; the comparative fit index (CFI) and the Tucker-Lewis index (TLI), with values greater than 0.90 considered optimal; the root mean square error of approximation (RMSEA), with values less than 0.08; and the standardized root mean square residual (SRMR), with cutoffs less than 0.08. and the WRMR index, with adequate values below 1. Factor loadings were considered acceptable with values greater than 0.50.

Regarding reliability, Cronbach's alpha and omega coefficients were applied, both of which were accepted with values greater than 0.65. These coefficients allowed for the internal consistency of the dimensions and the coherence of the items with each other to be established. Additionally, descriptive statistics such as the mean, standard deviation, skewness, and kurtosis were analyzed, as well as the corrected item-total correlation, with values greater than 0.30 considered indicators of good discrimination.

To test the hypotheses, a structural equation model (SEM) was implemented, applying the same fit criteria as the CFA under WLSMV estimation. Two levels of analysis were distinguished: the measurement model, which evaluated the reliability of the factor loadings, and the structural model, which represented the relationships between the latent variables. Structural coefficients were interpreted based on their magnitude, categorizing impacts as small (≥ 0.10), moderate (≥ 0.30), and large (≥ 0.50). This comprehensive approach allowed for rigorous empirical validation of the proposed theoretical model.

3. RESULTS

This results section shows the values obtained by applying the indicators described in the previous analysis point, projecting differentiated reports based on the presence of dimensions that explain the variables under analysis, such as innovation management and student satisfaction. All these results are shown below.

Based on the values presented in Table 2, the descriptive results of the dimensions of innovation in educational processes can be observed. At the inferential level, the item-remainder evaluation level is shown, which verifies that each of the arguments meets a good discriminatory capacity, since the indicator level details values above 0.30. In relation to the suitability of the AFE methodology, in which the polychoric correlation matrix is evaluated, a KMO = 0.854 was obtained as an indicator, which is qualitatively described as an acceptable range in the interpretation of partial correlations, while Bartlett's sphericity recorded a significance of $\chi^2 = 2286.99$, gl = 66, $p < 0.001$. In relation to the factors or dimensions, an extraction of two factors could be observed; the model proposes that 50.83% is explained by two factors.

Table 2. Descriptive, discriminatory, and factor loading reports on educational process innovation

Items (Observable variables)	Half	Dev. standard	Asymmetry	Kurtosis	Item-rest correlation	Factors	
						Process structure	Process management
IN1	4.13	0.799	−0.782	0.349	0.378	0.848	0.095
IN2	4.20	0.761	−0.991	1.167	0.423	0.749	0.003
IN3	3.91	0.882	−0.714	−0.022	0.540	0.706	0.104
IN4	3.39	1.089	−0.216	−1.007	0.641	0.693	0.079
IN5	3.67	1.046	−0.464	−0.348	0.352	0.564	−0.199
IN6	4.01	0.827	−0.519	−0.299	0.636	0.562	−0.085
IN7	3.81	0.815	−0.159	−0.607	0.450	0.556	−0.175
IN8	3.96	0.848	−0.463	−0.429	0.485	0.514	−0.124
IN9	4.19	0.765	−0.850	0.662	0.425	0.448	−0.299
IN10	3.41	1.181	−0.226	−0.907	0.558	−0.076	−0.917
IN11	3.21	1.154	0.047	−1.028	0.766	0.082	−0.751
IN12	3.83	1.052	−0.679	−0.409	0.444	0.290	−0.529

Note: IN = Innovation.

For the classification of the arguments that are not part of the conceptual explanation, the following results were obtained, for the argument IN7 it showed a relationship for the process structure factor of 0.556 while in the management of the processes with –0.175, as question IN8, a relationship of 0.514 was obtained for the first factor and –0.124 for the second factor. For argument IN12, a level of 0.290 was shown for the first factor and –0.529 for the second factor. In summary, it is ensured that the arguments presented can be clearly classified into the two factors described at a theoretical level on innovation management, these are: process structures and process management (see Table 2).

Student satisfaction, on the other hand, obtained the following results. For the analysis of the suitability of the polychoric correlation matrix through the KMO indicator, it gave a result of 0.936 and Bartlett's sphericity test of significance of $\chi^2 = 5215.801$, df = 153, $p < 0.001$. Representing the categorization of the arguments, called total explained variance of student satisfaction, it is shown that three factors explain the variable by 63.01%. That is, it can be concluded that the presentation of the arguments can be represented through the three dimensions proposed and conceptually confirmed: trust and security, tangible elements, and motivation to participate.

For the classification of the arguments that are not part of the conceptual explanation, the following results were obtained: for the argument, SS8 showed a relationship for the factor of 0.376 for trust and security, 0.262 for tangible elements, and 0.414 for motivation for participation. Regarding SS12, values of 0.270 were obtained for trust and security, 0.425 for tangible elements, and 0.305 for motivation to participate (see Table 3).

To identify the reliability of the dimensions that explain the variables of innovation in educational processes and student satisfaction, calculations were presented for two reliability indicators: alpha and omega. The alpha results show values above the minimum allowed of 0.70, except for motivation to participate, which yielded a value of 0.664. However, to avoid reliability distortion due to the size of the results, the alpha value was used. The omega value, an indicator that measures the variability of the results according to factorial classification, indicates that the alpha results are similar, exceeding the allowed 0.70, unlike the last component, which again places motivation slightly below the allowed limit. Regarding the inter-item weighting levels, it is observed that, on average, the weighting is moderate, demonstrating that the results obtained maintain an adequate level of internal consistency among the arguments collected and classified by dimensions (see Table 4).

Table 3. Descriptive, discriminatory reports and factor loadings of student satisfaction

Items (Observable variables)	Half	Dev. standard	Asymmetry	Kurtosis	Item-rest correlation	Factors		
						Trust and security	Tangible elements	Motivation to participate
SS1	3.82	0.885	–0.649	0.150	0.541	0.465	0.180	0.240
SS2	3.61	0.959	–0.583	–0.044	0.761	0.797	–0.284	0.395
SS3	3.94	0.919	–0.791	0.482	0.589	0.797	–0.047	0.001
SS4	3.94	0.980	–0.915	0.540	0.603	0.803	–0.002	–0.063
SS5	4.41	0.622	–0.551	–0.610	0.502	0.168	0.606	–0.051
SS6	4.13	0.783	–0.619	–0.075	0.655	0.717	0.219	–0.196
SS7	4.22	0.767	–0.701	–0.035	0.631	0.769	0.114	–0.149
SS8	3.77	0.977	–0.567	–0.215	0.721	0.376	0.262	0.414
SS9	3.76	0.989	–0.494	–0.548	0.573	0.587	0.079	0.212
SS10	3.94	0.862	–0.494	–0.391	0.690	0.702	0.193	–0.025
SS11	3.84	0.973	–0.658	–0.059	0.574	0.629	0.158	0.037
SS12	4.04	0.868	–0.713	–0.065	0.659	0.270	0.425	0.305
SS13	3.87	0.977	–0.582	–0.402	0.654	0.251	0.411	0.338
SS14	4.20	0.794	–0.837	0.343	0.583	–0.031	0.712	0.160
SS15	3.79	0.964	–0.587	0.105	0.616	0.478	0.269	0.187
SS16	4.21	0.770	–0.797	0.319	0.789	0.067	0.841	0.005
SS17	4.03	0.941	–0.842	0.149	0.673	0.311	0.534	0.100
SS18	3.49	1.072	–0.384	–0.410	0.528	–0.044	0.208	0.649

Note: SS = student satisfaction.

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Table 4. Dimensional reliability analysis of the innovation management variables and student satisfaction

Variable	n	Inter-Item Correlation			Alpha	Omega
		Range	M	DE		
Innovation of educational processes						
Process structure	6	0.304-0.670	0.453	0.095	0.822	0.827
Process management	3	0.585-0.706	0.628	0.063	0.832	0.847
Student satisfaction						
Trust and security	10	0.486-0.685	0.580	0.055	0.931	0.931
Tangible elements	4	0.488-0.744	0.613	0.084	0.858	0.868
Motivation to participate	2	–	0.499	–	0.664	0.697

Note: n = number of items; M = average; SD = Standard deviation.

Subsequently, the CFA methodology was applied with specific analyses based on the two variables presented. A general model was built that included the two educational process innovation factors and the three student satisfaction factors. The model showed a good fit in the majority of indicators; for example, the following were obtained: Chisq/df = 5.527; GFI = 0.903; AGFI = 0.834; CFI = 0.923; ILI = 0.900; NFI = 0.893; RMR = 0.053; and RMSEA = 0.071 (Hair et al., 2014; Hu & Bentler, 1999). In addition, nine additional models were built (see Table 5). The first measured the relationship between process structure and trust and security; All model assumptions were met within standards (Hair et al., 2014; Hu & Bentler, 1999).

The second model related the process structure with tangible elements; a model that fully met the established assumptions. The third model measured the relationship between the structure of these processes and the motivation to participate; a model that also successfully met the necessary assumptions. The fourth model measured the relationship between process management with trust and security; This model also met the necessary assumptions. The fifth model related process management to tangible elements; This model also managed to meet the necessary assumptions. The sixth model relates process management and motivation to participate, fully complying with the requested assumptions. The seventh model related the structure of the processes as an exogenous variable with the factors trust and security, tangible elements, and motivation to participate as endogenous variables; a model that managed to meet the necessary assumptions. The eighth model related process management as an exogenous variable and the factors trust and security, tangible elements, and motivation to participate, as endogenous variables; the model managed to meet some of the assumptions, and the others were found to be very close to the established minimum. In model nine, which was the complete model, it related two exogenous variables: process structure and process management, with the endogenous variables the factors

Table 5. Developed models

Models	Chisq/df	GFI	AGFI	CFI	TLI	NFI	RMR	RMSEA
Measurement model	5.527	0.903	0.834	0.923	0.900	0.893	0.053	0.071
Structural model 1 (PS → TS)	5.430	0.964	0.920	0.983	0.964	0.961	0.040	0.078
Structural model 2 (PS → TE)	5.627	0.970	0.949	0.960	0.975	0.954	0.040	0.719
Structural model 3 (PS → MP)	5.578	0.984	0.945	0.952	0.943	0.971	0.037	0.709
Structural model 4 (PS → TS)	5.813	0.918	0.913	0.918	0.906	0.927	0.051	0.803
Structural model 5 (PM → TE)	5.043	0.950	0.893	0.962	0.939	0.954	0.036	0.802
Structural model 6 (PM → MP)	5.619	0.977	0.914	0.975	0.937	0.970	0.035	0.709
Structural model 7 (PS → TS + TE + MP)	5.414	0.905	0.861	0.944	0.925	0.916	0.044	0.807
Structural model 8 (PM → CS + TE + MP)	7.333	0.898	0.804	0.891	0.892	0.896	0.065	0.082
Structural model 9 (PS + PM → TS + TE + MP)	5.683	0.908	0.831	0.916	0.900	0.897	0.081	0.071
Acceptable range	1–8	>.90	>.80	>.90	>.90	>.90	<.09	<.08

Note: PS = Process structure, PM = Process management, TS = Trust and security, TE = Tangible elements, MP = Motivation to participate. GFI = Goodness of fit index, AGFI = Adjusted goodness of fit index; CFI = Comparative Fit Index, TLI = Non-Normalized Fit Index, NFI = Normed Fit Index, RMR = Root Mean Square Error Index, and RMSEA = Error of Approximation.

Table 6. Hypothesis testing

Hypothesis	β	S.E.	C.R	p	R^2	Result
H_1 (PS → TS)	0.65	0.053	12.259	0.000	0.79	Accepted
H_2 (PS → TE)	0.37	0.037	10.187	0.000	0.58	Accepted
H_3 (PS → MP)	0.77	0.063	12.629	0.000	0.59	Accepted
H4 (PM → TS)	0.65	0.041	10.277	0.000	0.42	Accepted
H_5 (PM → TE)	0.62	0.029	9.196	0.000	0.38	Accepted
H_6 (PM → MP)	0.72	0.056	8.907	0.000	0.52	Accepted

Note: PS = Process structure, PM = Process management, TS = Trust and security, TE = Tangible elements, MP = Motivation to participate.

trust and security, tangible elements and motivation to participate; The model met the greatest number of assumptions, only missing the Normed Fit Index (NFI) (Hair et al., 2014; Hu & Bentler, 1999).

With the models presented in Table 6, the relationships of the dimensions were measured, which resulted in proposed hypotheses. Hypothesis 1 was accepted with p = 0.000 and R2 = 0.79, which showed that the process structure explains 79% of the behavior of trust and security. Hypothesis 2 is accepted with p = 0.000 and R2 = 0.58, finding that the process structure explains 58% of the tangible elements.

Hypothesis 3 was accepted with p = 0.000 and R2 = 0.59, determining that the process structure explains 59% of motivation to participate. Hypothesis 4 was accepted with p = 0.000 and R2 = 0.42, demonstrating that process management explains 42% of trust and security. Hypothesis 5 is also accepted with p = 0.000 and R2 = 0.38, demonstrating that process management explains 38% of tangible elements. Hypothesis 6 was accepted with p= 0.000 and R2 = 0.52, finding that process management explains 52% of the motivation to participate. These results are shown in Table 6.

Finally, in the SEM model, which relates the dimensions of both variables, jointly, it has been found that the process structure and process management explain 0.89 of the trust and security behavior, these two dimensions also explain the 0.69 of the tangible elements and 0.72 of the motivation to participate variable (see Figure 2).

4. DISCUSSION

The relationship between educational process innovation and student satisfaction in the context of higher education has been a topic of growing interest in recent decades, especially in an envi-

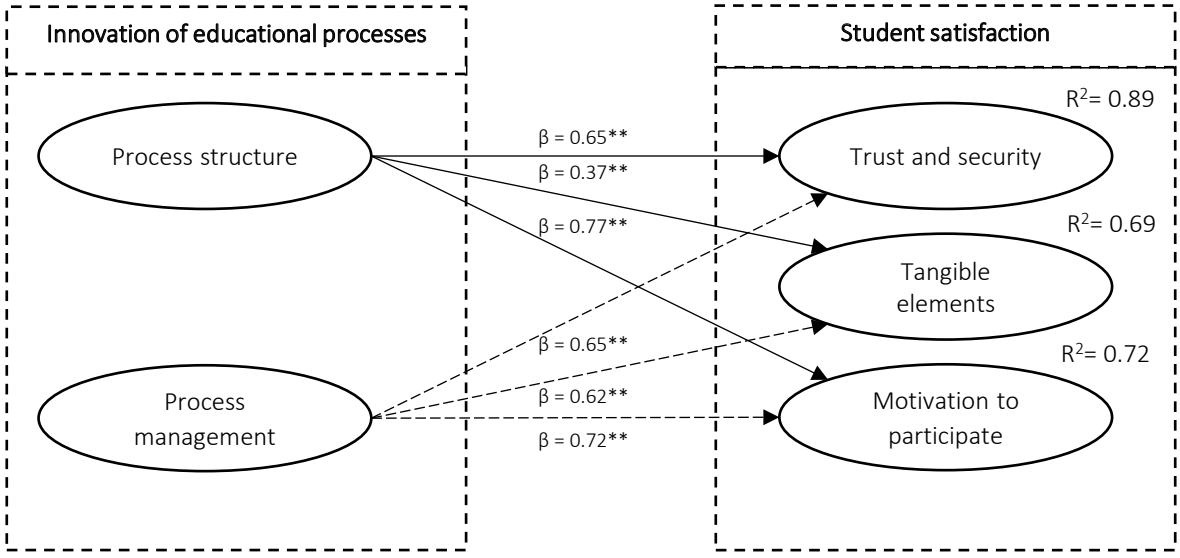

Figure 2. Dimensional relationship model between innovation management variables and student satisfaction

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ronment marked by digital transformation and the globalization of educational systems. Recent studies indicate that educational process innovation, in its dimensions of structure and process management, plays a crucial role in explaining university students' behavioral satisfaction, which can be analyzed through dimensions such as trust and security, tangible elements, and motivation to participate.

The organizational structure of a higher education institution represents the backbone of its ability to adapt to the changing demands of its environment. In this sense, Cheah et al. (2023) argue that a flexible and less hierarchical structure allows universities to respond more agilely and efficiently to student needs, which impacts their level of trust and security in the institution. This structural approach has direct implications for student satisfaction, as a rigid or bureaucratic structure could hinder access to necessary services and resources, negatively impacting their experience.

On the other hand, process management, defined as the administration of workflows and resources within an organization, is essential to ensure an efficient and high-quality student experience. Díaz-Garcia et al. (2023) point out that optimized process management, especially through the incorporation of advanced technologies and the digitalization of services, significantly improves the tangible elements of the student experience, such as technological infrastructure and accessibility to educational resources. This approach not only reduces the time and costs associated with administrative processes but also facilitates a more personalized and student-centered experience, which is key to increasing overall satisfaction.

Trust and security are critical dimensions in the perception of the quality of educational services. As Surya Bahadur et al. (2024) highlight, students who perceive that the organizational structure and processes of a university are efficient and oriented to their needs tend to develop greater trust in the institution. The university's ability to ensure transparent, efficient, and consistent processes generates a feeling of security in students, which, in turn, positively influences their satisfaction. This point is fundamental in the theory of organizational trust, which suggests that the satisfaction of service users is strongly linked to the perception of the reliability and competence of the organization (Mayer et al., 1995).

Tangible elements, such as physical infrastructure, technological resources, and the learning environment, are essential components of the student experience. Rögele et al. (2024) emphasize that the perception of the quality of educational services is directly related to the quality of the tangible elements that students can observe and use. In this sense, innovation in process management can improve these tangible aspects by allowing for greater investment in advanced technologies and modern physical spaces that facilitate learning. The perceived quality of these tangible elements can increase student satisfaction, as students feel that the institution is invested in their well-being and academic success.

Motivation to participate is another key factor in student satisfaction, which is strongly influenced by innovation in structure and process management. Deci and Ryan (2008) review their self-determination theory, which argues that students' motivation to actively participate in their learning process increases when they are provided with an environment that fosters autonomy, competence, and social interaction. Innovating educational processes, by facilitating a more flexible educational structure and more personalized processes, allows students to feel more engaged and empowered in their learning. This increased intrinsic motivation, fostered by an environment that supports their academic and personal development, contributes to greater overall satisfaction.

On the other hand, Heaton et al. (2019) highlight that an institution's ability to effectively manage innovation improves student motivation by providing a learning environment that encourages active interaction and the development of critical competencies. This approach not only enhances the academic experience but also reinforces active student engagement, which is essential for their academic and personal success.

Compared to the findings of González-Zamar et al. (2020) in their study on the relationship between educational innovation and satisfaction in the area of university well-being, their results are consistent with this study, as a high factor load-

ing is demonstrated at the exploratory level, which is confirmed by the application of a CFA. Given this statement, it is relevant that the SSE of the students in the sample serve as a strategic reference to focus their efforts on carrying out innovative activities so that, based on the resulting satisfaction, they can meet the changing needs of students and, therefore, enjoy a stable demand for their future operations. It is worth mentioning that a lack of work or operational treatment in the area of innovation can directly affect trust and security, then the motivation to participate and finally the tangible elements if they are aimed at preventing changes in the structures of the processes, while an unexecuted change in the management of the processes would directly affect trust and security, then the tangible elements and finally the motivation to participate, all guided by its level of relationship of dimensions.

Although it is true that the research presents important results, however, certain limitations cannot be ignored. The first refers to the sample, since it is focused on a single educational institution, for which subsequent studies could implement a sample that involves a greater number of institutions, so that the results are more generalizable. A second limitation is regarding the data collection technique, which included a questionnaire through the survey. Although it is an accepted technique, it shows limitations in terms of the depth of the data, for which other researchers in the future could implement techniques such as interviews, which can delve deeper into the measurement of variables and their relationships. A third limitation that must be reported has to do with the data collection, which was carried out at a single moment; subsequent studies could implement longitudinal studies, in such a way that the relationships of the variables in the long term can be measured. Finally, it is advisable to relate the variables with others, such as the use of technology, quality of service, and performance, which are variables highly related to those of the study.

CONCLUSIONS

This study aims to contribute to understanding the role of educational process innovation in enhancing student satisfaction, particularly within the emerging context of developing HEIs. The results obtained in this study demonstrated a positive and statistically significant relationship between the dimensions of educational process innovation and innovation management, through the rigorous application of structural equation models and the validation of measurement instruments. It was empirically verified that the dimension referring to process structure is strongly associated with students' perceptions of trust and security, as well as with the tangible elements of the educational environment and the motivation to actively participate in educational dynamics. Process management, meanwhile, although less strongly associated, is also positively and significantly linked to these dimensions of student satisfaction.

These findings suggest that innovation in educational processes constitutes a highly relevant explanatory variable for understanding student satisfaction levels in Higher Education Institutions (HEIs) in Ecuador. Consequently, it is inferred that HEIs that manage to implement significant innovations in their educational processes, focusing on structural and management aspects, can directly influence students' attitudes toward their academic experience. This suggests that by introducing corrective or improvement measures in the innovation of educational processes, the likelihood of consolidating sustained demand for the educational services offered increases, thus contributing to institutional strengthening and excellence in higher education.

AUTHOR CONTRIBUTIONS

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Visualization: Manuel Esteban Arevalo Avecillas, Hugo Daniel García Juárez.
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Writing – review & editing: Carmen Paola Padilla Lozano, Hugo Daniel García Juárez.

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APPENDIX A

Table A1. Structure of the questionnaire measuring innovation management variables and student satisfaction

Item	Innovation management
IN1	Do you consider that the University staff is up-to-date with the necessary knowledge to meet the needs of students?
IN2	The University has technological tools that allow it to offer good service.
IN3	You can easily differentiate the educational services offered by the University.
IN4	Do you know in detail all the levels of authority that make up the University (structure)?
IN5	The University routinely takes attendance at events held on campus (control).
IN6	Do you consider that the attitudes and aptitudes of the University staff are appropriate for providing good service?
IN7	The portfolio of services provided by the University exceeds the expectations of the university community.
IN8	The University presents a guide for the development of activities (processes).
IN9	The University staff has the necessary experience to provide good service.
IN10	The University has a system for receiving requests, complaints, or claims that allows users to express their dissatisfaction (processes).
IN11	I am familiar with the updated University regulations (norms).
IN12	Do you consider that the University carries out coordinated activities or programs across different programs (processes)?
Item	**Student satisfaction**
SS1	The advertising tools implemented by the University provide a clear understanding of the services offered in its programs.
SS2	University staff show interest in solving problems faced by students.
SS3	Continuous improvement has been evident in the services offered by the University in recent years.
SS4	The University offers its services equitably to students.
SS5	The University has the appropriate space to carry out its activities.
SS6	Do you trust the professional skills of university staff?
SS7	Would you recommend the services offered by the University?
SS8	The University is interested in maintaining an ongoing relationship with students.
SS9	The University responds promptly to student requests within the established timeframes.
SS10	University staff inspires students' confidence in the services it offers.
SS11	University staff offer alternative solutions when technical failures prevent the provision of the services they offer.
SS12	The University continually informs students about its services and activities.
SS13	University staff keeps students motivated to fulfill the purpose of their activities.
SS14	The University believes the University's physical appearance is adequate for providing its services.
SS15	The University develops activities that address problems. External resources presented by students
SS16	The elements used by the University meet the appropriate conditions for the development of its activities.
SS17	The tools used by the University to develop its activities are considered to be up-to-date with social reality.
SS18	Actively participate in the activities carried out by the University.

Note: IN = Innovation; SS = student satisfaction.

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