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Web traffic optimization and institutional branding in higher education

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ABSTRACT

Digital visibility has become an important component of institutional branding in higher education, yet limited empirical evidence explains how faculty-level website optimization contributes to brand image formation. This study evaluates web traffic optimization as a strategic capability using the context, input, process, output, and outcome (CIPOO) framework. An evaluative quantitative design was applied at Universitas Negeri Surabaya, involving 341 respondents consisting of 11 faculty website administrators and 330 website users. Data were collected through a five-point Likert-scale questionnaire and analyzed using descriptive evaluation and exploratory Pearson correlation based on aggregated faculty-level scores. The results show that context and outcome achieved the highest evaluation scores, indicating strong institutional alignment and positive branding outcomes, while process showed greater variability across faculties. Correlation analysis revealed a very strong significant positive association between output and outcome, whereas the input–process and process–output relationships were positive but not statistically significant. The novelty of this study lies in integrating faculty-level web traffic optimization, digital governance, and institutional branding within a single CIPOO-based evaluation model. These findings suggest that universities should strengthen website governance, digital capacity, and traffic monitoring to support institutional brand image.

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1. INTRODUCTION

In the era of digital transformation, higher education institutions increasingly rely on digital platforms to strengthen institutional visibility, stakeholder communication, and competitiveness. Institutional websites have evolved from information repositories into strategic communication channels that shape credibility, institutional attractiveness, service quality, and stakeholder engagement, making them important assets for digital governance and institutional branding [1]–[4]. Web traffic indicators—including visibility, accessibility, user engagement, and visit intensity—have consequently become important measures of institutional digital performance because they reflect the effectiveness of website management in supporting institutional reputation, brand awareness, and stakeholder trust [5]–[9]. Rather than representing only technical performance, web traffic optimization should be understood as a strategic organizational capability embedded within digital governance that supports communication, service delivery, and institutional competitiveness in higher education.

Digital transformation in higher education extends beyond the adoption of digital tools to encompass governance, communication, and service delivery [10], [11]. Achieving this transformation requires organizational readiness and coordinated governance [12], positioning web traffic optimization as a strategic capability rather than merely a technical activity. The novelty of this study lies in integrating faculty-level web traffic optimization, digital governance, and institutional branding within a single context–input–process–output–outcome (CIPOO)-based evaluation model. Unlike previous studies that treat web traffic mainly as a technical or descriptive indicator, this study explains how institutional context, resource readiness, website management practices, digital service performance, and branding outcomes are connected as an educational management system. This model provides a diagnostic framework for evaluating how digital governance conditions are translated into stakeholder engagement pathways and institutional image formation.

Based on the CIPOO framework, as shown in Figure 1, this study proposes three sequential relationships: input→process, process→output, and output→outcome. Organizational readiness (input) is expected to support website optimization processes (process), which in turn enhance digital service performance (output) and ultimately strengthen institutional brand image (outcome). Accordingly, this study addresses the following research question: how does web traffic optimization contribute to institutional brand image development through the CIPOO framework at the faculty level in higher education institutions? This study contributes by providing empirical evidence that conceptualizes faculty-level web traffic optimization as a systemic capability linking digital governance, website performance, and institutional branding. The findings offer both theoretical insights into educational management and practical guidance for strengthening website governance and digital communication in higher education.

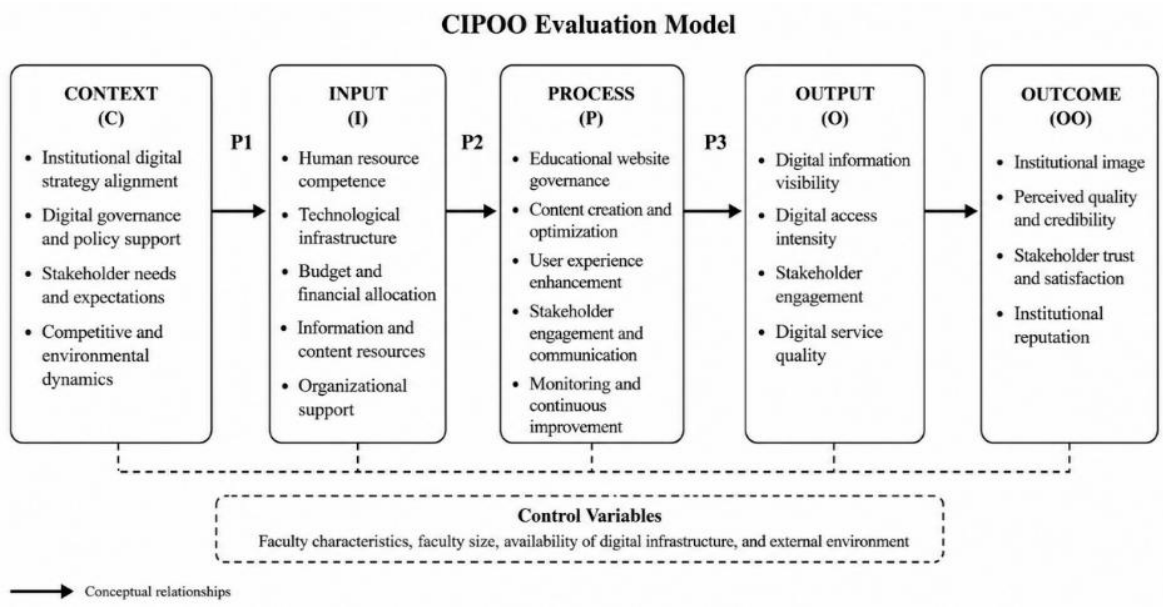

Figure 1. Conceptual framework of web traffic optimization and institutional brand image within the CIPOO evaluation model

2. METHOD

2.1. Research design

This study employed an evaluative quantitative design based on the CIPOO framework to examine the contribution of web traffic optimization to institutional brand image in higher education. The framework evaluates website optimization as an integrated system encompassing contextual alignment, resource readiness, implementation processes, digital service performance, and branding outcomes [13], [14]. The study was conducted at Universitas Negeri Surabaya, with all 11 faculties included through total sampling as the unit of analysis.

2.2. Participants and data collection

The study involved 341 respondents, including 11 faculty website administrators selected through purposive sampling and 330 website users (primarily students and prospective users) recruited through

convenience sampling. Data were collected over a two-month period using a structured questionnaire based on the CIPOO framework. The instrument comprised five-point Likert-scale items (1=strongly disagree to 5=strongly agree) covering all CIPOO components. Prior to data collection, the questionnaire was reviewed by experts to ensure content validity and clarity [15], [16]. Participants evaluated faculty websites based on their experiences and provided informed consent. Instrument validity, reliability, and exploratory factor analysis were conducted using individual-level responses, whereas descriptive evaluation and Pearson correlation analyses used aggregated faculty-level scores from 11 faculties.

2.3. Instrument, validity, and reliability

The research instrument consisted of 40 Likert-scale items distributed across five CIPOO components: context, input, process, output, and outcome. The indicators were adapted from previous studies on digital transformation, website quality, digital engagement, and higher education branding [9], [10], [12], [17]–[20]. The instrument was administered to both faculty website administrators and website users to obtain integrated perceptions of faculty-level digital governance and website performance. Context measured strategic digital alignment, while Input measured organizational and resource readiness, including human resource competency, technological infrastructure, training support, and organizational commitment. process, output, and outcome measured website optimization implementation, digital service performance, and institutional brand image, including website usability, information responsiveness, stakeholder trust, institutional credibility, and attractiveness. The operational blueprint of the instrument is presented in Table 1.

Table 1. CIPOO blueprint for web traffic and brand image evaluation

CIPOO component	Operational dimension	Main indicators	Respondent source
Context	Strategic digital alignment	Digital strategy, branding objectives, policy support, competitive environment [10], [12].	Administrators and users
Input	Organizational and resource readiness	Human resource competency, infrastructure, training support, organizational commitment [21], [22].	Administrators and users
Process	Website optimization implementation	Search engine optimization, content updating, information architecture, usability, stakeholder interaction [17], [18].	Administrators and users
Output	Digital service performance	Visibility, access intensity, engagement, service quality, information responsiveness [9], [20].	Administrators and users
Outcome	Institutional brand image	Brand awareness, credibility, trust, attractiveness, intention to recommend [18], [19]	Administrators and users

Note: The indicators were adapted from previous studies on digital transformation, website quality, digital engagement, and higher education branding.

Item validity was examined using corrected item–total correlation analysis, and all component-level item correlations exceeded the minimum threshold of 0.30. Construct validity was examined using exploratory factor analysis (EFA). The Kaiser-Meyer-Olkin value was 0.852, and Bartlett's test of sphericity was significant (χ^2=4642.072, df=780, p<.001), indicating that the data were suitable for factor analysis. The five extracted factors explained 48.540% of the total variance, which was considered acceptable for exploratory instrument validation in educational and social science research. The rotated factor loadings ranged from 0.486 to 0.786. Reliability testing showed that all CIPOO components demonstrated acceptable to good internal consistency. Cronbach's alpha coefficients ranged from 0.778 to 0.885, with the overall instrument reliability coefficient reaching 0.824. These results indicate that the instrument was valid and reliable for evaluating web traffic optimization and institutional brand image within the CIPOO framework [15], [23]. The validity and reliability results are summarized in Table 2.

Table 2. Instrument validity and reliability

Component	Items	Valid N	Corrected item–total correlation	Cronbach's alpha	EFA loading range	Decision
Context	8	341	0.561–0.611	0.850	0.671–0.721	Valid and reliable
Input	8	341	0.586–0.655	0.866	0.686–0.753	Valid and reliable
Process	8	341	0.587–0.703	0.885	0.673–0.786	Valid and reliable
Output	8	341	0.428–0.567	0.811	0.549–0.695	Valid and reliable
Outcome	8	341	0.394–0.575	0.778	0.486–0.705	Valid and reliable
Overall instrument	40	341	Component-level validation	0.824	0.486–0.786	Reliable

Corrected item–total correlations exceeded the minimum threshold of 0.30 for all components. EFA produced acceptable factor loadings ranging from 0.486 to 0.786; although one loading was below 0.50, it remained above the accepted minimum (0.40) for exploratory studies and was therefore retained. Cronbach's alpha coefficients exceeded 0.70 for all components, indicating satisfactory internal.

2.4. Data analysis and methodological limitations

Data were analyzed using descriptive evaluative statistics to summarize the performance of each CIPOO component across faculties. Likert-scale responses were aggregated and converted into percentage scores to improve interpretability and allow comparison among evaluation components [24]. The percentage score was calculated using (1):

$$P = \frac{\sum X}{\sum X1} \; x \; 100 \quad (1)$$

Where, P represents the percentage score, $\sum X$ represents the total respondent score, and $\sum X_I$ represents the ideal maximum score. The resulting scores were interpreted using four evaluation categories: very eligible, eligible, less eligible, and ineligible, as seen in Table 3. Pearson correlation analysis was conducted to examine the relationships among input, process, output, and outcome using aggregated faculty-level scores from 11 faculties. Correlation coefficients, *t*-values, and significance levels were calculated to identify relational tendencies among the CIPOO components [15], [24]. Given the limited number of analytical units, the results were interpreted as exploratory rather than causal relationships.

This study has several methodological limitations. First, the use of convenience sampling for website users may limit the representativeness of user perceptions. Second, the cross-sectional design does not capture changes in digital performance and institutional brand image over time. Third, because the correlation analysis was based on aggregated scores from 11 faculties, the findings should be interpreted as exploratory rather than broadly generalizable.

Table 3. Validation criteria

Criteria	Category (%)	Qualification percentage range
A	80-100	Very eligible
B	60-79	Eligible
C	50-59	Less eligible
D	<50	Ineligible

3. RESULTS

This section presents the results of the CIPOO-based evaluation of web traffic optimization and institutional brand image across faculties at Universitas Negeri Surabaya. The findings are presented through descriptive evaluation and Pearson correlation analysis using aggregated faculty-level data to examine performance patterns and relationships among the CIPOO components.

3.1. Descriptive statistics of CIPOO components

Table 4 summarizes the descriptive statistics of the CIPOO components based on aggregated faculty-level scores. Context and outcome achieved the highest mean scores, whereas process showed the greatest variability across faculties, reflected in its higher standard deviation. Figure 2 illustrates these performance patterns through a heatmap of CIPOO scores across the 11 faculties.

Figure 2 illustrates variations in CIPOO scores across faculties. Color intensity represents relative differences in CIPOO scores across faculties, with higher values indicating stronger performance. Overall, context and outcome components demonstrated consistently higher values across faculties, while input and process exhibited greater variation. Faculties such as the Faculty of Medicine, Faculty of Economics and Business, and Faculty of Engineering showed relatively stronger performance patterns across most dimensions.

Table 4. Descriptive statistics of CIPOO components

Component	Mean (%)	SD	Category
Context	87.2	2.59	Very eligible
Input	81.4	2.83	Very eligible
Process	77.5	4.17	Eligible
Output	84.8	3.45	Very eligible
Outcome	89.2	3.18	Very eligible

3.2. Component-level evaluation patterns

The component-level evaluation showed that context and outcome consistently achieved the strongest performance across faculties, indicating strong alignment between faculty website objectives and institutional branding. In contrast, input and particularly process showed greater variation, with process being

the only component classified as eligible rather than very eligible. These findings suggest that website optimization practices—including search engine optimization (SEO), content management, usability, information architecture, and stakeholder engagement—remain priority areas for improvement, despite strong institutional alignment and branding outcomes.

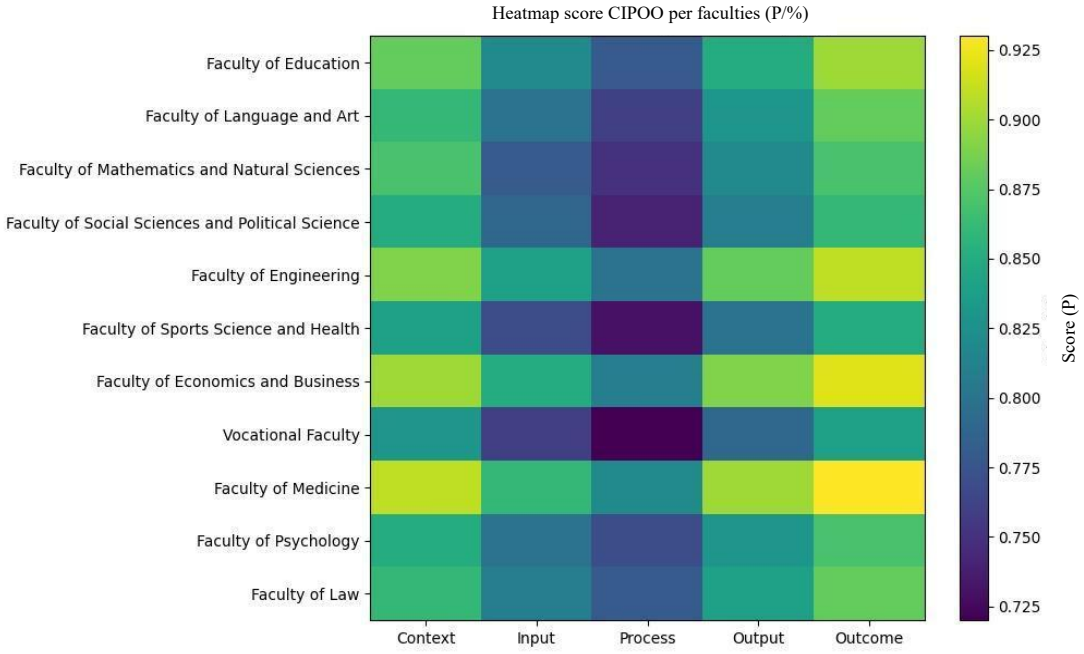

Figure 2. Heatmap CIPOO score results

3.3. Correlation analysis among CIPOO components

To complement the descriptive evaluation, Pearson correlation analysis was performed using aggregated faculty-level scores from the 11 faculties (n=11; df=9) to examine the relationships among the input, process, output, and outcome components. As shown in Table 5, input–process (r=.105, p=.758) and process–output (r=.179, p=.598) exhibited weak positive but non-significant associations, whereas output–outcome showed a very strong significant positive association (r=.939, p<.001). These findings indicate that the first and second conceptual propositions were not supported, as the input–process and process–output relationships were positive but not statistically significant. In contrast, the third proposition was supported by the strong significant output–outcome association, highlighting digital service performance as the primary pathway to institutional brand image.

Table 5. Pearson correlation results among CIPOO components

Relationship	r	t (df=9)	p	Interpretation
Input–process	0.105	0.32	0.758	Very weak positive and non-significant association
Process–output	0.179	0.55	0.598	Very weak positive and non-significant association
Output–outcome	0.939	8.19	<.001	Very strong significant positive association

4. DISCUSSION

4.1. Digital governance and organizational readiness in website optimization

The findings indicate that faculty websites should be viewed as educational communication infrastructure within higher education management rather than merely technical platforms. Website governance encompasses planning, coordination, information quality assurance, and stakeholder-oriented service delivery, consistent with studies emphasizing that successful digital transformation requires strategic alignment, organizational readiness, and coordinated governance [10], [12]. The strong context scores indicate that faculty website development is generally aligned with institutional digital transformation goals, whereas the greater variation in input and process suggests that policy alignment alone is insufficient without

adequate human resources, technical support, and structured management practices. Faculty-level digital governance should therefore be regarded as an educational management function linking institutional strategy, operational capacity, and service quality.

Previous studies emphasize that effective digital governance depends on the alignment of institutional goals, leadership, technological infrastructure, and human resource capability [2], [3]. Consistent with this systems perspective, institutional visibility arises from coordinated organizational capabilities rather than isolated technical interventions, explaining the uneven implementation observed across faculties despite a shared institutional strategy. Correlation analysis showed that output–outcome had the strongest significant association, whereas input–process and process–output relationships were positive but not statistically significant. These findings reinforce the importance of strategic alignment and coordinated governance in digital transformation [10], [12], while indicating that organizational readiness and implementation processes require consistent execution to improve website performance and institutional branding.

4.2. Variability of website optimization practices across faculties

The relatively greater variation observed in optimization practices suggests that institutional strategies alone are insufficient to guarantee implementation consistency. Although universities may formulate centralized digital policies, the translation of those policies into operational website practices appears highly dependent on faculty-level execution capacity. This finding indicates the existence of an implementation gap between strategic intent and operational realization.

Prior research has shown that website usability, content quality, and digital interaction mechanisms significantly influence stakeholder engagement and institutional communication effectiveness [17], [18]. This result supports those findings by showing that website optimization practices remain important for strengthening stakeholder-oriented digital communication. However, unlike studies that focus mainly on website quality as a technical attribute, the present study shows that optimization practices are shaped by faculty-level organizational routines and execution capacity. Faculties with stronger optimization performance may benefit from more mature digital workflows, stronger internal coordination, and continuous performance monitoring systems. Consequently, website optimization in higher education may be conceptualized as an institutional capability embedded within organizational processes rather than isolated technological practices.

4.3. Understanding the non-significant process–output relationship

An important finding of this study is the positive but non-significant relationship between the process and output components, indicating that website optimization practices did not directly translate into improved digital performance in the aggregated faculty-level analysis. This suggests that digital performance may not respond linearly to internal implementation improvements. Several factors may explain this result. Website traffic and visibility are influenced by external conditions beyond organizational control, including search engine algorithms, institutional reputation, user behavior, and broader digital ecosystems. Moreover, optimization interventions often require time before measurable effects become evident. Previous studies similarly indicate that digital visibility and reputation develop gradually through repeated stakeholder interactions and cumulative engagement [25], [26].

These findings challenge the assumption that stronger implementation immediately produces better digital outcomes. Instead, they support a systems-based perspective in which organizational performance emerges from interactions among contextual and environmental factors. The discrepancy with previous studies reporting direct effects of digital engagement on visibility and reputation [25], [26] may reflect the exploratory faculty-level design of this study and the time required for website optimization to influence measurable traffic and visibility. Thus, the findings extend the CIPOO framework by suggesting that implementation effectiveness is shaped by external institutional dynamics.

4.4. Digital performance and institutional brand image formation

Digital performance should be interpreted not merely as traffic volume or technical visibility, but as the ability of faculty websites to provide accessible, credible, and timely information for internal and external stakeholders. This perspective is consistent with studies emphasizing that digital systems should be evaluated by the value they create for users and society rather than by technical performance alone [27]. Similarly, higher education research shows that website usability, information quality, and interactive features shape stakeholder perceptions, institutional attractiveness, and reputation [9], [18]. The significant output–outcome association suggests that digital service performance contributes to institutional brand image through repeated stakeholder experiences. Websites that are visible, accessible, updated, and easy to navigate strengthen perceptions of institutional credibility, responsiveness, and professionalism, making digital access an important pathway to educational trust and institutional legitimacy.

These findings are consistent with branding research showing that stakeholder perceptions develop through cumulative interactions rather than direct promotional communication [5], [25], and with technology-mediated communication studies emphasizing the quality of digital interactions [28]. This study extends the literature by identifying digital service performance as the mechanism through which faculty-level web traffic optimization supports institutional brand image. Accordingly, universities should integrate web traffic optimization into educational communication governance, quality assurance, and institutional branding to promote coherent digital governance and equitable access in higher education [29].

4.5. Theoretical and practical contributions

Theoretically, this study contributes to educational management by conceptualizing web traffic optimization as a systemic governance capability rather than a stand-alone technical activity. The CIPOO framework demonstrates how institutional context, resource readiness, implementation, digital service performance, and institutional brand image interact within an integrated evaluation model. Practically, the findings highlight the need to integrate faculty website governance into quality assurance, stakeholder communication, and institutional branding. Strengthening governance standards, digital infrastructure, administrator capacity, and performance monitoring can improve website management consistency, while incorporating website performance indicators into quality assurance and accreditation systems may enhance digital governance, institutional accountability, and stakeholder trust.

4.6. Limitations and future research directions

This study has several limitations. First, the findings were based on self-reported questionnaires and may reflect respondents' perceptions rather than objective website analytics or actual user behavior. Second, the cross-sectional design limits the assessment of changes in digital performance and institutional brand image over time. Third, the study was conducted at a single university using aggregated faculty-level scores from 11 faculties; therefore, the correlation results should be interpreted as exploratory rather than causal or broadly generalizable. Finally, objective web analytics (e.g., unique visitors, bounce rate, session duration, search ranking, and longitudinal traffic trends) were not included. Future research should incorporate longitudinal, multi-institutional, and mixed-method designs together with objective web analytics to strengthen causal interpretation, external validity, and practical implications for higher education digital governance.

5. CONCLUSION

This study demonstrates that faculty-level web traffic optimization functions as a strategic governance capability supporting institutional branding in higher education. Using the CIPOO framework, the findings show that context and outcome achieved the highest evaluation scores, whereas Process exhibited greater variability across faculties. Correlation analysis revealed a strong significant association between output and outcome, while the input–process and process–output relationships were positive but not statistically significant. The study contributes by integrating web traffic optimization, digital governance, and institutional branding within a faculty-level CIPOO evaluation model. The findings highlight the importance of strengthening website governance as part of institutional quality assurance and branding strategies. Future research should employ longitudinal designs, objective web analytics, and multi-institutional comparisons to improve causal interpretation and the generalizability of the findings.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare no competing financial, personal, professional, or non-financial interests that could have influenced the work reported in this study.

INFORMED CONSENT

Informed consent was obtained from all participants prior to data collection. Participation was voluntary, and confidentiality and privacy were maintained throughout the study.

DATA AVAILABILITY

The data supporting the findings of this study are available from the corresponding author, [MSH], upon reasonable request. The data are not publicly available due to privacy and confidentiality considerations.

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