Brain Drain in Yemeni Universities: Analysis of HR Management Strategies for Retention and Job Satisfaction

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Abstract: Brain drain is one of the most serious problems that economic development and educational standards in countries like Yemen especially suffer from. The study investigates the link between HR management approaches, labor satisfaction, and their combined impact on Yemen's economy. The research highlights the importance of a high-skilled labor force in global development and the paradoxical challenges brain drain imposes. The main objective of this project is to study the complicated patterns that lead to brain drain, assess its economic impact on academic establishments and a country as well analyze methods used by HRM- human resources managers; they also help identify other implications derived from job satisfaction including role play. This work reflects on the nuances of organizational efficacies, analyzing how HRM policies influence retention or attrition rates for competent workers. This stage aims to explore the complicated relationship between an individual's happiness and their overall organizational system. It seeks to delve further into the understanding of how job satisfaction can accentuate or mitigate brain drain. The findings provide evidence of the significant effects of HR management techniques, satisfaction with work, and economic variables on the intentions toward leaving for other countries among academic staff members in Yemeni universities. On the one hand, discriminant validity analyses prove that measuring constructs are distinct from each other whereas R values highlight the predictive relevancy of the structural model. Mediation studies show that satisfaction with pay is a mediator between salary, supervision, and intentions of brain drain.

Keywords: HR management, Academic staff, Brain drain, Job satisfaction, Yemeni universities, Turnover, Skilled labor

1. Introduction

In the complicated web of global development skilful labor is a significant factor in sustaining economic prosperity, civic progress, and educational standards. However, the use of human resource management strategies has continued to grow and dictate courses taken by many nations. However, this important resource faces a potent enemy – the brain drains epidemic (Electronic Journal of Knowledge Management, 2024). This fact, especially in connection with labor export has a massive impact on economic growth and carries urgent risk for the stability of nations desiring to maintain progress.

At the same time that countries attend to the issue of a brain drain, developments beyond mere the loss of a skilled workforce are in store. This policy robs the country of intellectuals, who form the basic talent, that cannot be substituted and, therefore, which limits the possibilities of foreign competition. It is not just that this deterrent deprives economic development of impetus but also hinders civic progress which in turn erodes educational standards (Alaghbari & Beshr, 2019). The objective of this paper is to analyze the different components of it, including the economic impacts and systemic dilemma, with suggestions on limiting its adverse effects of it.

According to its role in the phenomenon of brain drain, educated workforce occupies a significant niche. It includes leaders and skillful specialists from different bestrias who perform an outstanding job as trailblazers, stop-watch persons, and developers of the nation. Immigration enriches a country's pool of skilled labor, helping the country become more competitive, the prerequisite of prosperity. On the other hand, the sustainability of their growth is vulnerable to the consistent exodus of highly skilled nationals – brain drain. The intellectual emigration is not merely an outflow of labor forces, but rather a destruction of the nation's intellectual stuffy being, which in turn will result in the emptiness in many the enterprises. There is a drawback, which is an appearance of these benefits that also create some obstacles to be sort out, those that may be removed by the individuals with inbuilt skills. In addition, brain drain because of the loss of competencies among teachers is a

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factor that precipitates the weakening standards of education hence reduction in the foundational base through which knowledge of future generations is acquired (UVA Library, n.d.) The negative ramifications from the brain drain didn't stop with the loss of workforce but profoundly influence the ability of the country to thrive and emerge stronger over time.

This study is designed to provide a holistic understanding of the intricate workings surrounding brain drain in Yemeni institutions with an all-encompassing set of goals. It then attempts to comprehensively examine the highly intricate patterns and fundamental variables that take part in the brain drain observed within these centers of learning. This research is aimed to consider all factors involved in this phenomenon including individual motivation and systemic issues. This will pave the way for an in-depth understanding of the root causes of brain drain. The study focused on the connection between salary, satisfaction with work, turnover, and brain drain. Numerous researches have looked at the impact of payment on work satisfaction and attrition. Studies indicate that remuneration affects job turnover negatively and significantly. Besides, it has been established that compensation affects an organization's propensity to depart negatively(Mo & Borbon, 2022). According to research, pay also leads to job satisfaction. The study revealed a significant relationship between work satisfaction and academic abandonment. Pay levels reduce attrition. (Tsujita, Oda, & Rajan, 2023). These studies show that income, job satisfaction, and intention to quit are related suggesting the importance of providing fair understanding pay on retention efforts. Pay as an issue among Yemeni academics has remained largely neglected. (Bekheet, Al Sudany, & Najm, 2023). Accordingly, this research aims at adding further understanding regarding the way functional dynamics of HRM are carried out in a Yemeni institutions through intensive research studies on the objectives included. Workers need to structure and synthesize essential information into helpful guides and suggestions that can be used to face up to the big problem of brain drain. This will especially help Yemeni higher education body to formulate and establish in the long run employment and investment policies that will serve to rebuild the whole country. In Yemen where social and political insecurity and economic problems that have made Yemen is an image and has caused the migration of academic staff abroad (Alhebshi et al., 2022).

One of the central issues affecting Yemeni universities and overall development is the brain drain, which means that many experienced academicians leave their country to seek employment in other nations. The purpose of this research is to identify the antecedents of brain drain in Yemeni academic institutions and to determine how HRM practices affect the level of job satisfaction and turnover intentions among the academic employees. The condition of economic and political insecurity in Yemen complicates the factors driving brain drain; therefore, the need to acknowledge the best practices of HRM to counter the challenges. More specifically, this research aims to identify the antecedents affecting academic professional's turnover decision by examining the compensation, career mobility, working environment and organizational support decisions. The paper's research question focuses on examining the impact of human resource management practices and job satisfaction on brain drain within Yemeni universities. Specific HRM practices such as compensation, career mobility, working environment, and organizational support will be addressed to understand their influence on academic turnover intentions and the broader issue of brain drain.

2. Literature Review

This literature review is aimed at revealing the complicated relationship between the 'brain drain' and its economic implications, especially concerning Yemeni universities. It provides a comprehensive review of the current literature, with particular emphasis on elucidating important economic implications associated with brain drain. While most emphasis is given to the academic sphere, particularly for HR management practices and job satisfaction. Scholars have exhaustively analyzed the challenges of the global brain drain. On the other hand, some thought should be made about problems specific to Yemeni universities. The present synthesis is intended to advance our insights regarding HR management practices and job satisfaction as impact factors of brain drain economic consequences in this unique academic setting.

2.1 Global Brain Drain and Economic Implications for Yemeni Universities

Brain drain is a popular theme discussed in academia, referring to the global economic anomaly that skilled workers depart their native countries. Respected authors, Alaghbari and Beshr (2019), provide a comprehensive analysis of the phenomenon when qualified workers are migrating. The observations above illuminate a challenging dilemma whereby individuals who search for economic opportunities abroad also contribute to the conspicuous loss of essential manpower in their home country. (Alaghbari & Beshr, 2019) This paradox describes the interrelations leading to questions about the possible future economic sustainability of countries losing such

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a large share of highly skilled workers. The understandings offered by such scholars strengthen our all-round understanding of the intricate challenges associated with the global brain drain phenomenon.

Situated in the Middle East region, and even more so, given Yemen's economic instability and political instability current emigration of highly skilled people as the challenge is especially evident. Over the years, renowned academics such as Astuti et al., (2023) and King in 2023 have described these intricacies highlighting how reliant Yemeni universities – which are valuable repositories of intellectual capital—are on general economic stability(Astuti, Prabowo, & Puspitasari, 2023)Thus, such a case of brain drain in this regional setting results in serious concerns about Yemen's socio-economic sustainability over the long term. These scholars offer highly valuable insights that contribute to the better interpretation of complicated mechanisms and outcomes of brain drain in the Middle East region (King, 2023).

The literature focuses on the central theme of economic stagnation caused by a brain drain that involves leaving highly educated individuals. Well-known academics, Aguiar-Quintana et al., (2021), point out how dire the consequences are when scholars leave Yemeni universities to create a vacuum that impedes economic development and suffocates creativity. B Brain drain not only deprives the nation of intellectual assets but also adversely affects the more general economic circumstances (Aguiar-Quintana et al., 2021).

2.2 HR Management and Job Satisfaction

The paper underscores the high-cost implications implicit in hiring and training new academic staff encountered to replace those existing ones. Darvishmotevali and Ali, (2020) have even brought attention to the considerable amount of money spent due to their continuous loss incurred from losing such valuable human resources, an action that compounds economic challenges faced by institutions as well as the national economy. [9]. The continuous nature of the replacement also adds not only immediate recruitment costs but also requires long-term investments in training programs. Not only does the continuous practice of draining talent render educational organizations financially unsustainable but also, as implied in literature. Skilled labor serves as a cornerstone for national development, and the phenomenon of brain drain poses significant challenges to economic progress, social advancement, and educational standards (Alhebshi et al., 2024).

The works particularly highlight the important part of which is the economic impact that brain drain had, especially concerning its negative influence on research and innovation. Al-Halili and Hongxin, 2019 and Arayssi et al., (2023) argue that the migration of qualified academics weakens Yemen's capacity to compete internationally making it impossible to progress in areas such as technology and science. Intellectual capital loss does not only stop research processes but limits a nation's capability to contribute major findings in international development (Al-Halili & Hongxin, 2019) . This significant drawback in research and innovation aggravates the effects of brain drain that have been discussed above according to the literature (Arayssi, Fakih, & Haimoun, 2023). This disruption has to be responded to because Yemen must keep its place in the progress of science and technology around the world.

The literature brings to the fore such a complicated link between the brain drain's economic implications and the quality of education as well as workforce training. Mo and Borbon, (2022) not only does the movement of skilled professionals affect the present educational setting but also makes a long-term impact on that nation's ability to develop an extremely precise labor force (Mo & Borbon, 2022) . However, the downfall of educational standards is an ongoing roadblock that worsens the economic effects associated with brain drain issues their specialists in this field. The focus should be placed on this connection to foster sustainable economic growth in Yemen.

The literature stresses the essential significance of HR management skills in overcoming and reducing financial ramifications resulting from brain drain. Duklaska et al., (2023), esteemed scholars, assert that salary as well as professional development opportunities are one of the major factors that influence patterns of brain drain, along with the company's culture (Duklaska, Ferrazza, & Cantafio, 2023) . Jinah et al., (2024) highlight the importance of strategic HRM approaches for creating a suitable atmosphere that allows these highly competent people to be retained in Yemeni institutions. These notions advocate proactive measures to address key factors associated with the loss of talented professionals, thus increasing the overall attractiveness of academic positions (Jinah et al., 2024) . As such, ensuring these human resources strategies are identified and implemented is a key step to prevent economic problems that arise from the loss of highly trained scholars in an eminent Yemeni setting. Research focuses on job satisfaction as a determinant that can facilitate or negate initiatives to minimize the economic impact of brain drain. Kunnumbrath and Kodali, (2023 also point out that a satisfied staff is less likely to seek opportunities elsewhere, which should reduce the economic consequences of brain drain (Kunnumbrath

& Kodali, 2023) . A favorable and satisfactory working atmosphere in Yemeni universities is of supreme importance.

Yemeni brain drain in the academic teaching institutions works under the condition that the emigration from the developing countries is apparently rational due to the economic, political and social turbulence. This is further compounded by factors such as low career progression, poor remuneration, and harsh working conditions. Instability is a problem present in many countries but, the Yemeni problem ACC is different due to a number of reasons arising from conflict and bad economic cycles. The literature mainly emphasizes compensation and job security as two important aspects of HRM that impact brain drain in the Yemeni universities. They noted that although other functions like professional development, organizational support, and workplace culture are important in mediating the effectiveness of a leader, none of them is as critical as the core functions identified above. The omission of these variables in the research is because prior studies in Yemeni academic context have not sufficiently investigated these factors. As a result, future research should supplement these findings to offer a better understanding of the influence of HRM on brain drain in Yemen.

3. Hypothesis

The conceptual framework of this study will center around four proposed hypotheses, which are as follows:

3.1 Higher Compensation Affects Positively Job Satisfaction

According to a study conducted by academic staff members at universities, it has been observed that salary significantly and positively influences their level of job satisfaction (Adanlawo & Nkomo, 2023). Based on the findings of the study, it has been shown that remuneration plays a pivotal role in influencing job satisfaction (Arta, Wibowo, Cakranegara, Hadi, & Zaroni, 2022). Additionally, effective communication has been identified as a crucial factor that positively affects employee job satisfaction. The research also investigated income as an external factor that influences the work satisfaction of academic staff at public institutions in Malaysia and found a significant association between income and job happiness (Mehrad, 2014). The study also underscored the importance of comprehending the factors that influence job satisfactio since they have the potential to elicit various workplace actions (Saria, 2015). In general, the remuneration received by academic personnel at universities has a notable influence on their level of job satisfaction. Consequently, businesses should duly consider this factor to enhance employee contentment and productivity (Nazir, Khan, Shah, & Zaman, 2013). Based on previous studies, the first hypothesis was developed:

> *H1: Higher compensation correlates positively with job satisfaction among academic personnel at Yemeni universities.*

3.2 Higher Levels of Supervision Affect Positively Job Satisfaction

Previous research has established a favorable correlation between job satisfaction and increased levels of supervision (Mohan, 2019; Sahana, Laoli, Situmorang, Hutabarat, & Ginting, 2022; Saunders, 2023; Sri, 2021). This correlation has been substantiated by research conducted in several contexts, encompassing applied behavior analysis interventions for children diagnosed with autism spectrum disorder (Maryanti, Arafat, & Eddy, 2021), a commercial enterprise involved in plantation activities, public primary educational institutions, and specific public primary schools within a designated district. The findings of these investigations revealed a significant favorable correlation between academic supervision and teacher job satisfaction, as well as increased levels of treatment faithfulness and work pleasure. Furthermore, a notable finding emerged indicating that the presence of capable supervision had a positive impact on employee satisfaction, particularly when supervisors exhibited qualities such as intellectual stimulation and genuine care (Saleh et al., 2022)The results of this study underscore the importance of supervision in promoting job satisfaction and recommend that employers priorities the implementation of effective supervisory strategies to enhance employee performance and wellbeing (Khalaf et al., 2024).

> *H2: Higher levels of supervision are positively correlated with job satisfaction among university faculty in Yemen.*

3.3 Job Security Affects Positively Job Satisfaction

There exists a positive correlation between job security and job happiness among academic professionals inside the university setting (Kato, Mugizi, & Kasule, 2023; L. Kim, Pongsakornrungsilp, Pongsakornrungsilp, Horam, & Kumar, 2023). Based on research conducted in higher education institutions in Pakistan, the level of job satisfaction among academics was found to be significantly influenced by the factor of job security (Afaq et al.,

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2022). In a study conducted in Lagos State, Nigeria, it was observed that job security had a substantial influence on the level of work satisfaction experienced by non-teaching personnel (Ayodele et al., 2022). The findings of this study indicate that there is a positive correlation between perceived job security and job satisfaction among academic staff members. This underscores the need to provide stable employment and equitable labor practices inside universities as a means to enhance job satisfaction among academic personnel. Empirical evidence suggests a positive correlation between job security and work satisfaction among university academic workers. According to a study conducted in Nigeria (Agbakwuru & Iyawe, 2023), job satisfaction among non-teaching professionals in public universities was found to be highly influenced by employment stability.

H3: Greater job security is positively correlated with job satisfaction among Yemeni university academic staff.

3.4 Higher job Satisfaction Effect Negatively With Intentions to Leave the Country

Multiple research studies have demonstrated that increased levels of job satisfaction are associated with a decrease in employees' intentions to quit their current positions or occupations. An investigation conducted within a utility firm in South Africa revealed that social well-being, which exhibits a positive correlation with job satisfaction, demonstrated a negative correlation with intentions to leave (Hennicks, Heyns, & Rothmann, 2022). Previous research has established a correlation between low levels of job satisfaction and individuals' inclination to emigrate. In a similar vein, it has been observed that extended working hours and bad working conditions are also associated with this desire to relocate. There is a consistent association between increased levels of job satisfaction and decreased intentions to leave a job, with job satisfaction serving as a key predictor of turnover intentions (Liu, Zhu, Wu, & Mao, 2019). The fourth hypothesis was formulated based on prior research findings:

H4: Higher job satisfaction among academic staff at Yemeni universities is negatively correlated with intentions to leave the country

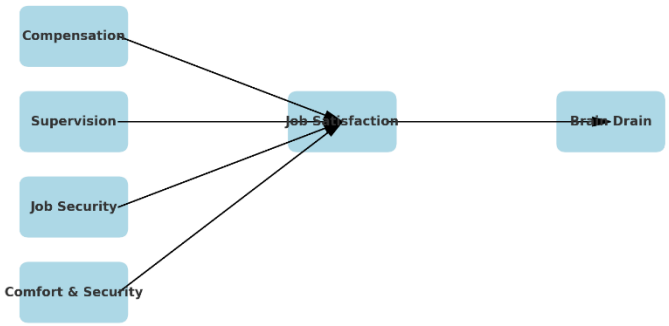


Figure 1: Hypothesis Model

The Hypothesis Model in Figure 1 presents four hypotheses that analyze the link between HR management practices and job satisfaction and the brain drain trend amongst the Yemeni universities' academic staff. The first hypothesis of this study is that there is a direct relationship between compensation, consisting of wages and incentives, and job satisfaction, proposing that employees receive fair monetary compensation hence improving their satisfaction levels. H2 claims that the high degrees of supervisory directions are also related to an enhancement in job satisfaction. In the light of H3, it means that job security enhances the satisfaction level because stability brings a contract. Last, H4 supposes that there is a negative relationship between job satisfaction and the intention to look for a job in another country, implying that higher levels of job satisfaction would make it less likely for the employees to seek employment in a foreign country. Job satisfaction is the variable of interest, which is moderated by elements from both Herzberg's model and the Pull-Pull Theory for these dynamics.

4. Methodology

4.1 Participants

The sample consists of 270 respondents randomly selected to represent the whole academic population in Yemen. The purposive selection of our respondents that is the principal in this kind of sampling assured not only

their real coverage of all types and dynamics of the university system in Yemen but also their detailed representation of the existing challenges and opportunities in this sector. As exactly the purpose of this study is to make the results more valid and accurate, and consequently, the data from a small homogeneous sample of 270 participants from a heterogeneous and representative sample is to be collected. A further step was the characterization of the reviewers' population, conducted methodically to comprehend better the sample. The information is present in the Table 1 below:

Table 1: Demographic Analysis

Demographics Category	**Frequency**
Gender Profile	
Male	140
Female	130
Age Profile	
20– 35 years	80
36 – 50 years	60
51 – 65 years	80
65 years and above	50
Education Profile	
MS/Phil	171
PhD	99
Work Experience	
0-5	70
6-10	83
11-20	60
21-30	57

The demographic characteristic of the respondents who form the academic population in Yemen is given in Table 1. From the data obtained from the gender distribution, slightly more males were recorded with 140 males and 130 females. In terms of age, respondents are categorized into four groups: Females: 80 are aged 20–35 years, 60 participants are aged 36–50 years, 80 are 51–65 years and 50 are 65 years and above in age. The majority of the respondents have a Masters or Phil degree (171) and 99 of the respondents have a PhD. With regards to work experience, 70 participants have 0-5 years, 83 have 6-10 years, 60 have 11-20 years and 57 have 21-30 years of experience. This diverse group guarantees that the researchers have a clear vision of the academic strengths and weaknesses in Yemen.

4.2 Common Method Bias

The research used an effective and systematic approach to detect and explore the potential existence of CMB. Technique bias is a method of common variation in measurement that stands to exist because of the application used and not what has been measured. The study used a comprehensive collinearity approach, which was generally taken up (Al-Halili & Hongxin, 2019). As an important parameter, VIF was used to assess and factor CMB out (Arayssi, Fakih, & Haimoun, 2023). Our findings revealed consistently acceptable VIF values below 3.3 for all variables in our analysis about the measure of collinearity used herein. This result shows a low degree of collinearity that proves the absence of common technique bias. Resorting to the use of VIF as a diagnostic tool enriches our methodology and assures reliability by verifying validity. The dependability of its conclusions is warranted in this study because it has completely dealt with the potential bias that may arise from common methodological factors, thus assuring their solidity.

In addition, the goal-oriented and diligent selection of variables as well as the careful use of statistics increases the resilience of the study. The minimization of the strength of measures such as multiple vaccinations also enhances internal validity and consequently will lead to consistent reliability. The carefulness in the methodology reveals interest in rigorous methods and contributes to strengthening credibility on expanding awareness of the intricacy between HRM practices, job satisfaction, tendency for brain drain occurrence among Yemeni institutions (Maung, 2019).

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The survey questions were created based on the theoretical models, chiefly using the Two-Factor Theory and the Push-Pull Theory. These frameworks were adjusted to the Yemeni context of academia to capture all the possible variables that might affect job satisfaction, and the decision to engage in brain drain (Tsujita, Oda, & Rajan, 2023). Some of the survey items were developed in a way to measure other factors like compensation, comfort & security, brain drain, supervision, and satisfaction with an aim of achieving the research objectives.

Full Collinearity Testing

The collinearity testing procedure is significant because it estimates the level of dependability among predictor variables, therefore allowing one to make the correct inference from the statistical data. The VIF values assigned to each of the categories (Compensation, Comfort & Security, Brain Drain, Supervision, and Satisfaction) on which this evaluation is based are very significant (Albanese, 2022). The main observation related to the Compensation VIF metric (2.001) is the lack of collinearity strength. Compensation has a relatively low VIF, the indicator reveals a weak correlation with other predictors. Therefore, information from the Compensation factor is considerably different from the data obtained from other factors.

Based on the above reasons, the research method of this study is Partial Least Squares Structural Equation Modeling (PLS-SEM) since it is capable of handling a complicated model with a non-normal distribution and a small sample size. Qualitative research therefore is best suited in exploratory studies that seek to establish patterns in socio-economic environments such as the Yemeni academia [31]. The data analysis followed two major stages. First, the measurement model of the PLS-SEM path model was generated to find out the relationships between the latent and observed variables. Secondly, the reliability of the model was established through a composite reliability test while convergent validity was tested through Average Variance Extracted (AVE) [32].

VIF of 1.009 for Comfort & Security is low, which highlights the absence of collinearity issues clearly and strongly so far as possible. It constitutes an autonomous variable for the model, and its contribution to total variance is nearly insignificant. The VIF (Variance Inflation Factor) is low, justifying the validity of Comfort & Security as a distinct and important predictor (Jelili, 2022). VIF for the Brain Drain is 1.061, a relatively low value of collinearity presented here This finding implies that the relationship between Brain Drain as a variable and others is not too redundant, reflecting its significance for this model. The small VIF increases the reliability of Brain Drain as a relevant and independent variable. The VIF value of 1.058 for Supervision shows that it has very low collinearity with other predictor variables (Mojab, 2022). The low value of the VIF for this variable suggests its important contribution and thus a distinctive role in the model. The lack of a strict correlation increases the trustworthiness of Supervision as an important predictor.

The VIF for Satisfaction is 2.016, which signifies a slightly high value but still an acceptable one. This variable implies a modest level of multicollinearity which reflects low shared variance with other predictors. However, the VIF value does not indicate a concerning level of multicollinearity and Satisfaction remains significant in the model as represented in Table 2 below.

Table 2: Collinearity Testing

Compensation	Comfort & Security	Brain Drain	Supervision	Satisfaction
2.001	1.009	1.061	1.058	2.016

4.3 Data Analysis

To address the specific properties of this data set to be studied, a Partial Least Squares Structural Equation Modelling (PLS-SEM) approach was used to analyze acquired datasets. PLS-SEM was preferred to other methods, like CB-SEM because of its flexibility and efficiency especially when handling sophisticated models with moderate sample data. With data that have intrinsic complexities, PLS-SEM does produce reliable results [12].

Another reason for selecting PLS-SEM was its ability to handle non-normally distributed data. PLS-SEM is a very practical model to use when dealing with nonnormal data [12]. Notably, the ability to adapt is especially crucial in handling real datasets that may not be normally distributed. The data analysis technique occurred in two main phases: The first stage involved the estimation of the structural equation model with PLS-SEM. This entailed making links between fundamental concepts and quantifiable parameters, as well as determining the similarity of such a model to the data that were gathered. Phase two focused on the validity of the model (Mojab, 2022).

This included evaluating the reliability and validity of conceptual underpinnings and reviewing a model for measurement application according to empirical findings that were consistent with theoretical predictions.

Measurement Model:

The measuring model went through a vigorous assessment, largely aimed at determining the reliability and validity of constructs based on outer modeling. As an element of construct dependability, internal consistency was assessed based on composite reliability. It provided useful information on indicator coherence in each construct to ensure they all represented reliable measurement devices (Jelili, 2022). Meanwhile, the reliability of each single indicator was meticulously examined determining what part a particular signal plays in its corresponding concept. The comprehensive analysis had an important role in proving the validity of the measuring model. One aspect of construct validity was convergent validity, which is AVE [36]. This measure evaluated the extent to which indicators captured the variance of constructs accurately. The assessment of convergent validity corroborated that the indicators captured the targeted constructs correctly, reinforcing convergence's strength in the measurement model [37].

The model's ability to explain the variance in the independent constructs and its predictive accuracy was assessed with the path coefficients, the R2 values, Q2 measures, and F2 tests that were derived from the PLS-SEM analysis of the standard tables. These enabled the establishment of the factors responsible for job satisfaction and the likelihood of Yemeni brain drain in the academic institutions (Meesters, van Schilt, & Aciru, 2019). Yemen was chosen as the country of focus based on the heterogeneity of socio-economic environment in which the academic workforce in Yemen operates with regard to specific challenges, such as workforce turnover and job satisfaction in the context of larger economic and political volatility (Meesters, van Schilt, & Aciru, 2019). Thus, this study focuses on Yemen to gain specific rather than general knowledge that might be useful for enhancing the understanding of HR management practices in difficult conditions.

The Structural Model:

Before the inquiry, an examination for structural modeling applied to understand such a nested structure of endogenous and exogenous factors was addressed by evaluating internal models. The provided internal model served as a reliable basis for understanding the system interconnectivity within the framework [40]. To ascertain the importance and relevance of the said relationships in the structural model, path coefficients were computed.

The R2 values were needed in order to assess predictive accuracy of the model and figure out how many forms of endogenous influences were included in the explanatory factors. Behavior of the model to provide predictions was measured with Q2 score and demonstrated its ability to generalize and be robust against the out-of-sample data. The F2 measure played a fundamental role in the measurement of the influence that was having on an internal variable by an external, thus, determining how much each factor influenced its target. In this analysis, a two- step method with SmartPLS embedded software is applied. In order to do this the first stage applied was the assessment of a measurement model for lower-order constructs and proving their validity and reliability.

4.4 Theoretical Framework

The model is grounded in established theoretical frameworks to contextualize our research effectively. Specifically, our study draws on the Two-Factor Theory and the Push-Pull Theory. These frameworks provide a robust foundation for understanding the motivational factors influencing job satisfaction and the propensity for brain drain within Yemeni academic institutions. The Two-Factor Theory posits that certain factors (hygiene factors and motivators) influence job satisfaction and dissatisfaction, while the Push-Pull Theory explores the forces that attract individuals to migrate (push factors) or keep them in their current environment (pull factors). By integrating these theories, our model seeks to comprehensively examine the complex dynamics influencing workforce retention and satisfaction in Yemen's academic sector. In our study, these theories combine to give the complex picture of the challenges within the Yemen academic sector, where the understanding of motivational forces and migration dynamics is paramount. Combining these frameworks will create awareness of how these factors contribute to the enhancement of workforce retention and satisfaction as presented by the developed model. It not only strengthens the theoretical framework but also provides the policy maker and institutional manager with good reference to the organizational change and its strength for operation in the dynamic socio-economic environments. Thus, our theoretical framework can be seen as an integrated model for understanding and approaching challenges that exist in the context of human resource management in Yemeni academia and preventing brain drain, fostering employee satisfaction.

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Our research employs Partial Least Squares Structural Equation Modeling (PLS-SEM) due to its suitability for handling complex models with relatively smaller sample sizes and non-normally distributed data, which are common in our research context (Gefen et al., 2011). PLS-SEM offers flexibility and efficiency in analyzing relationships between latent variables, making it particularly suitable for exploratory studies aiming to understand nuanced relationships within socio-economic contexts like Yemeni academia. This approach allows us to assess both measurement and structural models comprehensively, ensuring robustness and reliability in our findings (Hair et al., 2017). In evaluating the measurement model, we prioritize reliability and validity checks to ensure the robustness of our constructs. Internal consistency is assessed through composite reliability, ensuring that our measurement items reliably measure their respective constructs. Convergent validity, assessed through Average Variance Extracted (AVE), confirms that our indicators adequately capture the variance within their constructs, thereby validating their reliability as measurement tools (Hair et al., 2017).

4.5 Structural Model Analysis

The structural model analysis involves computing path coefficients to determine the strength and direction of relationships between variables. These coefficients provide insights into the predictive power of our model, helping us understand how different factors influence job satisfaction and the likelihood of brain drain within Yemeni academic institutions. R2 values are used to assess the proportion of variance explained by the endogenous variables, indicating the model's explanatory power and its ability to predict outcomes of interest (Meesters, van Schilt, & Aciru, 2019). Additionally, Q2 scores evaluate the model's predictive relevance and generalizability, demonstrating its robustness against out-of-sample data. The F2 measure assesses the effect size of exogenous variables on endogenous constructs, highlighting the relative importance of each predictor in influencing the observed outcomes (Hair et al., 2017).

5. Results and Discussion

Survey Details

Survey instrument used in this study was compiled from standard surveys to ensure that it is relevant to the study and in line with the conceptual framework. Job satisfaction items referred to research like Mo and Borbon (2022) on the capacity of the employees to satisfy with the jobs they are doing. Some of the questions were developed from Al-Halili & Hongxin (2019) exploring perceived fairness and adequacy of compensation and benefits. Leadership support items and frequency of performance review item were generated and used to measure the overall supervision quality in line with Darvishmotevali and Ali (2020). Perceived brain drain intentions were assessed using items borrowed from Kunnumbrath and Kodali (2023), in which participants assessed their inclination to look for employment overseas or any other reasons. Details of the survey items and the constructs they aim to capture are presented in Table 3 to provide the studies' genesis and their relevance to the current study.

Table 3: Survey Constructs, Items, and Sources

Construct	Survey Item	Source
Job Satisfaction	"How satisfied are you with your overall job?"	Mo & Borbon (2022)
Compensation	"How fair is your compensation compared to peers?"	Al-Halili & Hongxin (2019)
Supervision	"How frequently do you have performance reviews?"	Darvishmotevali & Ali (2020)
Brain Drain Intentions	"How likely are you to consider employment abroad?"	Kunnumbrath & Kodali (2023)

5.1 Reliability and Validity Analysis

The reliability and validity analysis for the seven constructs pay satisfaction, financial rewards, and supervisor communication. (Alotaibi, 2023) Such an evaluation was critical in ensuring the robustness and validity of the measuring model, especially since compensation supervision comfort and security legalization pleasure offshoring are part of higher-order constructs within this study framework.

The values of factor loadings were the determining factors that informed whether an item should be either included or excluded from the measurement model. (Rendón-Zapata & Bedoya, n.d.). A stringent cut-off value of 0.8 was employed to determine what should be included or excluded in the report. Items that had factor loadings coefficients than 0.5 were considered inadequate and thus eliminated from the analysis process. Only persons having values ranging between 0.6 and 0.7 were included in the list as per what previous research publications (Rendón-Zapata & Bedoya, n.d.) had determined to be criteria for inclusion into this stead. The detailed approach adhered to established standards helping the reliability and validity of the measurement model. The inclusion of factor loading values indicated a commitment to validity and strict methods in such as way that only items that correlated significantly with their construct were retained. This was a key tactic for maintaining the validity of the measurement model and subsequent analysis.

5.2 Convergent and Discriminant Validity

Convergent and discriminant validities are essential in terms of validation of measurements to ensure accuracy, and strong correlation but uncorrelation with each other respectively. [32]. These validation measures were widely used in this study, applying precise methods for deep assessment of the constructed validity and uniqueness. The convergent validity using the average variance extracted (AVE) measured significant homogeneity within indicators for each variable. Crossloading scores and set criteria were used to establish the discriminant validity of variables showing their ability to distinguish themselves from others. The rigorous adherence to these validation approaches increases the quality of results from this research and validates the consistency between subtle aspects of observed phenomena and those captured by this measurement model (Sirgy et al., 2019).

Convergent validity was evaluated by calculating the average variance extracted (AVE) value. We compared the values of AVE, which indicate shared variance within each continuous variable across its indicators. It Fornell and Larcker's (1981) recommended a cut-off point of 0.5. Significantly, all AVE values in this study are above the specified threshold for convergent validity and thus firmly confirm it. This finding indicates that the indicators of each variable in the study exhibit a considerable level of construct validity, thereby reinforcing the reliability and consistency measurement model.

In evaluating discriminant validity, what was emphasized when assessing the properties of variables in terms of measurement? This significant characteristic is focused on evaluating the discriminatory power of a variable and thus requires an analysis of relationships between items within one framework. The evaluation also considers whether the metrics only reflect a single construct. Cross-loading scores were analyzed and compared to predefined criteria to determine discriminant validity (Satti, 2022).The discriminant validity analysis revealed compelling results that unequivocally support the variables' ability to differentiate. The HTMT ratios, which differentiate our items that measure other constructs and those measuring the same construct proved unequivocally anchored to unique measurements. Many, of these ratios frequently remained far below the conservative threshold of 0.85 to illustrate the outstanding effectiveness of dividing variables into different and independent concepts (Jawasreh, 2021). The outcome provides strong substantiation that the variables are effective in reflecting various aspects of the studied phenomena. This also makes the measurement model more reliable and valid in detecting weak associations among variables under study.

5.3 Higher-Order Constructs

The evaluation of more complex concepts, for instance, Compensation and Supervision, refers us to their importance as the underlying variables in the research framework. The reliability of the constructs Compensation and Supervision was tested by Cronbach's alpha. The alpha values for Compensation and Supervision were 0.85, respectively, much higher than the recognized criterion of 0.7 as represented in Table 4 [45]. This means that these constructs reflect high reliability. This implies that all the items within one high-order construct constantly evaluate a common underlying latent variable.

Table 4: Higher Order Construct Reliability & Convergent Validity

Construct	AVE	Compensation	Supervision	Job Satisfaction	Brain Drain
Compensation	0.518	1	0.652	0.71	0.588
Supervision	0.514	0.652	1	0.743	0.633
Job Satisfaction	0.59	0.71	0.743	1	0.77
Brain Drain	0.572	0.588	0.633	0.77	1

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However, the assessment of convergent validity based on composite reliability (rho_c) and average variance extracted (AVE), also supported the dependabilities as latent constructs of Compensation and Supervision. The composite reliability values for the Compensation (rho_c = 0.87) and Supervision items both exceeded the minimum requirement of 0.7, indicating that a consistent and stable measurement model is sufficient (Rauch, 2019). Besides, the AVEs of Compensation (AVE = .518) and Supervision (AVE=0.514) are higher than 0. This supports the convergent validity of these higher-order constructs, indicating that each item in a given construct generates unique information and functions as an appropriate measure of its underlying principle (Jawasreh, 2021).

In conclusion, the thoughtful appraisal of such sophisticated concepts as reliability and convergent validity provides solid evidence that Compensation and Supervision represent strong stable constructs. These constructs are key elements of the study's research framework that improve the accuracy and validity of measurement model information on phenomena under analysis.

5.4 Structural Model Assessment

In case the variables in this measurement model are valid and reliable, PLS-SEM proceeds with an evaluation of the validation inner model – namely structural one. The latter stage is very important for confirming relationships between endogenous and exogenous constructs. Several important factors guide the evaluation of structural models in the PLS-SEM framework as shown in Figure 2 below.

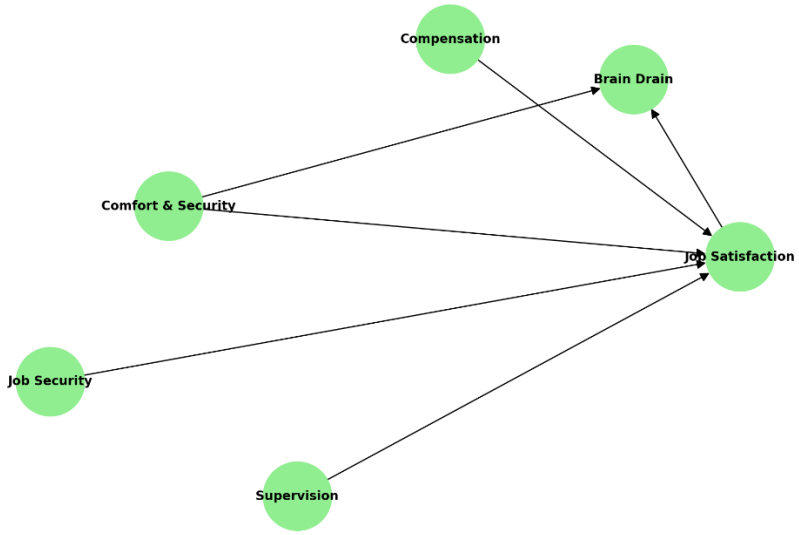


Figure 2: Structure Inner Model Assessment

Shown in figure 2 below is the structural model that was used in this study. Besides the hypothesized relationships, other relationship that were established include Comfort & Security and Job Satisfaction as well as Comfort & Security and Brain Drain. This extended model offers further understanding of factors that shape the process of retention of employees. (Rauch, 2019). In addition, the R^2 value is a measure employed in PLS-SEM that measures predictive model accuracy. This indicates the degree to which variability in endogenous constructions is explained by external constructs. A higher R^2 value shows a greater capability of the model in explaining data (Jawasreh, 2021).

The Q2 values are an important measure used to assess the predictive power of the structural model. It measures how well the model can predict further than what is used for estimation, shedding light on whether it might work in larger populations. Also, the F^2 measure is used to quantify how much an exogenous variable influences an endogenous variable. This measure provides a full understanding of the substantial impact on variables from the structural model, especially under a moderated mediation analysis context. This way, the PLS-SEM structural model assessment discloses links between various concepts and assesses how well a given set of assumptions can explain or predict. This detailed analysis adds to our understanding of the subtle machinations occurring within the research structure whereby interpretation and conclusions may be drawn from variable interactions.

5.5 Assessing R2 Values

To further improve the assessment of the structural model in PLS-SEM, R^2 values are included; this important measure is known as a coefficient of determination. R^2 is a good measure that has innate diagnostical capacity, which provides meaningful data on the accuracy of the model and its ability to forecast [9]. This measure provides the degree of correlation between observed and predicted scores on an endogenous construct based on a squared value. Within the frame of this research, R^2 values play an essential role in disclosing a joint impact on internal variables from external stimuli, especially regarding satisfaction and brain drain. The values serve as the criterion for assessing the structural model's effectiveness determining how strong external factors affect these important internal variables (Arayssi, Fakih, & Haimoun, 2023). Various R^2 values make it possible to analyze the evaluation more accurately, defining how factors interact within an object of study.

R^2 is a measure of correlation between actual and predicted values for dependent variables. R^2 values are known to be important in this study due to their importance in explaining the overall effect of external influences on internal variables more specifically contentment and brain drain (Mo & Borbon, 2022). These factors are very important for the research framework as it is necessary to analyze their predictive value in detail. R^2 values are used in the study as a measure by which to evaluate how much there is the contribution of external factors towards observed variances in satisfaction and brain drain. This comprehensive analysis enhances the understanding concerning a model's ability to make predictions, providing in-depth knowledge regarding relationships between internal and external elements within a research environment.

The R^2 values from this study are an important measure of the ability to explain by a structural model. They give indications of how well the model reflects variability in crucial exogenous features, namely happiness and brain drain. Happiness and Brain Drain form significant robustness of the structural model which we have developed (Kunnumbrath & Kodali, 2023). The good signs mean that the model works correctly to the expectations in the sense that the factors included in the analysis have a high impact on both satiation and the level of brain drain. This validation improves a model's accuracy that researchers feel confident that it shows and comprehends the vital internal aspects correctly (Saleh et al., 2022). The R2 values being positive are indicators of the enhancing nature of the model at both the theory as well as practical level to dig deeper into the sources for difficulty in satisfaction of the employees while facilitating their relative drain-off in government and private institutions in Yemen (Mo & Borbon, 2022).

5.6 Assessing Q2 Values

To ensure the model validation was comprehensive, this research utilized blindfolding. The Stone-Geisser Q2 value was treated as a focal metric allowing the assessment of predictive significance for each respective endogenous variable (Naal et al., 2023). To determine the cross-validated redundancy Q2 values for all of the dependent variables, a comprehensive assessment was carried out by using an omission distance that is ten.

The results of the investigation provide a compelling justification for the predictive nature of the PLS structural model before deployment. The Q2 value was 0.485 for the endogenous variable "pleasure" which indicated a large effect size strength. This means that the model predicts and captures changes in the "pleasure" variable well enough to make a significant contribution toward understanding this concept within its framework (Biygautane, 2023). Secondly, the Q2 value computed for the variable "brain drain" was 0.399 which shows a sizable effect magnitude This emphasizes the model's superior capability to predict and provide justification for changes in brain drain within. The high Q2 values indicate that the developed model can understand the complexities of "pleasure" and "brain drain," which implies its accuracy in correctly predicting as well as facilitating learning about Yemeni colleges (Aljuaid, 2022).

We observe that all the Q2 values obtained were positive and this means that the PLS structural model used has predictive significance. A positive value of Q2 is consistently greater than zero implying that the predictions provided by a model are often better than random guessing (Maung, 2019). This supports the validity of the model in describing and explaining changes observed in the variables being considered. The good performance of the model attests to its trustworthiness and utility as a predictor that accurately captures dynamics observed in the events being studied. The positive Q2 values indicate the model's ability to exceed random chance in terms of prediction accuracy, setting a solid foundation for its practical use and theoretical development (Tsujita, Oda, & Rajan, 2023). This observation increases the trust in the model's predictive ability to verify its value as a useful instrument for understanding internal variables about Yemeni colleges.

To improve the quantitative structure of the PLS structural model, a meticulous validation process is made based on the blindfolding technique and Q2 values calculation (Pocinho, Garcês, and De Jesus, 2022). The conclusion

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of predictive validity also confirms the theoretical framework for this conceptual model, along with its practical application in understanding fine details involved with pleasure and brain drain within the Yemeni Institutions [29]. The 'blindfolding' method, combined with the Stone-Geisser Q2 value serves as a measure of rigorous validation that provides confidence in model predictive power and its role in knowledge building.

As shown in Table 5, key metrics evaluating the structural model's performance for two endogenous variables: Job Satisfaction (JS)& Brain Drain (BD) R^2 for JS equals 0.506, which means that about fifty-point-six percent of the variance in job satisfaction can be explained by the predictors; whereas, the R^2 for BD is 0.755, i.e., 75.5% of the variance in brain drain. The revealed Q^2 values, 0.485 for JS and 0.399 for BD, characterize the model with high predictive relevance due to really big values of effect sizes. The above facts prove that the proposed model effectively depicts the changes in job satisfaction and brain drain and thus the application and importance of the model provide sufficient proof to validate this.

Table 5: Results of R^2 and Q^2

Endogenous Latent Variable	R^2	Adjusted R^2	Q^2 (=1-SSE/SSO)	Effect Size
JS	0.506	0.750	0.485	Large
BD	0.755	0.497	0.399	Large

Small: 0.0 < Q2 effect size < 0.15; Medium: 0.15 < Q2 effect size < 0.35; Large: Q2 effect size > 0.35

5.7 Assessing F2 Values

When analyzing the research model, a significant aspect is to evaluate whether there are effects of F^2 size for it to be determined how much variation occurs on R-value when one particular endogenous variable has been eliminated from the equation. The F^2 size effect is a statistical indicator of the impact that a specific predictor latent variable has on an endogenous variable (Albanese, 2022). This study becomes vital to understanding the complex connections between internal variables and current external conditions.

The F^2 size effect is an essential metric that aids in the characterization of how specific external factors could influence the variance explained by internal elements. In this model, the F^2 size effect is moderate to large for exogenous variables (World Health Organization, 2020). This array of effects provides beneficial detail, shining a light on the diverse characterization within relationships between internal and external triggers. A low F^2 effect size implies limited impact which means that particular external variables only moderately influence the variability explained in internal parts (El-Sherif, 2022).

On the other hand, a medium F^2 effect signifies greater impact where some external influences play significant roles in affecting variances of internal features. This advanced understanding of the F^2 size effect spectrum can help researchers discriminate between different levels in which each external variable affects internal constructs (Albanese, 2022). This helps to determine key factors in the model, which informs strategic decision-making to enhance its effectiveness. Presuming that researchers focus on determining the influence reflected by F^2 size effects, interventions and changes made in Yemeni universities are prioritized (World Health Organization, 2020). This enables them to conform to the unique character of the interplay between endogenous and exogenous factors.

The F^2 size effect is a significant measure that reveals in detail the manner through which particular exogenous variables impact endogenous constructs within the research model. The positive sign and small F^2 size effect suggest a limited influence of the endogenous variable, which means that the specific exogenous factor does not have major impacts on determining inertia for its low value at about 1 (El-Sherif, 2022). A medium F^2 size effect implies that the endogenous components were significantly influenced by a particular exogenous variable. This all-encompassing understanding is integral to appreciating the different roles that each external factor plays in developing the overall accuracy of a predictive model (Albanese, 2022).

The different levels of F^2sizes yield a range of impact that allows researchers to compare each component's relative importance as represented in Table 6. The high level of accuracy in the analysis makes possible a selective approach to improving the model, letting researchers decide which changes should be preferred

depending upon how far influence is manifested by various external variables (Meesters, van Schilt, & Aciru, 2019). It is also possible for researchers to improve the model by considering various levels of the F^2 size effect and focusing on influential components (World Health Organization, 2020). Recognizing the role of certain external elements contributes greatly to an enhancement in accuracy and performance when refining models, which provides a better reflection on the complicated interactions within the research context embedded by Yemeni universities.

Table 6: Result of F^2

	f-square	Effect Size
C&S -> BD	0.006	Small
C&S -> JS	0.988	Large
FR -> BD	0.002	Small
FR -> JS	0.005	Small
JS -> BD	1.371	Large
PS -> BD	0.03	Small
PS -> JS	0.04	Small
SC -> BD	0.006	Small
SC -> JS	0.005	Small
SS -> BD	0.013	Small
SS -> JS	0.001	Large

Small: 0.0 < f^2 effect size < 0.15; Medium: 0.15 < f^2 effect size < 0.35; Large: f^2 effect size > 0.3

Table 6 shows the estimation of f^2 values, which measure the impact of various predictors on the endogenous variables – brain drain (BD) and job satisfaction (JS).). The coefficient amounts are compared and classified as small, medium, or large depending on particular benchmark criteria. For instance, there is a high value of the effect size, 0.988 for Comfort & Security (C&S) and JS where Comfort & Security had a large impact on job satisfaction. Compared with BD, the effect of C&S on JS (f^2 = 0.006) and other predictors, such as FR, on JS and BD is also small. It is worth mentioning that job satisfaction has the greatest impact on the brain drain variable (f^2 = 1.371) which supports the notion that it is the most important variable in this model.

The researchers could reliably estimate how much change in exogenous variables deviated the model from explaining phenomena by measuring F^2 size effects, thereby helping get a detailed understanding of their impact. This quantitative data is important for better provision and optimization of the model that enables a more precise description of complicated interactions within the scope under investigation. The F^2 size effect is an important criterion for understanding the contribution of different exogenous variables (Rauch, 2019). It aids researchers in focusing and sharpening these elements to enhance the predictive power of the model. Thus, researchers can improve the validity and importance of the model by identifying how much influence each variable exerted on endogenous constructs. This allows them to decide which aspects they should emphasize or change because it empowers them. The F^2 size effect is also important to the ongoing evolution of the research model, allowing researchers to make tiny adjustments that reflect dynamic dialectic interaction between external and internal variables in Yemeni organizations (Meesters, van Schilt, & Aciru, 2019).

The F^2 size effect analysis improves the study model by defining the real value and meaning of linkages between exogenous factors, revealing their nature. This statement not only improves the theoretical basis of the model but also provides useful recommendations for stakeholders who wish to harness or minimize certain aspects (Halim, 2021). By incorporating the F^2 size effect as an impact, the improved understanding of research outcomes adds to reliability and timeliness in model creation for Yemeni universities.

5.8 Mediation Analysis

First, mediation analysis is a statistical technique that allows investigation of the effects of one variable on another indirectly through a third. This method exceeds simple correlations by attempting to estimate how much a variable influences the propagation of changes from causes and available effects (Raheb, 2023). One of the main strengths of mediation analysis is rooted in causality, which makes it possible to conduct fundamental mechanism investigations into interaction processes.

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The process involves the analysis of a hypothetical causal chain, in which one variable (X) affects another factor Naturally, when studying the indirect effect that an independent variable has on a dependent variable through its mediating outcome, they often carry out successions of regression studies (Alaghbari & Beshr, 2019).

The systematic and implemented procedures of the PLS-SEM model begin with the Mediation Analysis. In the first stage, we determine the direct relationship that came in between the causal variable and an effect variable. While this assessment must be statistically significant nearly all statistics experts interpreted a p-value less than 0.5 as an indication for direct effect. In addition, the Basecamp can be done without taking into account the existing variable standing in between itself and the target; that's because it is the only section that stays unchanged (Raheb, 2023).

When the direct relationship is proven as statistically significant in Stage 1, mediating variable needs to be added to a PLS path model. The function of the APD - CM proof gives the direct association between the p12 * p23 indirect pathway is seen. After the issue has undergone the bootstrapping technique, the indirect path is tested (Alaghbari & Beshr, 2019). If it is found that the indirect effect plays an important role, this implies support of a mediated model. Job satisfaction serves as an essential link that connects different variables to brain drain intentions according to this study's mediation results. Table 7 presents a summary of the study results which detail both indirect effects with their corresponding statistical significance levels alongside the full mediation model postulates.

Table 7: Mediation Analysis: Customer Satisfaction as Mediator

Specific Indirect Effect	T-Statistic	P-Value	Total Indirect Effect	T-Statistic	P-Value	Mediation Hypothesis
C&S → JS → BD	12.93	0.00	C&S → JS → BD	12.93	0.00	Supported
Compensation → JS → BD	1.963	0.04	Compensation → JS → BD	3.24	0.00	Supported
Supervision → JS → BD	2.36	0.00	Supervision → JS → BD	2.88	0.00	Supported

The last phase in the mediation analysis is bootstrapping to analyze indirect paths. Bootstrapping is one of the resampling methods where they repeatedly sample from the dataset with replacement for purposes of estimating a statistic's distribution (King, 2023). In mediation analysis, this method is quite useful as it allows the estimation of confidence intervals and assessing the importance of indirect effects.

Secondly, the two mediation models offered seek to shed light on precise indirect effects of Comfort & Security (C&S) and Compensation via the JS process about BD. The results are summarized in the table below (Aguiar-Quintana et al., 2021). The T-statistic for the indirect effect of C&S on BD through JS is 12.93 with a p value equal to zero. This corresponds to a statistically significant mediating effect. Secondly, there is an indication of a meaningful mediation effect because Compensation has an indirect impact on BD through JS p-value = 0.4; T statistic acceptable moderating mediatz2s. In addition, the finding is strengthened by a significant specific indirect effect of Supervision on BD through JS with t value c' = 2.36 and p (c) < .01 (Darvishmotevali & Ali, 2020).

These overall indirect effects, which capture the joint contribution of mediation in individual pathways, accentuate mediating paths. The indicated T-statistics and p-values lend statistical support to the idea that Job Satisfaction mediates the relationships between Comfort & Security, Compensation, and Supervision with Brain Drain (Al-Halili & Hongxin, 2019).

The results shown in Table 5 stand as strong support that Comfort & Security, Compensation, and Supervision are HR management practices studied with a high impact on Brain Drain. Table 5 presents the results of mediation analyses, focusing on Customer Satisfaction (CS) as a mediator of the relation between different independent variables and Brain Drain (BD) through Job Satisfaction (JS). This shows that a mediator analysis and direct comparison between C&S- BD and JS mediated was configured with a T-statistic of 12.93; and p- value of 0.00 < 0.05 hence agrees that Comfort & Security (C&S) has a significant and quite strong indirect impact on BD through JS as postulated. Likewise, for the relationship between Compensation and BD through JS, it was found that the T-statistic was 1.963 and the p-value was 0.04, meaning a potential mediation effect. Lastly, the Influence of Supervision on BD through JS is also positive signified by a T-statistic 2.36 and a p-value of 0.00. In general, these findings affirm Hypotheses one, two, and three that establish job satisfaction as a mediator between the above-noted independent variables and brain drain. This effect is moderated by Job Satisfaction. This helps us see that HRM procedures influence the intentions of academic personnel to engage in Brain Drain

inside universities using complex mechanisms (Arayssi, Fakih, & Haimoun, 2023) Bootstrapping results from mediation analysis have shown considerable evidence that Job Satisfaction plays a critical mediating role between Compensation, Supervision, and Brain Drain intentions. The indirect implications in the relations between these variables reveal how complicated interactions are involved within the HRM framework shedding light on subtle dynamics that direct academic staff' intentions to leave Brain Drain (Jinah et al., 2024).

6. Conclusion

In conclusion, this research focuses on the important issue of brain drain that has been faced by universities in Yemen, especially concerning their faculty members. This research study seeks to address one of the important gaps in the current literature concerning HR management practices related to/ applicable to Yemen by presenting a comprehensive analysis and work satisfaction as a mediation variable. This research has contributed useful information about the determinants of inclinations to emigrate and their implications for personnel management in Yemeni colleges.

The study further points out how HR management practices, in particular compensation and supervision functions are of great importance in the resulting factors that motivate brain drain. The outcomes highlight, indeed, the importance of dealing with these human resources policies because addressing them will help to reduce risks associated with losing highly qualified academic specialists. In addition, the findings validate that job satisfaction determines how these human resources practices affect attitudes on brain drain. In particular, the extent of employee satisfaction and their evaluation of compensation package value are crucial factors that determine employees' migration assessments.

This study shows that the mediation studies used in this work reveal job satisfaction as a powerful mediator between compensation, supervision, and intentions of brain drain. The outcomes of these analyses confirm the idea that only satisfied individuals are less predisposed to consider emigration, making job satisfaction another methodology that would be efficient in battling with brain drain issue among Yemeni institutions.

The findings of the study have practical relevance to both practitioners in HRM's and university administrators indicating that such interdependence should be assessed at any stage of a professional's career. The adoption of strategic steps aimed at improvement such as increases in remuneration, oversight, and general job satisfaction to retain highly skilled academic personnel can serve a critical role in reducing the brain drain menace. This research contributes significantly to the already available body of knowledge by conducting an in-depth study on challenges faced by academic workers in Yemen. It focuses on the factors and links that stand behind the country, sometimes referred to as brain drain. The value of the study is that it allows the identification of specific aspects that are related to brain drain in Yemeni academic settings. This addresses the lack of understanding of how this is happening in a country whose economic structure stands out.

The results of the study are beneficial and practical to HR management in university settings in Yemen. The findings show that the impact of reward, oversight, and general job satisfaction is interdependent in determining academic experts' inclination to be involved in brain drain. Thus, the research implies that to improve the remuneration package it is necessary not only to pay attention to improving the supervision process but also vice versa. The final purpose is to increase job satisfaction for highly qualified professionals in the field of science.

According to the report, HRM practitioners at Yemeni universities are advised to carry out detailed research on salary structures and supervision systems. Institutions can promote job satisfaction, as well as hashes to retain talented scholars by addressing some of the unique challenges that come with these features. However, the research highlights that HR management should be considered from a holistic perspective considering the multidimensionality of components involved in brain drain. Additionally, given the particular socio-economic challenges peculiar to Yemen discussed in this study, structural changes are proposed as targeted measures that can be aimed at increasing overall job satisfaction. By recognizing the impact of broader contextual variables like economic instability and political unrest on job satisfaction, this study argues that strategic actions need to move beyond just salary adjustments and provide supervision alone in addressing such factors as their root causes. This might involve implementing ergonomic work environments and laws that promote the universal well-being and contentment of academic labor.

Despite some valuable insights into the workings of brain drain in Yemeni universities, this study raises several limitations that may affect its findings' applicability. The study centers on a convenience sample of the Yemeni context. Hence, care should be taken in generalizing the results. The unique socio-economic and geopolitical identity of Yemen may include contextual factors that limit the generalizability of the study's findings to other

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places or countries. In future studies, other determinants of brain drain need to be investigated using even more representative samples for the generalizability of findings.

Despite these limitations, the study does contribute considerably to our understanding of HRM dynamics in Yemeni universities. This study creates a solid base to design targeted solutions by explaining the interdependence among compensation schemes, supervision techniques, job satisfaction, and causes of brain drain. HRM professionals can also use these findings in devising and implementing projects that create a favorable environment, leading to the retention of quality academicians. The report puts particular focus on the importance of the education sector as a springboard for broader socio-economic change and also highlights the potential to organize sustainable development in Yemen by implementing targeted reforms into the country's academic system.

Finally, even though the conclusions of this study may not be universally applicable everything else is established with a foundation for further research and intervention in dealing with brain drain issues. Further research should aim at ensuring inclusive multidimensionality and investigate the other moderating variables to provide a better understanding of brain drain dynamics in different frameworks. The implications of the study are more than just limited to Yemen as its geographical boundaries. It gives important insights into the topic of this study for HRM professionals and politicians who want to keep competent people in universities and promote sustainable development.

Ethics and AI Statement: Strict ethical rules regulated research procedures to gain valid consent from participants while preserving their privacy together with confidentiality rights from beginning to end of the study. All collected personal information underwent anonymization processes before researchers implemented proper security measures. All research procedures respected institutional ethical protocol. Research team members conducted a complete examination of algorithmic analysis results while maintaining constant oversight to ensure both accuracy and integrity. Human researchers proved critical to check AI computational results and reduce potential biases and maintain creation transparency along with fairness as well as accountability running through the entire research design.

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Appendix

Demographic Questions

1. **What is your gender?**
    i. Male
    ii. Female
    iii. Other
    iv. Prefer not to say
2. **What is your age group?**
    i. 20–35 years

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ii. 36–50 years

iii. 51–65 years

iv. 65 years and above

3. **What is your highest level of education?**

i. Master's/PhD

ii. Other (please specify)

4. **How many years of work experience do you have in academia?**

i. 0-5 years

ii. 6-10 years

iii. 11-20 years

iv. 21-30 years

Section 1: Compensation

5. **How satisfied are you with your current salary?**

(1 = Very dissatisfied, 5 = Very satisfied)

i. 1

ii. 2

iii. 3

iv. 4

v. 5

6. **Do you believe that your compensation is fair compared to similar positions in other universities?**

i. Yes

ii. No

iii. Unsure

7. **How often do you receive salary increases or bonuses?**

i. Annually

ii. Biannually

iii. Rarely

iv. Never

Section 2: Job Satisfaction

8. **How satisfied are you with your overall job?**

(1 = Very dissatisfied, 5 = Very satisfied)

i. 1

ii. 2

iii. 3

iv. 4

v. 5

9. **To what extent do you feel your job meets your expectations?**

(1 = Not at all, 5 = Very much)

i. 1
ii. 2
iii. 3
iv. 4
v. 5

10. **How likely are you to recommend your university as a good place to work?**

(1 = Not at all likely, 5 = Very likely)

i. 1
ii. 2
iii. 3
iv. 4
v. 5

Section 3: Supervision

11. **How would you rate the quality of supervision you receive in your role?**

(1 = Very poor, 5 = Excellent)

i. 1
ii. 2
iii. 3
iv. 4
v. 5

12. **Do you feel supported by your supervisor in your professional development?**

i. Yes
ii. No
iii. Somewhat

13. **How frequently do you have performance reviews with your supervisor?**

i. Monthly
ii. Quarterly
iii. Annually
iv. Rarely
v. Never

Section 4: Job Security

14. **How secure do you feel in your current position?**
(1 = Not secure at all, 5 = Very secure)

i. 1
ii. 2
iii. 3
iv. 4
v. 5

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15. **Have you considered leaving your current position in the last year?**
    - Yes
    - No
    - Maybe

Section 5: Brain Drain Intentions

16. **How likely are you to consider employment opportunities abroad?** (1 = Not at all likely, 5 = Very likely)
    i. 1
    ii. 2
    iii. 3
    iv. 4
    v. 5
17. **What factors would most influence your decision to leave your current position?** (Select all that apply)
    i. Better compensation
    ii. Better job security
    iii. Professional development opportunities
    iv. Quality of life
    v. Other (please specify)

Section 6: General Feedback

18. **In your opinion, what are the top three factors that could improve job satisfaction for academic staff at your university?**

[Open-ended response]

19. **What specific changes would you suggest to reduce the brain drain issue within Yemeni universities?**

[Open-ended response]

20. **Any additional comments or suggestions?**

[Open-ended response]