NON-TECHNOLOGICAL DETERMINANTS OF INTER-INDUSTRY KNOWLEDGE SHARING AMONG PORT WORKERS: STRATEGIC INSIGHTS FROM MALAYSIA

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Abstract

Efficient port operations rely on knowledge exchange among industry workers. Previous studies have identified several factors influencing this exchange. For instance, Caporuscio et al. (2020) noted that port operators often have limited industry-specific knowledge, which can hinder effective knowledge sharing. Additionally, there is a recognized gap in understanding the non-technological elements that shape the exchange of inter-industry information among port operators. Al-Busaidi and Olfman (2017) highlighted the crucial roles played by individuals, peers, and organizations in facilitating information-sharing processes. This study examines how individual, peer, and organizational non-technological factors impact port workers' willingness to share their expertise across industries. Using a sample of seven critical operators from Malaysia's federal port, the research employs a revised tool to measure these factors and promote information flow. Survey data from knowledge workers in Malaysia's port operator sector further supports the findings, indicating that individual characteristics notably influence knowledge sharing among port personnel. This study contributes valuable insights to the broader understanding of how these factors influence information exchange among port workers across different industries.

Keywords: Knowledge Sharing, Port Operator Companies, Non-Technical Determinants

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1. INTRODUCTION

Effective inter-industry knowledge sharing among port employees is crucial for enhancing operational efficiency, fostering innovation, and sustaining a competitive advantage in the dynamic marine industry (Adabere et al., 2021). Understanding the factors that influence knowledge transmission among port workers across industries is particularly important in Malaysia's port sector.

In today's knowledge-driven economy, sharing knowledge is essential for fostering innovation and improving firm performance across all sectors. Yeboah (2023) observes that rapid advancements in technology have led firms to increasingly recognize the strategic importance of sharing information. While extensive research has been conducted on factors influencing knowledge sharing within and across companies, limited focus has been placed on examining the determinants of information dissemination among various sectors, especially in port operations workers.

Ports play a vital role as service providers, emphasizing qualities such as dependability, exceptional service, frequent departures, competitive pricing, integration of information technology, and skilled management. Palmer (2020) highlights that ports globally initiated deliberate enhancements to their organizational structure and operational systems as early as the 1910s, aiming to offer a higher level of flexibility and adaptability across all aspects, including the shipping industry, port users, logistics participants, and the needs of the surrounding areas.

The Maritime Transport Review, published by the International Maritime Organization (IMO), reported a small decline of 2.3% in ship utilization for international trade activities. However, sea-borne transport remains crucial in facilitating the growth of nations by contributing to global international trade (United Nations Conference on Trade and Development [UNCTAD], 2023). Ports handle 80 percent of worldwide international trade, making a substantial contribution to linking developing countries with port communities to worldwide trade (de Langen, 2015).

The port industry's rapid expansion, including the acquisition of new facilities and infrastructure, utilization of advanced platforms for cargo information sharing, and intricate documentation processes involving multiple parties, has necessitated knowledge sharing across sectors (Sarfaraz et al., 2023). Recent technological advancements have facilitated the exchange of knowledge and expertise among port staff on a global scale (Bucak et al., 2023). While technology solutions are significant, the non-technological aspects that impact information exchange within the port environment are equally crucial (Nikghadam et al., 2023). These variables pertain to socio-cultural, organizational, and human factors that influence the willingness and ability of port workers to share information across various sectors of the economy. Ensuring that prospective employees have the requisite knowledge, abilities, and attitudes to adapt to future advancements is imperative (Ardito et al., 2022).

Despite the acknowledged importance of knowledge sharing, there exists a notable gap in the literature regarding the non-technological factors influencing inter-industry knowledge sharing among port workers, especially in Malaysia (Fioravanti et al., 2023). While some studies have explored knowledge sharing within specific industries or organizations, comprehensive research examining the complex dynamics of information exchange between industries within the port ecosystem is lacking.

Knowledge sharing involves spreading information, ideas, solutions, and best practices among different persons, departments, and sectors (Nguyen, 2021). This collaborative process aims to leverage the expertise and experience of everyone to promote innovation and growth (Baldé et al., 2018).

Fully understanding the interchange of information between businesses requires considering aspects unrelated to technology. Previous studies have mostly focused on investigating the impact of technological factors, such as information systems and digital platforms, on behaviors associated with knowledge sharing. While acknowledging the significance of these elements, it is crucial not to overlook the influence of non-technological factors. Non-technological drivers encompass a wide range of factors, including human traits, peer influence, and organizational features.

This study aims to analyze non-technological variables at the individual, peer, and organizational levels that influence knowledge sharing among port workers in Malaysia across several industries. The primary discoveries of this investigation are anticipated to illuminate the fundamental aspects that influence the exchange of knowledge between different industries among port workers in Malaysia. This research intends to analyze the main factors and their effects to establish strategies and interventions that will enhance collaboration, innovation, and competitiveness in the Malaysian maritime industry.

The paper is structured as follows: Section 1 provides the introduction. Section 2 presents the literature review. Section 3 outlines the methodological framework. The results and explanation of the findings are detailed in Section 4, while the conclusion is presented in Section 5.

2. LITERATURE REVIEW: THE DETERMINANTS OF INTER-INDUSTRY KNOWLEDGE SHARING

Knowledge sharing among port workers across industries is influenced by various non-technological factors, as supported by several academic frameworks. The social exchange hypothesis, proposed by Blau (1964), suggests that individuals engage in knowledge exchange expecting something valuable in return, such as recognition or reciprocity. Social capital theory, developed by Nahapiet and Ghoshal (1998), emphasizes the role of social connections and networks in facilitating knowledge exchange within organizations. Additionally, the theory of planned behavior, introduced by Ajzen (1991), suggests that individual attitudes, subjective norms, and perceived behavioral control influence information-sharing behavior.

Individual factors play a crucial role in how port personnel distribute information, with research showing that individual characteristics significantly

influence knowledge dissemination within and among organizations. For example, Chandran and Alammari (2021) studied the adoption of knowledge sharing in eLearning communities in Saudi Arabia and found that factors such as effective communication, trust between individuals, and the acceptance of technology greatly influence knowledge sharing among academic staff. This highlights the importance of considering certain characteristics as influential elements in the exchange of information between industries.

Organizational culture, incentives, and leadership significantly influence knowledge sharing within port organizations. Ng (2023) observed that an organizational culture supporting learning and collaboration enhances knowledge sharing among employees. This finding aligns with Nonaka and Takeuchi's (1996) concept of a knowledge-creating organization, which emphasizes the role of organizational culture in promoting information creation and sharing. Organizations fostering a nurturing culture that values collaboration and information dissemination are more likely to facilitate knowledge transfer among port operator personnel across various industries (Al-Busaidi & Olfman, 2017).

In addition to personal and organizational attributes, the influence of peers, namely social networks, plays a significant role in driving the exchange of information. Oh et al. (2023) highlighted the positive impact of social support from colleagues on knowledge sharing. Furthermore, individuals' decisions to share information are influenced by societal norms and peer influence (Ghorbani et al., 2022). Tsai and Ghoshal (1998) proposed that internal company networks can create social capital, facilitating information sharing across industries. Understanding the structure and function of social networks among port operator personnel can provide valuable insights into their information-sharing practices and enhance knowledge exchange across industries. Additionally, Mohammed and Kamalanabhan (2020) investigated how the perception of social capital within work teams affects individuals' proactive efforts to acquire tacit knowledge from colleagues. Their findings suggested that all aspects of social capital, except shared language and trust based on benevolence, significantly influence employees' inclination to acquire tacit knowledge.

Knowledge sharing is widely acknowledged as a critical element in enhancing organizational performance and has been a subject of extensive research attention over the years (Yeboah, 2023). Previous studies on knowledge sharing have predominantly concentrated on internal factors within organizations, including leadership, organizational culture, and information technology infrastructure (Al-Busaidi & Olfman, 2017). While these studies have considerably advanced our comprehension of knowledge sharing processes within enterprises, they often neglect the broader external factors that could impact the exchange of information between industries.

Port operators play a crucial role in the global supply chain by facilitating the exchange of information among firms. Ensuring the sharing of knowledge among port operators from different businesses is essential for fostering innovation and enhancing competitiveness in the maritime sector. Numerous studies have investigated the factors that promote collaboration and information exchange among port authorities, shipping corporations, and other relevant stakeholders. For example, Ghorbani et al. (2022) conducted a study examining how strategic alliances and partnerships facilitate the exchange of knowledge and transfer of technology among port operators. Additionally, efforts have been made to establish port community systems (PCS) and information-sharing platforms with the aim of enhancing communication and cooperation among corporate participants.

This study aims to gain valuable insights into enhancing collaboration and innovation in the Malaysian maritime industry by thoroughly investigating non-technological factors and their impact on knowledge sharing among different industries in the port sector. Individuals involved in port operations, such as dockworkers, managers, and administrative staff, play a vital role in the daily functioning of these facilities. Therefore, understanding the factors that influence their willingness to share information between industries could offer valuable insights into the mechanisms that encourage inter-industry knowledge sharing (Kura et al., 2014).

The objective of this study is to investigate the impact of non-technological factors on the information-sharing behavior of port operator personnel. These non-technological variables encompass a range of factors related to individuals, peers, and organizations (Hansen et al., 2005; Nahapiet & Ghoshal, 1998). While previous research has investigated these factors within the context of information exchange within organizations, their impact on knowledge sharing across industries, particularly among port operators, remains largely unexplored.

3. METHODOLOGICAL FRAMEWORK

The study utilizes quantitative research methods to examine the relationship between non-technological factors and the sharing of industry information among port operators' staff. This method was chosen because it offers a comprehensive understanding of the relationship, enabling precise measurement and analysis of variables. While qualitative approaches, such as interviews or focus groups, could provide deeper insights into underlying factors, quantitative methods are better suited for establishing empirical relationships and generalizing findings to a broader population. Additionally, although a mixed-methods design could be considered, the quantitative approach was selected as the most appropriate for exploring the quantitative aspects of knowledge sharing among port workers.

Simple random sampling was employed as the preferred approach for non-probability sampling. The study focuses on knowledge workers from seven federal seaports in Malaysia, classified according to the Ministry of Transportation Malaysia's (MOT) criteria. The sample size, determined using Krejcie and Morgan's (1970) sampling table, aims to reach 384 participants who will be invited to complete a questionnaire.

The questionnaire items were adapted from a previous study by Al-Busaidi and Olfman (2017) to gather essential data from survey participants. The questionnaire includes 5-point Likert scale questions and open-ended questions, leveraging the Likert scale's effectiveness in academic research for reliable feedback collection.

Data analysis employed descriptive and regression analytical techniques to derive the study's findings and evaluate its research objectives. This approach ensures a comprehensive examination of the data obtained from original sources, facilitating a thorough understanding of the research problem.

Linear regression, a commonly used statistical method, was employed to establish the relationship between variables. Specifically, it aimed to predict the value of variable *Y* within a specific patient group based on the linear and additive values of variable *x*. This method relies on several assumptions, including the independence of *Y* observations, consistent variability of *Y* within specific *x*-strata, and the normal distribution of *Y* within *x*-strata.

Before analyzing the data, it was crucial to verify these assumptions. The study focused on three key assumptions: homoscedasticity, normal distribution, and absence of multicollinearity. Homoscedasticity refers to the uniform variance of errors, which can be verified through residual analysis. Multicollinearity, indicating interdependence among independent variables, was assessed using the variation inflation factor (VIF), with a VIF value above 10 indicating significant multicollinearity issues that could affect the reliability of the regression analysis. Ensuring a VIF below 10 was essential for a successful multicollinearity test, as stated by Reddy and Balasubramanyam (2021).

The equation for the multiple linear regression model is as follows:

$$Y = \beta + \beta_0 x_{11} + \beta_1 x_{21} + \cdots + \beta_j x_{ij} + \varepsilon \quad (1)$$

where: β_o, β_1,..., β_j are constants; x_{i1},..., x_{ij} are unknown parameters/independent variable $i = 1,\ldots, n$.

In matrix terms, the following matrices should be defined:

$$Y = \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix} \qquad x = \begin{bmatrix} 1 & x_{11} & x_{12} \\ 1 & x_{21} & x_{22} \\ \vdots & \vdots & \vdots \\ 1 & x_{n1} & x_{n2} \end{bmatrix} \quad (2)$$

$$\beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_n \end{bmatrix} \qquad \varepsilon = \begin{bmatrix} \varepsilon_0 \\ \varepsilon_1 \\ \vdots \\ \varepsilon_n \end{bmatrix}$$

where:

- Y is a vector of responses;
- β is a vector of constants;
- x is matrix parameters;
- ε is a vector of independent normal random variables.

The three sums of squares and mean squares utilized in variance analysis are the sums of regression (SSR), sums of error (SSE), and sums of total (SST). The variances for analysis of variance can be represented using matrix notation in the following manner:

$$SSR = \beta x' Y - \left(\frac{1}{n}\right) Y' J Y$$

$$SSE = (Y - x\beta)'(Y - x\beta) \quad (3)$$

$$SST = Y'Y - \left(\frac{1}{n}\right) Y' J Y$$

Moreover, the sum of squares has a well-defined degree of freedom. J is an $n \times n$ matrix. The degrees of freedom for *SSR* equals $p - 1$, where p represents the number of predictor variables or parameters. The *SSE* is associated with the degrees of freedom $(n - p)$, where n is the number of respondents in the research. The *SST* is typically associated with $n - 1$ degrees of freedom, as is traditional.

The following equations illustrate the statistical technique known as analysis of variance (ANOVA), along with the calculations for mean square regression (MSR) and mean square error (MSE). MSE is a quantitative metric that calculates the average of the squared deviations between anticipated and actual values, serving as a measure of risk. It computes the average of the squared errors. An error is the difference between the estimated value of a parameter and its actual value. The mismatch occurs either due to randomness or because the estimator fails to include relevant information that could result in a more precise estimation.

$$MSR = \frac{SSR}{p - 1}$$

$$MSE = \frac{SSE}{n - p} \quad (4)$$

4. RESULTS AND DISCUSSION

The residual variance was calculated using Statistical Package for the Social Sciences (SPSS) software, and a scatter plot was employed to visualize the residual variance, as shown in Figures 1a–1c.

Figure 1a. Scatter plot of variance of residuals: IV1

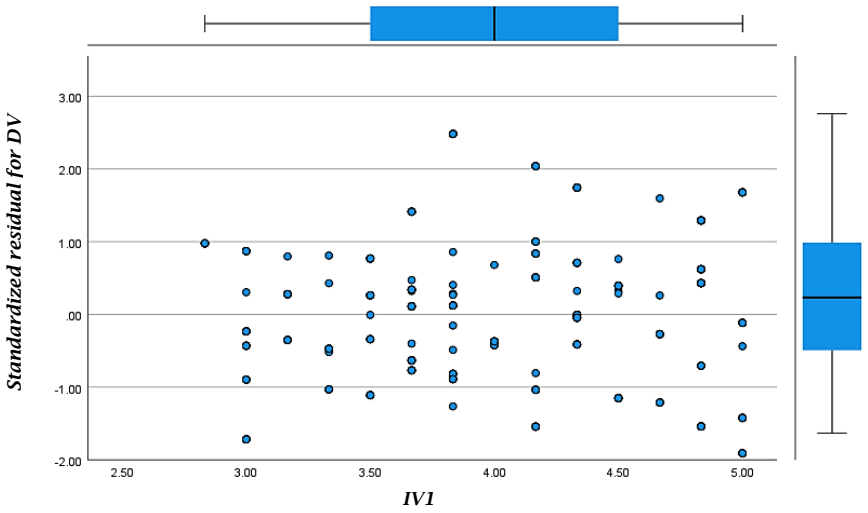


Figure 1b. Scatter plot of variance of residuals: IV2

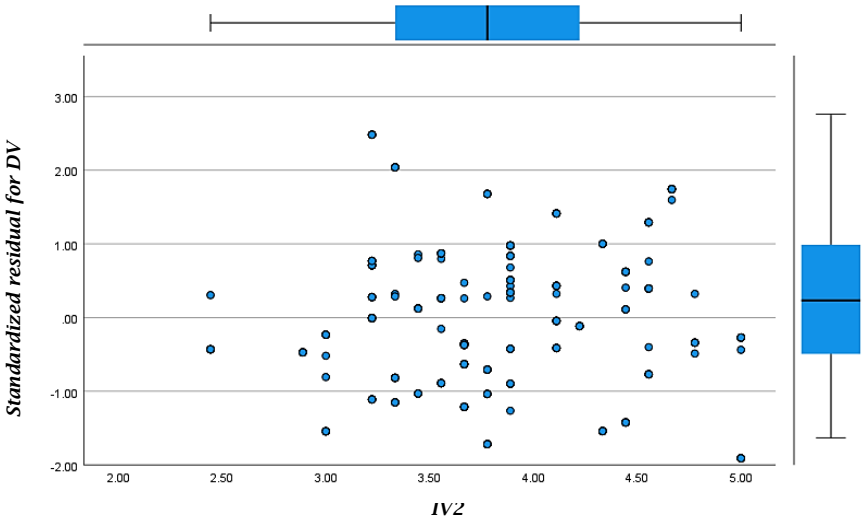
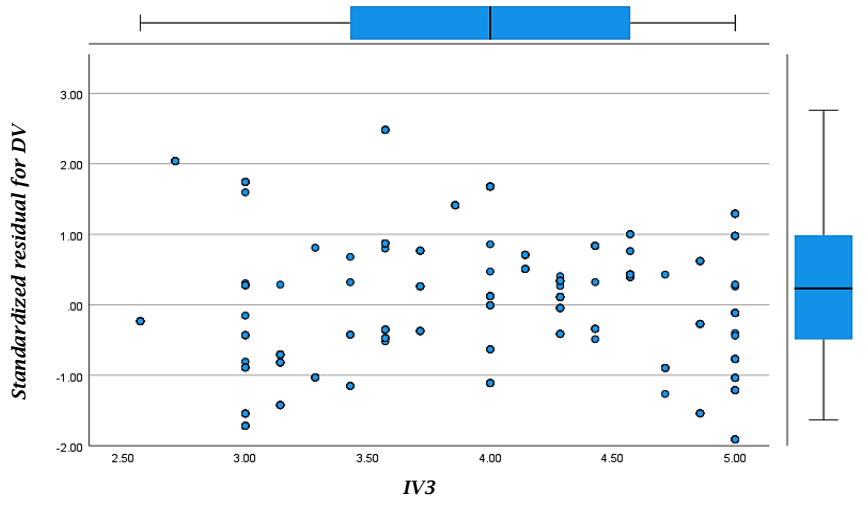


Figure 1c. Scatter plot of variance of residuals: IV3



The scatter plot indicates that the residuals are randomly scattered, without any discernible patterns, confirming the verification of the residual variance in this study.

Normality is a crucial assumption in multiple linear regression, and researchers must ensure that their data meets this assumption. To assess normality, a Q-Q plot was used in this study to examine whether the data points conform to a normal distribution. The Q-Q plot, depicted in Figure 2, shows a linear trendline, indicating that the data points closely follow a normal distribution. This finding satisfies the assumption of normality in the regression analysis.

Figure 2. Normality Q-Q plot

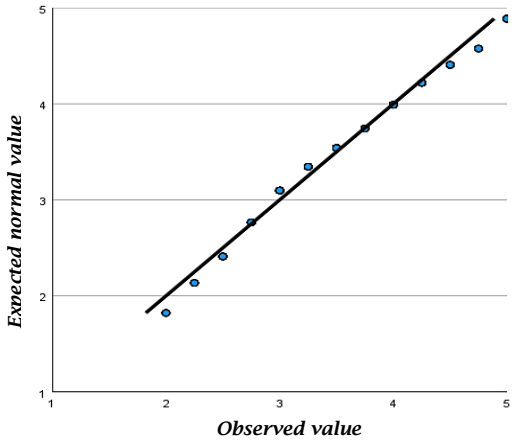


Table 1 indicates that individual, peer, and organizational factors have positive and statistically significant effects on inter-industry knowledge sharing among port operation staff.

Table 1. Collinearity diagnostics

Model		Unstandardized coefficients		Sig.
		β	Std. error	
1	Constant	0.926	0.307	0.003
	Individual factors	0.300	0.073	0.000
	Peer factors	0.281	0.094	0.003
	Organizational factors	0.094	0.069	0.177

Specifically, increases in individual factors, peer factors, and organizational factors are associated with increases in knowledge sharing effects, with coefficients of 0.300, 0.281, and 0.094, respectively.

The study satisfied the necessary criteria for conducting multiple linear regression analysis. It utilized this analysis to predict the dependent variable based on the independent factors. Table 1 reveals that individual variables have the greatest impact on inter-industry information exchange, as evidenced by their highest β value of 0.300. All the significant variables influence the inter-industry knowledge sharing effects.

The calculated multiple linear regression model for the independent variables (*individual factors*, *peer factors*, and *organizational factors*) is as follows:

$$\hat{Y} = 0.926 + 0.300\ individual\ factors + 0.281\ peer\ factors \quad (5)$$

The multicollinearity analysis in Table 2 for the multiple linear regression model shows that all independent variables (*individual factors, peer factors, and organizational factors*) have tolerance values below 0.99 and VIF values below 10, indicating no significant multicollinearity issues.

Table 2. Multiple linear regression

Model	*Tolerance*	*VIF*	*Sigma value*
Individual factors	0.746	1.341	0.690
Peers factors	0.550	1.817	0.166
Organizational factors	0.627	1.596	0.000*

*Note: * Significant at 0.05.*

These results suggest that each independent variable contributes unique information to the model and is not redundant with the others. Therefore, the model's reliability is not compromised by multicollinearity, enhancing the validity of the regression analysis.

The ANOVA in Table 3 shows that the regression model is statistically significant ($F = 25.163$, $p < 0.001$), indicating that the independent variables (*individual factors, peers' factors, and organizational factors*) collectively have a significant effect on the dependent variable (*inter-industry knowledge sharing effects*). The regression model accounts for a substantial amount of variance in the dependent variable, as indicated by the high F-value and the large difference between the regression and residual sums of squares. This suggests that the model provides a good fit to the data and that the independent variables are meaningful predictors of *inter-industry knowledge sharing effects.*

Table 3. Analysis of variance or ANOVA

Model	*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
Regression	34.817	3	11.606	25.163	0.000
Residual	133.753	290	0.461		
Total	168.571	293			

The study highlights the significance of *individual factors* in fostering knowledge sharing among port operation staff across diverse industries. This observation is consistent with Tang et al. (2024), who found that employees are more inclined to reciprocate knowledge sharing when the sharing party is perceived as skilled and competent. Moreover, Zhou et al. (2023) emphasize the influence of personal traits such as self-efficacy, image, and knowledge efficacy on information-sharing behaviors, suggesting that individuals with expertise and skills are more likely to share information with peers from various industries.

Additionally, the impact of peers is recognized as a key factor in information transmission among port workers. Participants emphasized that peer behavior, dependability, and active involvement encourage the sharing of industry information among port personnel. This highlights the role of peers in motivating individuals to share information within their organization or industry. These findings

are in line with Fauzi Nya-Ling, Thursamy, Ojo, et al. (2019), who proposed that both peer interactions and *organizational factors* significantly influence the information-sharing behavior of Muslim academics.

5. CONCLUSION

The study concludes that individual characteristics and personal traits, such as self-efficacy, image, and knowledge self-efficacy, significantly influence knowledge sharing among port operation staff. Additionally, the behavior, dependability, and active involvement of colleagues within an organization promote knowledge sharing. These findings are consistent with prior research by Tang et al. (2024) and Zhou et al. (2023), highlighting the impact of both peer and *organizational factors* on information sharing. The study corroborates the findings of Fauzi, Nya-Ling, Thursamy, Ojo, et al. (2019) regarding the significance of peers and organizational characteristics in shaping information-sharing behavior.

However, the study's scope is limited to investigating only three components: individual, peer, and organizational factors. Future research should consider enhancing the questionnaire by incorporating additional elements in these sections and extending the data collection period to ensure an adequate sample size. The primary objective of this study is to broaden the understanding of knowledge sharing by examining the influence of non-technological factors on knowledge exchange across various industries. Insights into the factors that facilitate or hinder knowledge sharing between industries can inform the development of targeted strategies and policies to promote knowledge exchange and collaboration. The study's findings have practical implications for port operators, policymakers, and managers aiming to improve information sharing, thereby fostering economic growth and innovation in the interconnected global context.

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