Business Process Reengineering in Universities Under Pressure: A Contextual Analysis of Yemeni Higher Education Institutions Amidst Compound Crises

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Dr. Yahya Abdelwahab Yahya Al-Wareeth(*)
Thamar University, Yemen

Abstract

Objective: This study aimed to analyze the challenges facing the implementation of Business Process Reengineering (BPR) in Yemeni universities operating under compound crises (war, economic collapse, institutional division, staff displacement), develop a modified model integrating BPR and crisis management, and identify priorities for intervention in administrative processes.

Methodology: The study adopted a mixed-methods approach with an explanatory sequential design. Quantitative data were collected using a questionnaire administered to a stratified random sample of (287) academic and administrative leaders in Yemeni public universities (Sana'a, Aden, Hadhramaut). Qualitative data were collected through (28) semi-structured in-depth interviews with university leaders.

Results: The results showed that the level of BPR implementation in Yemeni universities was low (Mean = 2.78/5), while the impact level of compound crises was very high (Mean = 4.24/5), and the level of institutional performance effectiveness was medium (Mean = 3.15/5). The results also revealed a positive and strong correlation between BPR and institutional performance effectiveness ($r = 0.642$, at $\alpha = 0.01$). Regression analysis showed that BPR explains 41.2% of the variance in institutional performance effectiveness ($R^2 = 0.412$). Structural equation modeling (PLS-SEM) revealed a partial mediating effect of compound crises on the relationship between BPR and performance (VAF = 28.0%), with good model fit indices (CFI = 0.936, RMSEA = 0.052). Qualitative results further revealed spontaneous institutional adaptation and innovation mechanisms developed by administrative staff, the most prominent challenges facing implementation, and the highest-priority administrative processes for redesign (admission and registration, financial operations, human resource management).

Conclusion: A modified four-stage model was developed (Readiness and Diagnosis under Fragility, Redesign amidst Crisis, Rapid Implementation and Adaptation,

* Yahya Abdulwahab Yahya Al-Wareth, Assistant Professor of Business Administration, Dhamar University-Yemen, and Gulf Colleges, Hafr Al-Batin, Saudi Arabia, yahyah307@gmail.com, https://orcid.org/0009-0009-9129-3331.

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Transformation and Learning from Crisis), and fit indices demonstrated its validity for application in the Yemeni context.

Recommendations: The study recommends that Yemeni universities adopt the modified model, invest in spontaneous adaptation mechanisms, employ low-cost technology, and focus on core processes. It also recommends that the Ministry of Higher Education develop flexible policies, establish an emergency fund to support administrative development, and coordinate with international organizations. International organizations are urged to reconsider their support priorities and adopt the modified model in their programs.

Keywords: Business Process Reengineering (BPR), Universities Under Pressure, Compound Crises, Yemeni Universities, Crisis Management, Mixed-Methods Approach, Structural Equation Modeling.

Introduction

In recent decades, Business Process Reengineering (BPR) has emerged as one of the most influential radical management approaches to enhancing organizational performance. It rests on the fundamental rethinking and radical redesign of business processes in order to achieve dramatic improvements in critical performance measures such as cost, quality, and speed (Hammer & Champy, 1993). This concept subsequently found its way into higher education institutions across the world, as they sought to keep pace with the requirements of the digital age, the pressures of global competition, and declining public funding (Al-Mashari & Zairi, 2000; Davenport & Short, 1990).

Nevertheless, the overwhelming majority of theoretical frameworks and applied models associated with BPR originated and developed within relatively stable institutional contexts that presume a minimum level of political and economic stability, a robust infrastructure, and a regular flow of human and material resources (Grover et al., 1997). This foundational assumption poses a major problem when attempting to apply these models in radically different contexts, namely "universities under pressure."

First - Statement of the Problem

This study defines "universities under pressure" as higher education institutions that operate in environments characterized by compound fragility and chronic instability, such as zones of armed conflict, protracted economic crises, and partial or total institutional collapse (Buckland, 2018; Ensign, 2025). In such contexts, the conventional challenges of administrative development intertwine with the challenges of institutional survival, creating a complex research dilemma that has not received adequate scholarly attention in contemporary management literature.

Yemeni universities represent a salient example of this category of institutions. Since the escalation of armed conflict in 2015, Yemeni universities have operated under what may be described as "compound crises"-a concept referring to the overlap and entanglement of multiple simultaneous crises that interact with and amplify one another's effects (Yanikkaya, 2025). In the Yemeni context, these compound crises manifest across five principal dimensions: (1) the political and security crisis (the di-

vision of state institutions, the persistence of armed conflict); (2) the economic crisis (currency collapse, years-long suspension of salaries, scarcity of funding); (3) the structural crisis (destruction of university infrastructure, frequent interruptions of electricity and internet); (4) the human crisis (displacement of academic and administrative staff, loss of expertise); and (5) the technological crisis (weak digital infrastructure, shortage of hardware and software) (Heleta, 2025; Milton, 2021).

Despite these harsh conditions, which could drive any institution toward total collapse, Yemeni universities have-in one way or another-continued to carry out their educational mission. This raises a profound research question concerning how administrative processes can be reengineered and developed in an environment of such fragility and complexity. Can the conventional models of BPR withstand the test of "institutional fragility"? Or is there a pressing need for a modified model that accommodates the specificity of the context and draws upon the spontaneous adaptation and institutional innovation mechanisms developed by local staff?

Second - The Research Gap and Significance of the Study.

A systematic review of the literature indicates a clear scarcity of studies addressing the implementation of BPR in higher education institutions operating under the pressure of compound crises, particularly in the Arab region in general and Yemen in particular. Most prior studies have either: (a) focused on the implementation of BPR in relatively stable developing-country universities (Abdelwahab, 2019); (b) examined the impact of crises on higher education without linking it to radical administrative development approaches (Milton, 2021; Tytarenko, 2022); or (c) presented theoretical post-conflict models without testing them in a context of ongoing crisis (Perez Gama et al., 2017). Moreover-to the best of the researcher's knowledge-no field study has examined the implementation of BPR in Yemeni universities under compound crises using a mixed-methods approach (Alnawah, 2019; Miftah & Al-Sanafi, 2025).

The significance of the present study is established at three principal levels:

1- Theoretical significance - The study seeks to test and extend the boundaries of classical BPR theory by proposing a modified conceptual framework that integrates the logic of radical development with the logic of resilience and adaptation under crisis. This represents a qualitative contribution to organizational and change-management theory in fragile contexts.

2- Practical significance - The study offers a practical model that decision-makers in Yemeni and comparable Arab universities (such as those in Syria, Libya, Iraq, Sudan, and Somalia) can draw upon when attempting to develop their administrative performance under similar conditions. It also documents the spontaneous adaptation and institutional innovation mechanisms that can be leveraged within a deliberate, methodical framework.

3- Humanitarian and national significance - The study focuses on a vital institution (the university) that embodies communities' hope of emerging from crises, by preserving human and intellectual capital and ensuring the continuity of higher education under the most difficult circumstances.

Third - Research Questions

Proceeding from the foregoing, the research problem is articulated in the following principal question: What challenges face the implementation of BPR in Yemeni universities under compound crises, and how can a modified model be constructed that renders such implementation feasible and effective?

This principal question gives rise to the following sub-questions:

1- What is the level of BPR implementation in Yemeni universities from the perspective of academic and administrative leaders?
2- What is the level of impact of compound crises (political, economic, structural, human, technological) on administrative processes in Yemeni universities?
3- What is the level of institutional performance effectiveness (administrative efficiency, service quality, business continuity, beneficiary satisfaction, organizational resilience) in Yemeni universities?
4- Is there a statistically significant correlation between BPR implementation and institutional performance effectiveness in Yemeni universities?
5- Do compound crises exert a mediating effect on the relationship between BPR and institutional performance effectiveness?
6- What adaptation and institutional innovation mechanisms have Yemeni universities spontaneously developed, and how can they be leveraged within a deliberate, methodical reengineering framework?

Fourth - Objectives of the Study

This study aimed to achieve the following:

1- Principal objective: To develop a modified model of BPR for Yemeni universities that is congruent with the specificity of the compound-crisis context.
2- Subsidiary objectives:
   - To diagnose the reality of BPR implementation in Yemeni universities and measure the level of impact of compound crises and the level of institutional performance effectiveness.
   - To analyze the relationship between BPR and institutional performance effectiveness under compound crises.
   - To test the mediating effect of compound crises on the relationship between BPR and institutional performance effectiveness.
   - To explore and document the spontaneous adaptation and institutional innovation mechanisms developed by administrative staff.
   - To offer applicable recommendations for decision-makers in Yemeni and comparable universities.

Fifth - Delimitations of the Study

The study was delimited as follows:

1- Spatial delimitation: The study was confined to a sample of Yemeni pub-

lic universities in three different geographical regions (Sana'a, Aden, and Hadhramaut), to ensure representation of the varied crisis context.

2- Temporal delimitation: Data were collected during the period from October 2024 to March 2025.

3- Thematic delimitation: The study focused on administrative processes (rather than purely academic ones such as curricula), and on the senior- and middle-management levels (rather than the level of operational staff or students).

4- Human delimitation: The sample was confined to academic and administrative leaders (university presidents, vice-presidents, secretaries-general, college deans, directors-general, and heads of administrative departments).

Theoretical Framework and Prior Studies

First - Introduction to the Theoretical Framework

The theoretical framework constitutes the conceptual structure upon which the study relies in building its hypotheses and interpreting its findings. This study draws upon the integration of three principal theoretical schools: (1) theories of Business Process Reengineering (BPR); (2) theories of crisis management in fragile environments; and (3) theories of institutional performance in higher education. This integration forms a comprehensive analytical framework that enables an understanding of the mechanisms through which BPR influences the institutional performance of universities under the pressure of compound crises, within a unique Yemeni context.

Second - Theoretical Framework of BPR

1- **The concept of BPR:**

BPR is defined as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical performance measures such as cost, quality, service, and speed" (Hammer & Champy, 1993). BPR is distinguished from other administrative development approaches by the following characteristics:

Table (1): Characteristics of BPR

Characteristic	Description
Radicalism	It does not merely improve existing processes but rethinks them from scratch
Process orientation	It focuses on core processes rather than on organizational structures or functions
Dramatic leaps	It targets large-scale performance gains (50% or more) rather than incremental improvements
Technology enablement	It employs information technology as a key enabler of redesign

Table (1) shows that the characteristics of process reengineering are radical and process-oriented, and that they achieve qualitative leaps rather than incremental improvements through technological enablement.

2- **The core components of BPR:**

The BPR literature identifies four core components that must remain in balance for any reengineering initiative to succeed in universities (University of Michigan, n.d.; Grover et al., 1997):

- **Defining strategic objectives** - Strategic planning constitutes a prerequisite for the effective implementation of BPR, involving the definition of the overall mission, the identification of key results areas, and the setting of specific, measurable goals.
- **Process improvement** - Processes are defined not on the basis of internal organizational requirements but on the basis of stakeholders' requirements (students, society, the labor market), while taking organizational constraints into account.
- **Technology application** - Information technology is the key enabler for linking processes across functional and organizational boundaries; the real challenge, however, lies in employing it to enable innovative responses rather than merely to automate existing processes.
- **People development** - Securing the support of middle-management staff (the true change agents) represents the greatest challenge for any BPR initiative, since they face perceived threats from reengineering, which is often used to flatten hierarchical structures and downsize the workforce.

3- **Stages of BPR implementation:**

The literature offers multiple models for implementing BPR, from which the following principal stages can be derived (Al-Mashari & Zairi, 2000; Davenport & Short, 1990):

Table (2): Stages of BPR

Stage	Key tasks
Planning and preparation	Defining the strategic vision, analyzing organizational culture, identifying critical processes
Diagnosis and analysis	Understanding existing processes, identifying points of dysfunction and bottlenecks, measuring current performance
Redesign	Designing new processes, developing prototypes, testing alternatives
Implementation and transformation	Implementing new processes, managing change, training personnel
Evaluation and continuous improvement	Measuring outcomes, evaluating performance, making necessary adjustments

Table (2) illustrates the importance of a sequential set of BPR stages, beginning with planning, then diagnosis and redesign, proceeding to implementation, and concluding with evaluation and continuous improvement.

4- **Success and failure factors of BPR:**

Studies point to a set of factors that contribute to the success or failure of BPR implementation (Grover et al., 1997; O'Neill & Sohal, 1999):

Table (3): Success and Failure Factors of BPR

Success factors	Failure factors
Top-management support and commitment	Organizational and cultural resistance
A clear strategic vision	Poor understanding of the BPR concept
Understanding stakeholder needs	Focus on incremental improvement rather than radical change
Effective change management	Neglect of the human dimension
Provision of necessary resources	Weak planning and unclear objectives

Table (3) sets out the most important success factors and the most important failure factors in BPR implementation, focusing on the changes that take place during the implementation process.

Third - Theoretical Framework of Compound Crises and Crisis Management

1- **The concept of crisis and its types:**

In the organizational context, a crisis is defined as "an unexpected event that disrupts the organization's core activities, threatens its objectives, creates a state of uncertainty, and requires a rapid and decisive response" (Fischbacher-Smith, 2025). Crises are distinguished from ordinary organizational problems by the severity of their impact, the speed of their development, the complexity of their causes, and the ambiguity of their consequences.

2- **The VUCA environment and crisis management:**

Fischbacher-Smith (2025) affirms that crisis management differs from ordinary management owing to the severity, speed, and consequences of decisions, and that crises reflect a VUCA environment characterized by:

Table (4): The VUCA Environment

Component	Its reflection in Yemeni universities
Volatility	Shifting front lines, sudden interruption of services
Uncertainty	Not knowing when salaries will be paid, electricity outages
Complexity	Overlap of political, economic, and human dimensions
Ambiguity	Multiplicity of stakeholders, absence of accurate information

Table (4) shows that the VUCA environment is a volatile environment characterized by uncertainty and complexity arising from the overlap of its various dimensions, together with ambiguity, the multiplicity of stakeholders concerned with BPR, and the absence of accurate information.

3- **The concept of compound crises (Polycrisis):**

The concept of "compound crises" or "polycrisis" is one of the recent concepts in the crisis-management literature, referring to the overlap and entanglement of multiple simultaneous crises that interact with and amplify one another's effects (Yanikkaya, 2025). In the Yemeni context, these compound crises manifest across five principal dimensions:

Table (5): Dimensions of Compound Crises

Dimension	Principal manifestations
Political and security crisis	Division of state institutions, persistence of armed conflict, absence of stability
Economic crisis	Currency collapse, years-long suspension of salaries, inflation, funding scarcity
Structural crisis	Destruction of infrastructure, interruption of electricity and internet, damage to buildings
Human crisis	Displacement of academic and administrative staff, loss of expertise, deterioration of living conditions
Technological crisis	Weak digital infrastructure, shortage of hardware and software, interruption of communications

Table (5) illustrates the dimensions of compound crises in the implementation of BPR, encompassing the political and security crisis, the economic crisis, the structural crisis, the human crisis, and the technological crisis, all of which directly interact with one another and affect the BPR implementation process.

4- **A crisis-management model for higher education:**

Gigliotti and Fortunato (2023) present an integrated five-stage crisis-management model for higher education:

Table (6): A Crisis-Management Model for Higher Education

Stage	Key tasks
Signal detection	Identifying early indicators of potential crises
Probing and prevention	Analyzing risks and taking proactive measures
Damage containment	Limiting the spread of the crisis and its effects
Recovery	Returning to normal operations and restoring confidence
Learning	Drawing lessons and developing institutional capacities

Table (6) presents an integrated crisis-management model for higher education through which the failure of BPR implementation may be averted.

Fourth - Theoretical Framework of Universities in Fragile Contexts

1- **The concept of "universities under pressure":**

The concept of "universities under pressure" refers to higher education institutions that operate in environments characterized by compound fragility and chronic instability, such as zones of armed conflict, protracted economic crises, and partial or total institutional collapse (Ensign, 2025). In such contexts, the challenges facing universities transcend the boundaries of ordinary administrative challenges, extending to immediate survival challenges concerning the very continuity of institutional existence.

2- **Characteristics of universities in conflict environments:**

Heleta (2025) documents the devastating effects of conflict on higher education institutions, which include:

- The destruction of buildings, facilities, and physical infrastructure.
- The killing, injury, or displacement of academics, staff, and students.
- The loss of years of teaching and study.
- The complete or near-complete interruption of funding.
- The division of the institution between different areas of control.
- The loss of institutional documents and records.

3- **Lessons learned from the experiences of universities in conflict zones:**

Ensign (2025) draws from the experiences of four American international universities (in Nigeria, Myanmar, Lebanon, and Bulgaria) a set of important lessons for universities under pressure:

Table (7): Lessons Learned from the Experiences of Universities in Conflict Zones

Lesson	Content
Focus on a distinctive mission	A clear university mission helps to guide decisions in times of crisis
Building strong relationships with the local community	The local community serves as a protective shield for the university in times of conflict
Resilience and rapid adaptation	Shifting to distance learning and alternative programs when services are interrupted

Table (7) sets out the most important lessons learned from the experiences of universities in conflict zones for averting the failure of BPR implementation.

Prior Studies

First - International Studies

1- **Hammer & Champy (1993) - United States:**

- *Topic:* Establishing the concept of BPR.
- *Principal finding:* Laying the theoretical foundations of BPR as a radical management approach.
- *Contribution:* The fundamental theoretical framework of the study.

2- **Al-Mashari & Zairi (2000) - United Kingdom:**

- *Topic:* A holistic review of BPR practices.
- *Principal finding:* Identifying the success and failure factors of BPR and emphasizing the importance of the institutional context.
- *Contribution:* The analytical framework for success and failure factors.

3- **Tytarenko (2022) - Ukraine:**

- *Topic:* BPR in higher education under conditions of war.
- *Principal finding:* BPR represents a necessary innovative solution under conditions of war, with an emphasis on distance learning.
- *Contribution:* The application of BPR in an armed-conflict context (close to the Yemeni context).

4- **Ensign (2025) - United States (experiences of universities in Nigeria, Myanmar, Lebanon):**

- *Topic:* University leadership in crises.
- *Principal finding:* The importance of focusing on a distinctive mission, building relationships with the local community, and resilience and rapid adaptation.
- *Contribution:* The concept of "universities under pressure" and adaptation mechanisms.

5- **Fischbacher-Smith (2025) - United Kingdom:**

- *Topic:* Crisis management in university departments.

- *Principal finding:* The importance of understanding the VUCA environment and the "crisis incubation" stage.
- *Contribution:* The theoretical framework for analyzing crises.

6- **Yanikkaya (2025) - Global:**

- *Topic:* The response of universities to the age of polycrisis.
- *Principal finding:* Introducing the concept of "polycrisis" and analyzing universities' responses.
- *Contribution:* The concept of compound crises as an analytical framework.

Second - Arab Studies

1- **Abdelwahab (2019) - Egypt:**

- *Topic:* The implementation of BPR in Egyptian universities.
- *Principal finding:* The existence of organizational and cultural challenges facing BPR implementation in Egyptian universities.
- *Contribution:* The comparable Arab context.

2- **Fadlelmula & Qadhi (2024) - Qatar (Gulf states):**

- *Topic:* A systematic review of artificial intelligence research in higher education in the Gulf states.
- *Principal finding:* Only 12% of Gulf universities implement integrated systems, with a gap in applied studies.
- *Contribution:* The research gap in the Gulf and Arab context.

Third - Yemeni Studies

1- **Alnawah (2019) - Yemen / China:**

- *Topic:* Evaluating the impact of BPR on the scholarship sector in the Yemeni Ministry of Higher Education.
- *Principal finding:* A positive impact of BPR on the efficiency and effectiveness of performance.
- *Contribution:* The study's methodology and instruments, and the Yemeni context.
- *Limitations:* Conducted during the period prior to the escalation of the crisis (2010), and focused on a specific sector (scholarships).

2- **Miftah & Al-Sanafi (2025) - Yemen:**

- *Topic:* The effect of BPR on improving the productive efficiency of the Public Corporation for Textile Industries.
- *Principal finding:* The level of BPR implementation was medium to low (2.93/5).

- *Contribution:* Recent indicators of the reality of BPR implementation in Yemeni institutions.
- *Limitations:* Focused on an industrial rather than an educational sector, and did not address the impact of the crisis.

Fourth - Analysis of the Research Gap

Based on the foregoing presentation and analysis of theoretical and empirical studies, the principal research gaps that this study seeks to fill can be identified:

Table (8): Analysis of the Research Gap

Gap	Manifestations
Focus on stable contexts	Most studies were conducted in relatively stable developing countries or in Western countries
Scarcity of studies in compound-crisis contexts	Few studies have addressed BPR in armed-conflict environments and protracted economic crises
Absence of studies on Yemeni universities	No field study has addressed BPR in Yemeni universities under the current crisis
Separation of BPR and crisis management	Most studies have addressed BPR and crisis management separately, without a model integrating them
Focus on the academic dimension	Studies have focused on academic processes (teaching and learning) while neglecting administrative processes
Absence of modified models for fragile contexts	No modified BPR model exists that is congruent with the specificity of compound crises
Predominance of the quantitative method	Most studies relied solely on quantitative methods, without qualitative depth
Scarcity of the mixed-methods approach	Few studies have used the explanatory sequential design (quantitative then qualitative)
Absence of structural equation modeling	Few studies have used PLS-SEM to analyze complex relationships and test mediation effects

Table (8) presents an analysis of the research gap in prior studies through its manifestations and the multiplicity of gaps therein.

1- **The position of the present study relative to these gaps:**

The present study is distinguished by filling the aforementioned gaps as follows:

Table (9): The Position of the Present Study Relative to the Gaps

Gap	How the present study fills it
Contextual	Studying Yemeni universities under compound crises (war, economic collapse, staff displacement)
Thematic	Developing a modified model integrating BPR and crisis management
Methodological	Using the mixed-methods approach (quantitative + qualitative) with PLS-SEM to analyze mediation

Table (9) clarifies the position of this study relative to prior studies, encompassing the gap, the context, the thematic dimension, and the methodology.

Fifth - The Proposed Conceptual Model

1- **The theoretical basis of the model:**

The proposed conceptual model of this study proceeds from the premise that implementing BPR in universities under the pressure of compound crises requires a methodical integration of the logic of radical development (BPR) and the logic of resilience and adaptation under crisis. This model rests on three principal theoretical foundations:

Table (10): The Proposed Conceptual Model

Theoretical foundation	Reference	Application in the model
BPR theory	Hammer & Champy (1993)	Radical process redesign
Crisis-management theory	Fischbacher-Smith (2025)	Analysis of the VUCA environment and crisis stages
Organizational resilience theory	Buckle et al. (2020)	Adaptation and resilience mechanisms

Table (10) presents the proposed conceptual model of the study, which focuses on the theoretical foundation and its application in the model, together with a review of the principal references of prior studies.

2- **The variables of the model:**

- **Independent variable - BPR:**
  - First dimension: Focus on core processes
  - Second dimension: Radical redesign
  - Third dimension: Achievement of dramatic performance leaps
  - Fourth dimension: Employment of information technology
  - Fifth dimension: Organizational and cultural change
- Mediating variable - Compound crises
- **Dependent variable - Institutional performance effectiveness:**
  - First dimension: Administrative efficiency
  - Second dimension: Service quality
  - Third dimension: Business continuity
  - Fourth dimension: Beneficiary satisfaction
  - Fifth dimension: Organizational resilience

3- **The proposed modified model (integrating BPR with crisis management):**

This study proposes a modified model that blends the stages of BPR with the stages of crisis management across four interrelated stages:

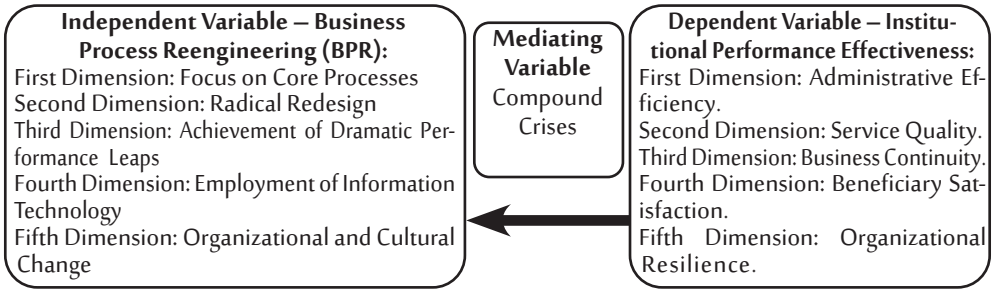

Figure (1): The Proposed Modified Model

Figure (1) illustrates the proposed modified model that was constructed, along with the relationships of influence among its various dimensions.

Table (11): The Proposed Modified Model

Stage	Name of the modified stage	Integration of BPR and crisis management
1	Readiness and Diagnosis under Fragility	Diagnosing processes while assessing contextual risks
2	Redesign amidst Crisis	Radical redesign while maintaining business continuity
3	Rapid Implementation and Adaptation	Implementing solutions with rapid adaptation mechanisms
4	Transformation and Learning from Crisis	Building institutional resilience and learning to confront future crises

Table (11) illustrates the proposed modified model of the study, which encompasses the dimensions of the independent variables, the dimensions of the dependent variables, and the mediating variable.

Hypotheses

Drawing upon the theoretical framework and the proposed conceptual model, the following hypotheses were formulated:

Table (12): Hypotheses

Hypothesis code	Hypothesis statement
H1	A low level of BPR implementation and a medium level of institutional performance effectiveness are expected in Yemeni universities
H2	A positive, statistically significant correlation is expected between BPR implementation and institutional performance effectiveness
H3	A statistically significant effect of BPR implementation on institutional performance effectiveness is expected
H4	Compound crises may play a (partial) mediating role in the relationship between BPR and institutional performance effectiveness
H5	Statistically significant differences are expected in respondents' responses attributable to the control variables (geographical location, university size, functional position)

Table (12) sets out the principal hypotheses formulated on the basis of the proposed conceptual model.

Study Methodology

First - Study Method

This study adopted the mixed-methods approach with an explanatory sequential design. This approach was selected for the following reasons:

1- **The complexity of the phenomenon studied:**

The phenomenon of implementing BPR in a compound-crisis context is a complex phenomenon that requires numbers (to determine the magnitude of the challenges and their prevalence) and words (to understand the depths of the human experience and the adaptation mechanisms).

2- **Methodological integration:**

The mixed-methods approach allows the strengths of the quantitative method (generalizability and the ability to generalize findings) and the qualitative method (depth and understanding of the hidden dimensions of the phenomenon) to be combined within a single study (Creswell & Creswell, 2018).

3- **The nature of the explanatory sequential design:**

The design was implemented in two consecutive phases:

- **Phase One (quantitative):** Collecting and analyzing quantitative data first to test hypotheses and identify general relationships.
- **Phase Two (qualitative):** Collecting and analyzing qualitative data to interpret and deepen the understanding of the quantitative findings.

Second - Study Population and Sample

1- **Study population:**

The study population comprised all academic and administrative leaders in Yemeni public universities operating in different areas of control. The target categories included:

Table (13): The Study Population

Category	Description
Senior leadership	University presidents, vice-presidents, secretaries-general of universities and their assistants
Middle management	College deans, directors-general (director-general of human resources, financial affairs, admission and registration)
Executive management	Heads of administrative departments in the principal facilities

Table (13) defines the study population, which comprises senior leadership, middle management, and executive management.

Three geographical regions representing the diverse Yemeni context were selected (Sana'a, Aden, and Hadhramaut) to ensure representation of the crisis's impact in different regions.

2- **Study sample:**

- **Quantitative-phase sample:**

Table (14): The Quantitative-Phase Sample of the Study

Item	Details
Selection method	Stratified random sampling
First stratum	Geographical region (Sana'a, Aden, Hadhramaut)
Second stratum	University size (large, medium, small)
Planned sample size	300 respondents, per the Krejcie & Morgan formula
Returned questionnaires	312 questionnaires
Questionnaires valid for analysis	287 questionnaires
Response rate	82%

Table (14) presents the quantitative-phase sample, encompassing the stratified sample, the geographical region, and university size.

- **Qualitative-phase sample:**

Table (15): The Qualitative-Phase Sample of the Study

Item	Details
Selection method	Purposive sampling
Selection criteria	A leadership position held since before the crisis (2015), rich experience in dealing with crises, representation of all regions
Sample size	28 in-depth interviews (theoretical saturation achieved)
Method of conducting interviews	18 face-to-face interviews, 10 interviews via Zoom

Table (15) sets out the qualitative-phase sample of the study, encompassing the selection method, the selection criteria, the size of the selected sample, and the method of conducting the interviews.

Study Findings and Discussion*First - Findings*

Demographic and professional characteristics of the study sample: Table (16) sets out the distribution of the study sample (N = 287) by demographic and professional variables.

Table (16): Distribution of the Sample by Demographic and Professional Characteristics

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	198	69.0
	Female	89	31.0
Academic qualification	Doctorate	124	43.2
	Master's	142	49.5
	Bachelor's	21	7.3
Years of experience	Less than 5 years	32	11.1
	5–10 years	87	30.3
	11–15 years	103	35.9
	More than 15 years	65	22.7

Variable	Category	Frequency (N)	Percentage (%)
Geographical location	Sana'a	98	34.1
	Aden	104	36.2
	Hadhramaut	85	29.7
University size	Large (more than 10,000 students)	76	26.5
	Medium (5,000–10,000 students)	112	39.0
	Small (fewer than 5,000 students)	99	34.5
Functional position	Senior leadership	43	15.0
	Middle management	156	54.4
	Executive management	88	30.6

Table (16) shows the following:

- Males constituted the largest proportion of the sample (69.0%), reflecting the nature of the leadership workforce composition in Yemeni universities.
- More than 92% of the sample held postgraduate qualifications (doctorate and master's), indicating a high level of academic qualification.
- The sample was distributed fairly evenly across the three geographical regions, which enhances the generalizability of the findings.
- Middle management constituted the largest proportion of the sample (54.4%), which is to be expected given the density of this category.

Second - Findings of the Descriptive Analysis of the Study Variables

1- **Level of BPR implementation:**

Table (17) presents the means and standard deviations for the BPR variable and its five dimensions.

Table (17): Means and Standard Deviations of the BPR Dimensions

Rank	Dimension	Mean	Standard deviation	Implementation level
1	Focus on core processes	3.12	0.78	Medium
2	Radical redesign	2.89	0.85	Low
3	Achievement of dramatic performance leaps	2.76	0.91	Low
4	Organizational and cultural change	2.54	0.88	Low
5	Employment of information technology	2.31	0.94	Low
	Overall mean for BPR	**2.78**	**0.72**	**Low**

Note on Table (17): The level was classified according to the following criteria: (1.00–2.33) low, (2.34–3.67) medium, (3.68–5.00) high.

Table (17) shows the following:

- The overall mean for BPR implementation in Yemeni universities was low (2.78 out of 5).
- The dimension "focus on core processes" ranked first (medium), while the dimension "employment of information technology" ranked last (low).

2- **Level of impact of compound crises:**

Table (18) presents the means and standard deviations for the compound-crises variable and its five dimensions.

Table (18): Means and Standard Deviations of the Compound-Crises Dimensions

Rank	Dimension	Mean	Standard deviation	Impact level
1	Economic crisis	4.52	0.67	Very high
2	Structural crisis	4.38	0.72	Very high
3	Human crisis	4.21	0.79	High
4	Political and security crisis	4.15	0.84	High
5	Technological crisis	3.94	0.88	High
Overall mean for compound crises		**4.24**	**0.68**	**Very high**

Table (18) shows the following:

- The overall mean for the impact of compound crises was very high (4.24 out of 5).
- The "economic crisis" ranked first, followed by the "structural crisis."
- The "technological crisis" ranked last (3.94), but remained at a high level.

3- **Level of institutional performance effectiveness:**

Table (19) presents the means and standard deviations for the institutional performance effectiveness variable and its five dimensions.

Table (19): Means and Standard Deviations of the Institutional Performance Effectiveness Dimensions

Rank	Dimension	Mean	Standard deviation	Effectiveness level
1	Business continuity	3.68	0.74	High
2	Organizational resilience	3.34	0.81	Medium
3	Administrative efficiency	3.08	0.79	Medium
4	Beneficiary satisfaction	2.91	0.86	Medium
5	Service quality	2.73	0.92	Low
Overall mean for institutional performance effectiveness		**3.15**	**0.71**	**Medium**

Table (19) shows the following:

- The overall mean for institutional performance effectiveness was medium (3.15 out of 5).
- The dimension "business continuity" ranked first (high).
- The dimension "service quality" ranked last (low).

Third - Reliability and Validity Test Results

Table (20): Cronbach's Alpha Coefficients for the Study Variables and Their Dimensions

Variable	Number of items	Cronbach's alpha	Reliability level
BPR (overall)	25	0.912	Very high
Compound crises (overall)	25	0.934	Very high
Institutional performance effectiveness (overall)	25	0.908	Very high

Table (20) shows that all Cronbach's alpha coefficients are statistically significant at the (0.01) level.

Table (21): KMO and Bartlett Test Results for the Study Variables

Variable	KMO value	Bartlett's test	Significance (Sig.)	Variance explained (%)
BPR	0.887	3245.67	0.000	68.4%
Compound crises	0.912	4123.89	0.000	72.1%
Institutional performance effectiveness	0.894	3567.23	0.000	65.8%

Table (21) presents the KMO and Bartlett test results for the study variables.

Fourth - Hypothesis Testing Results

1- **Test of the first hypothesis (H1):**

H1 states: "There is a low level of BPR implementation and a medium level of institutional performance effectiveness in Yemeni universities."

Table (22): Results of Testing H1

Indicator	Value	Level	Result
Overall mean for BPR	2.78	Low	✓ Confirmed
Overall mean for performance effectiveness	3.15	Medium	✓ Confirmed

Per Table (22), the decision regarding H1 was: the hypothesis was accepted.

2- **Test of the second hypothesis (H2):**

H2 states: "There is a positive, statistically significant correlation between BPR implementation and institutional performance effectiveness."

Table (23): Pearson Correlation Matrix Among the Study Variables

Variable	1	2	3
BPR	1		
Compound crises	-0.487**	1	
Institutional performance effectiveness	0.642**	-0.534**	1

** Table (23) shows that the correlation is significant at the (0.01) level.

Observations:

- There is a positive and strong correlation between BPR and performance effectiveness (r = 0.642).
- There is a negative and strong correlation between compound crises and performance effectiveness (r = -0.534).

Decision regarding H2: the hypothesis was accepted.

3- **Test of the third hypothesis (H3):**

H3 states: "There is a statistically significant effect of BPR implementation on institutional performance effectiveness."

Table (24): Simple Linear Regression Analysis Results

Variable	Beta coefficient (β)	T-value	Significance	R^2	F
BPR	0.642	12.722	0.000	0.412	161.85

Observations on Table (24):

- $R^2 = 0.412$, indicating that BPR explains 41.2% of the variance in performance effectiveness.
- The beta coefficient ($\beta = 0.642$) is positive and statistically significant.

Decision regarding H3: the hypothesis was accepted.

4- **Test of the fourth hypothesis (H4):**

H4 states: "Compound crises play a (partial) mediating role in the relationship between BPR and institutional performance effectiveness."

Table (25): Mediation Effect Analysis Results for Compound Crises

Path	Direct effect	Indirect effect	Total effect	T-value	VAF	Type of mediation
BPR → Crises → Performance	0.487	0.189	0.676	4.23**	28.0%	Partial

** Table (25) indicates significance at the (0.01) level.

Observations:

- VAF = 28.0%, which falls within the range (20%–80%).
- The mediation is partial, meaning that 28% of the effect is explained through compound crises.

Decision regarding H4: the hypothesis was accepted.

5- **Test of the fifth hypothesis (H5):**

H5 states: "There are statistically significant differences in respondents' responses attributable to the control variables."

Table (26): Between-Group Difference Test Results

Control variable	Test	Test value	Significance	Differences present
Gender	T-test	0.876	0.382	No
Academic qualification	ANOVA	1.234	0.293	No
Years of experience	ANOVA	1.567	0.198	No
Geographical location	ANOVA	8.234	0.000	Yes
University size	ANOVA	6.789	0.001	Yes
Functional position	ANOVA	5.432	0.004	Yes

Per Table (26), the decision regarding H5 was: the hypothesis was partially accepted.

6- **Structural Equation Modeling (PLS-SEM) Results**

Table (27): Structural Model Evaluation Indices

Dependent variable	R^2	Q^2	R^2 level
Institutional performance effectiveness	0.487	0.312	Medium to high
Compound crises (as mediator)	0.237	0.145	Weak to medium

Table (27) presents the structural equation modeling results through the structural model evaluation indices.

Table (28): Model Goodness-of-Fit Indices

Index	Computed value	Acceptable value
SRMR	0.048	< 0.08
RMSEA	0.052	< 0.08
CFI	0.936	≥ 0.90

Table (28) presents the model fit indices, where the acceptable values were satisfactory.

7- **Qualitative Analysis Results (In-Depth Interviews):**

The thematic analysis of the interviews yielded four principal themes:

Theme One: Spontaneous adaptation and institutional innovation mechanisms:

- "When electricity and internet were almost completely cut off in 2016, we were forced to switch to a temporary alternative paper-based system, and we created a coordinated paper archive for all student transactions." (Participant 7, senior leadership, Sana'a)
- "We used the WhatsApp application as an alternative platform for communication between departments and with students, and we established official groups for each college and each department." (Participant 15, middle management, Aden)

Theme Two: Challenges of implementing BPR under crises:

- "Salaries have not been paid regularly for 8 years. How do you expect an employee to take the initiative to develop their work when they do not know whether they will eat tomorrow?" (Participant 3, senior leadership, Aden)
- "We lost major administrative talent who emigrated outside Yemen, and these people formed the backbone of administrative work." (Participant 11, senior leadership, Hadhramaut)

Theme Three: The administrative processes with the highest priority for redesign:

- "Admission and registration processes are the lifeblood of the university; any delay in them means losing students." (Participant 5, middle management, Aden)
- "Financial operations are at the top of the priorities, especially the disbursement of salaries and the collection of fees." (Participant 20, senior leadership, Sana'a)

Theme Four: Proposals for developing a modified BPR model:

- "BPR cannot be implemented in the same way it is applied in a university in a stable country; we need a 'light,' 'flexible,' and 'low-cost' model." (Participant 2, senior leadership, Hadhramaut)

Fifth - Discussion of Findings

1- **Discussion of the level of BPR implementation in Yemeni universities (H1).**

Finding: The level of BPR implementation is low (2.78/5).

Interpretation and discussion: This finding is consistent with the study of Miftah and Al-Sanafi (2025), which found that the level of BPR implementation at the Public Corporation for Textile Industries in Sana'a was medium to low (2.93/5), and with the Jimma University (2021) study, which indicated that the implementation of BPR in technical education institutes in Ethiopia was not effective owing to a lack of resources and support.

The low level of BPR implementation in Yemeni universities can be explained by several factors:

- **The impact of compound crises** - As the findings showed that the impact of compound crises is very high (4.24/5), universities' preoccupation with survival and continuity challenges has precluded the allocation of sufficient time and effort to radical administrative development initiatives such as BPR. This is consistent with Buckland's (2018) view that universities in fragile environments balance survival challenges against development challenges.
- **Weak employment of information technology** - The dimension "employment of information technology" ranked at the lowest level (2.31), which is to be expected given the frequent interruption of electricity and internet and the destruction of digital infrastructure. This is consistent with Al-Mashari and Zairi's (2000) finding that technology is the key enabler of BPR and that its absence impedes implementation.
- **Weak organizational and cultural change** - The dimension "organizational and cultural change" ranked fourth (2.54), indicating the presence of organizational and cultural resistance to change-a phenomenon common in BPR implementation even in stable contexts (Grover et al., 1997).

2- **Discussion of the level of impact of compound crises.**

Finding: The level of impact of compound crises is very high (4.24/5).

Interpretation and discussion: This finding is consistent with Heleta's (2025) study, which documented the devastating effects of conflict on higher education institutions, and with Yanikkaya's (2025) study on polycrisis in higher education.

The high impact of compound crises can be explained as follows:

- **The economic crisis ranks first (4.52)** - The years-long suspension of salaries is the most influential factor, because it affects employees' fundamental work motivation. As one participant noted: "Salaries have not been paid regularly for 8 years. How do you expect an employee to take the initiative to develop their work?" This reflects the reality that the material challenge is the most pressing.
- **The structural crisis (4.38)** - The destruction of university infrastructure (buildings, electricity, internet) renders any administrative development impossible in the absence of a minimum level of basic services.
- **The human crisis (4.21)** - The displacement of academic and administrative staff led to the loss of institutional expertise, making the development process more difficult in the absence of competencies capable of leading change.

3- **Discussion of the level of institutional performance effectiveness.**

Finding: The level of institutional performance effectiveness is medium (3.15/5).

Interpretation and discussion: This finding is distinguished by a marked variance among the dimensions:

- **Business continuity (high – 3.68)** reflects the capacity of Yemeni universities to withstand and survive despite harsh conditions. This is consistent with Ensign's (2025) study, which found that universities in conflict zones develop exceptional business-continuity capacities. It also reflects the "spontaneous adaptation and institutional innovation mechanisms" revealed by the qualitative interviews.
- **Service quality (low – 2.73)** - The decline in service quality is the price that universities paid for their continuity. Amid resource scarcity and service interruption, the focus was on "continuity" rather than "quality." This explains the apparent contradiction between high business continuity and low service quality.

4- **Discussion of the relationship between BPR and institutional performance effectiveness (H2, H3).**

Finding: A positive and strong relationship ($r = 0.642$), and an explanatory effect ($R^2 = 0.412$).

Interpretation and discussion: This finding is consistent with Alnawah's (2019) study, which found a positive effect of BPR on the efficiency and effectiveness of performance in the Yemeni scholarship sector, and with the study of Miftah and Al-Sanafi (2025), which found a positive effect of BPR on productive efficiency.

This relationship can be explained as follows:

- Even under crises, universities that adopted BPR principles (albeit to a limited extent) were better able to achieve superior performance, because BPR helps to focus on core processes and to disregard unnecessary secondary processes.
- The value $R^2 = 0.412$ means that factors other than BPR explain 58.8% of the variance in performance, the most prominent of which are: the impact of compound crises (as discussed under H4), available resources, and human competencies.

5- **Discussion of the mediation effect of compound crises (H4).**

Finding: Partial mediation (VAF = 28.0%).

Interpretation and discussion: This finding is the most innovative in this study, as it has not previously been examined in the Arab context.

- **Meaning:** 28% of the effect of BPR on performance effectiveness is explained through the role of BPR in helping universities adapt to compound crises and mitigate their effects. In other words, implementing BPR not only improves performance directly but also improves it indirectly by enhancing the university's capacity to confront crises.

- **Theoretical importance:** This finding confirms the validity of the modified model that integrates BPR with crisis management. Conventional BPR models presume a stable context, whereas this study demonstrates that BPR can be a tool for crisis management, not merely a tool for development under stable conditions.

6- **Discussion of the between-group differences (H5).**

Finding: Differences according to geographical location, university size, and functional position.

Interpretation and discussion:

- **Geographical location (in favor of Hadhramaut)** - This reflects the varying impact of the crisis by region. Hadhramaut was less affected by the conflict compared with Sana'a and Aden, which provided a relatively more stable environment for developing administrative work.
- **University size (in favor of large universities)** - Large universities possess greater human and material resources and the capacity to retain competencies, which makes them more capable of implementing BPR.
- **Functional position (in favor of senior leadership)** - This finding may reflect a "perception gap" between those who formulate policies (senior leadership) and those who implement them (middle and executive management). Senior leadership may be more optimistic because they see the complete picture, whereas middle management faces the daily challenges of implementation.
- **Absence of differences according to gender, qualification, or experience** - This indicates that these demographic variables were not an influential factor in evaluating the study variables, meaning that the findings can be generalized regardless of these characteristics.

7- **Discussion of the qualitative findings:**

- **Spontaneous adaptation mechanisms** - These mechanisms represent an "institutional treasure" that can be leveraged. Rather than disregarding these spontaneous practices, they can be organized and converted into methodical procedures within a modified BPR framework. This is consistent with the concept of "spontaneous institutional innovation" referred to in Ensign's (2025) study.
- **Challenges of implementing BPR** - The challenges revealed by the interviews (material, organizational, human) are consistent with the failure factors identified in the BPR literature (Grover et al., 1997), but they are more acute in the Yemeni context.
- **Redesign priorities** - The participants' agreement that admission and registration processes, financial operations, and human resource management are the highest priorities provides a practical orientation for development efforts amid resource scarcity.

Sixth - Theoretical and Practical Implications of the Findings

1- **Theoretical implications**

- **Extending the boundaries of BPR theory:** The study demonstrated that BPR can be implemented-albeit in a modified form-in compound-crisis contexts, which extends the boundaries of a theory that had been confined to stable contexts.
- **Validating the modified model:** The good fit indices (CFI=0.936, RMSEA=0.052) confirm the validity of the model integrating BPR with crisis management.
- **Developing the concept of "compound crises" as a mediating variable:** The study provided a statistical treatment of the concept of compound crises, which opens the door to further studies on the role of context in organizational relationships.

2- **Practical implications**

- **Guiding development efforts:** The findings direct universities to focus on core processes (admission and registration, financial operations, human resources) rather than attempting to develop everything at once.
- **Leveraging spontaneous adaptation mechanisms:** Rather than importing ready-made models, universities can benefit from the innovative practices developed locally by their staff.
- **Accounting for contextual differences:** The existence of differences according to geographical location and university size means that a single model cannot be applied to all universities; rather, it must be adapted to local conditions.

Conclusions and Recommendations

First - Conclusions

This study arrived at a set of theoretical and field conclusions, based on the analysis of the quantitative data collected from (287) academic and administrative leaders and the qualitative data extracted from (28) in-depth interviews with Yemeni university leaders. These conclusions can be summarized as follows:

1- **Conclusions concerning the level of the variables (test of H1)**

- **First conclusion - The level of BPR implementation in Yemeni universities is low:** The overall mean for BPR implementation in Yemeni universities was (2.78 out of 5), a low level. The dimension "employment of information technology" ranked at the lowest level (2.31), followed by the dimension "organizational and cultural change" (2.54). This indicates that Yemeni universities have not yet seriously adopted this modern administrative approach, and that technical challenges (weak digital infrastructure, interruption of electricity and internet) and cultural challenges (resistance to change, absence of a culture of continuous improvement) represent the greatest obstacle to its implementation.

- **Second conclusion - The level of impact of compound crises in Yemeni universities is very high:** The overall mean for the impact of compound crises was (4.24 out of 5), a very high level. The "economic crisis" topped the list of the most influential dimensions (4.52), followed by the "structural crisis" (4.38). This confirms that Yemeni universities operate under exceptional conditions far exceeding what conventional BPR models presume, since the years-long suspension of salaries and the destruction of infrastructure represent existential challenges rather than mere conventional obstacles solvable within ordinary timeframes.
- **Third conclusion - The level of institutional performance effectiveness in Yemeni universities is medium, with variance among the dimensions:** The overall mean for institutional performance effectiveness was (3.15 out of 5), a medium level. Nevertheless, the findings showed considerable variance among the dimensions: the "business continuity" dimension recorded the highest level (3.68 — high), while the "service quality" dimension recorded the lowest level (2.73 — low). This reflects the capacity of Yemeni universities to "survive and withstand" despite the crises, but at the expense of the quality of services provided. In other words, the priority was continuity rather than quality.

2- **Conclusions concerning relationships and effects (test of H2, H3)**

- **Fourth conclusion - The existence of a strong correlation between BPR and institutional performance effectiveness:** The Pearson correlation matrix revealed a positive and strong correlation between BPR implementation and institutional performance effectiveness ($r = 0.642$, at $\alpha = 0.01$). This means that universities that implemented BPR principles to a greater extent were better able to achieve superior institutional performance, even under crises. This relationship confirms that BPR is not an academic luxury but an administrative necessity that contributes tangibly to improving performance.
- **Fifth conclusion - The existence of a strong direct effect of BPR on institutional performance effectiveness:** Simple linear regression analysis showed that BPR explains (41.2%) of the variance in institutional performance effectiveness ($R^2 = 0.412$), with a standardized effect coefficient ($\beta = 0.642$). This means that more than 40% of the changes in institutional performance can be explained by the extent of BPR implementation. This finding confirms that investment in developing administrative processes bears fruit even under the most difficult circumstances.
- **Sixth conclusion - The existence of a negative relationship between compound crises and institutional performance effectiveness:** The findings revealed a negative and strong relationship between compound crises and institutional performance effectiveness ($r = -0.534$), confirming that an escalation in the severity of crises leads to a deterioration in institutional performance. Nevertheless, the existence of a moderate negative relationship between BPR and compound crises ($r = -0.487$) indicates that BPR implementation can contribute to mitigating the severity of the crises' impact-a finding confirmed by the mediation result below.

3- **Conclusions concerning the mediation effect (test of H4)**

- **Seventh conclusion - Compound crises play a partial mediating role in the relationship between BPR and performance:** Path analysis using PLS-SEM showed that compound crises play a partial mediating role in the relationship between BPR and institutional performance effectiveness, with a VAF value of (28.0%). This means that approximately one quarter of the effect of BPR on performance (28%) is explained through BPR's capacity to help universities adapt to compound crises and mitigate their effects, while the remainder (72%) is a direct effect.
- This conclusion is the most innovative in the study, as it demonstrates that the conventional BPR models that presume a stable context are insufficient, and that there is a pressing need for a modified model integrating BPR and crisis management. This model (set out in the theoretical framework) was developed and its validity statistically tested.

4- **Conclusions concerning the between-group differences (test of H5)**

- Eighth conclusion - The existence of differences according to geographical location, university size, and functional position:
  - Geographical location (in favor of Hadhramaut): The estimates of leaders in Hadhramaut universities (the least affected by the conflict) were higher than those of Aden and Sana'a universities. This reflects the varying impact of the crisis by region.
  - University size (in favor of large universities): Large universities were more capable of developing their performance compared with small and medium universities, owing to the greater human and material resources they possess.
  - Functional position (in favor of senior leadership): The estimates of senior leadership were more optimistic than those of middle and executive management, which may reflect a "perception gap" between those who formulate policies and those who implement them.
  - Ninth conclusion - The absence of differences according to gender, qualification, or experience: The findings showed no statistically significant differences attributable to gender, academic qualification, or years of experience, indicating that these demographic variables were not an influential factor in evaluating the study variables, and that the findings can be generalized regardless of these characteristics.

5- **Qualitative conclusions (from the interviews)**

- **Tenth conclusion - The existence of investable spontaneous adaptation and institutional innovation mechanisms:** The in-depth interviews revealed the existence of multiple adaptation mechanisms developed spontaneously by administrative staff, the most prominent of which are:
  - Switching to alternative paper-based systems amid the interruption of electricity and internet.

- Using mobile phone applications (WhatsApp, Telegram) as alternative communication platforms.
- An administrative rotation system to reduce fuel consumption (for generators) and to lower the risks of commuting in conflict zones.

These mechanisms represent an "institutional treasure" that can be leveraged and employed within a deliberate, methodical framework for implementing BPR, rather than importing ready-made models from stable contexts.

- **Eleventh conclusion - A threefold set of challenges impeding BPR implementation in the Yemeni context**: The interviews identified three principal challenges impeding BPR implementation:
  - The material challenge: The years-long suspension of salaries led to the absence of fundamental work motivation.
  - The organizational challenge: The complexity of routine procedures requiring the signatures of 7 people in 4 different buildings.
  - The human challenge: The displacement of administrative competencies and the loss of institutional expertise.
- **Twelfth conclusion - Agreement on redesign priorities:** The interview participants agreed that the administrative processes with the highest priority for redesign are (in order):
  - Admission and registration processes - the lifeblood of the university.
  - Financial operations - especially the disbursement of salaries and the collection of fees.
  - Human resource management - especially the database of emigrated and displaced staff.
- **Thirteenth conclusion - The validity of the modified model for application in the Yemeni context:** The model fit indices (CFI = 0.936, RMSEA = 0.052, SRMR = 0.048) showed that the proposed modified model (which integrates BPR with crisis management across four stages) exhibits good fit with the study data, confirming its validity for application in the Yemeni context and comparable contexts.

Second - Recommendations

Based on the foregoing conclusions, the study offers the following recommendations, categorized by target party:

1- **Recommendations for Yemeni Universities:**

- **Recommendation 1: Adopt the proposed modified model:** The study recommends that Yemeni universities adopt the proposed modified model (whose validity has been statistically verified) as a methodical framework for developing administrative processes under compound crises. This requires:

Table (29): Recommendations for Yemeni Universities

Action	Description
Forming specialized working teams	To assess the reality of existing processes and identify intervention priorities in accordance with the model's four stages
Developing phased implementation plans	Based on the model, beginning with the "Readiness and Diagnosis under Fragility" stage
Establishing a monitoring and evaluation unit	To monitor the model's implementation and periodically measure its outcomes, while providing mechanisms for continuous feedback

Table (29) sets out the most important recommendations for Yemeni universities in implementing BPR.

- **Recommendation 2: Leverage spontaneous adaptation and institutional innovation mechanisms:** The study calls on Yemeni universities to document and leverage the adaptation and institutional innovation mechanisms developed spontaneously by administrative staff, through:

Table (30): Leveraging Spontaneous Adaptation and Institutional Innovation Mechanisms

Action	Description
Establishing a central database	Of successful innovative practices in dealing with crises, classified by process type and geographical region
Converting practices into standardized procedures	Formulating them as official policies and procedures while preserving their flexibility
Recognizing innovative initiatives	Establishing an annual award for administrative innovation in confronting crises

Table (30) sets out the leveraging of spontaneous adaptation and institutional innovation mechanisms.

- **Recommendation 3: Focus on core (priority) administrative processes:** The study recommends focusing on reengineering the core processes most closely linked to the continuity of the educational mission, according to the following priorities:

Table (31): Focus on Core (Priority) Administrative Processes

Priority	Administrative process	Procedural recommendations
First	Admission and registration processes	Digitizing admission forms and providing them in offline formats
Second	Financial operations	Simplifying admission procedures from 7 steps to a maximum of 3 steps
Third	Human resource management	Establishing unified service windows in each college

Table (31) sets out the focus on core (priority) administrative processes together with the procedural recommendations.

- **Recommendation 4: Employ appropriate technology (low-cost and highly flexible):** The study calls for employing information technology in a manner congruent with crisis conditions, focusing on:

Table (32): Employing Appropriate Technology (Low-Cost and Highly Flexible)

Action	Description
Using low-data applications	Those that work well under weak internet (such as Lite applications and offline forms)
Relying on open-source solutions	To reduce costs and avoid dependence on external vendors
Developing decentralized systems	That can operate independently in the event of connection loss with the parent university
Utilizing social media platforms	(WhatsApp, Telegram) as temporary alternatives for institutional communication, with clear policies for official use

Table (32) sets out the employment of appropriate technology (low-cost and highly flexible) through actions and a description of the technology-employment method.

- **Recommendation 5: Build human capacities and organizational resilience:** The study recommends investing in building human capacities and organizational resilience through:

Table (33): Building Human Capacities and Organizational Resilience

Action	Description
Intensive training programs	In the field of BPR and crisis management, targeting middle management (the true change agents)
Building communities of practice	To exchange experiences among universities at the local and regional levels
Developing mentoring programs	That transfer the experiences of veteran leaders to young staff
Integrating resilience concepts	Organizational resilience into mandatory training programs for new administrative leaders

Table (33) sets out the recommendation to build human capacities and organizational resilience.

2- **Recommendations for the Ministry of Higher Education and Scientific Research (Yemen):**

- **Recommendation 6: Develop flexible national policies that accommodate crises:** The study calls on the Ministry of Higher Education to develop flexible national policies that accommodate the specificity of crises, including:

Table (34): Developing Flexible National Policies That Accommodate Crises

Action	Description
A flexible regulatory framework	That allows universities greater flexibility in their financial and administrative procedures (delegation of disbursement authority, simplification of contracting procedures)
Business-continuity guidelines	For emergency situations, covering multiple scenarios
Modified performance standards	Commensurate with crisis conditions, such that universities are not penalized for performance declines resulting from circumstances beyond their control

Table (34) sets out the recommendation to develop flexible national policies that accommodate crises.

- **Recommendation 7: Establish an emergency fund to support administrative development:** The study recommends establishing a special emergency fund to support administrative development in universities, aiming to:

Table (35): Establishing an Emergency Fund to Support Administrative Development

Objective	Description
Urgent funding	For essential maintenance and the continuity of basic services (electricity, communications, fuel for generators)
Supporting digital transformation initiatives	For the most affected universities, especially those suffering chronic internet interruption
Funding exceptional training programs	For administrative staff in the fields of BPR, crisis management, and digital transformation

Table (35) sets out the recommendation to establish an emergency fund to support administrative development.

- **Recommendation 8: Coordinate with international and regional organizations:** The study calls on the Ministry to strengthen coordination with international and regional organizations supporting education (UNESCO, the World Bank, ISESCO, ALECSO) in order to:

Table (36): Coordination with International and Regional Organizations

Objective	Description
Technical support	For implementing modified BPR models in Yemeni universities, through specialized experts
Scholarships	For administrative staff to obtain specialized training abroad
Project funding	To develop the digital infrastructure of universities, focusing on low-cost solutions

Table (36) sets out the recommendation to coordinate with international and regional organizations.

- **Recommendation 9: Document and disseminate successful experiences:** The study recommends that the Ministry document and disseminate the successful experiences of Yemeni universities in adapting to crises, through:

Table (37): Documenting and Disseminating Successful Experiences

Action	Description
Issuing a national guidebook	Titled "Adaptation and Institutional Innovation Mechanisms in Yemeni Universities under Crises"
Holding an annual conference	To exchange experiences among universities regarding the development of administrative performance under crises
Establishing an electronic platform	For the exchange of knowledge and experiences among Yemeni and comparable Arab universities

Table (37) sets out the recommendation to document and disseminate successful experiences.

3- **Recommendations for International Organizations and Donors:**

- **Recommendation 10: Reconsider support priorities for higher education in conflict zones:** The study calls on international organizations and donors to reconsider their support priorities for higher education in conflict zones, through:

Table (38): Reconsidering Support Priorities for Higher Education in Conflict Zones

Action	Description
Transitioning from temporary relief support	To supporting sustainable institutional development initiatives
Allocating a portion of aid	To developing administrative capacities and not only the academic dimension or physical infrastructure
Supporting BPR projects	As a priority to ensure institutional continuity, since administrative collapse leads to the collapse of educational services in their entirety

Table (38) sets out the recommendation to reconsider support priorities for higher education in conflict zones.

- **Recommendation 11: Adopt the modified model in support programs:** The study recommends that international organizations adopt the modified model (integrating BPR with crisis management) as a reference framework for designing support programs in comparable contexts, such as:
  - Syria, Libya, Iraq, Sudan, Somalia, Palestine (Gaza).
  - While taking into account the local specificities of each context.
  - Developing a regional version of the model in cooperation with the League of Arab States and regional organizations.
- **Recommendation 12: Build strategic partnerships with local universities:** The study calls on international organizations to build strategic partnerships with local universities that transcend the conventional donor–beneficiary relationship, founded on:

Table (39): Adopting the Modified Model in Support Programs

Action	Description
Participation in project design	In a manner congruent with the genuine needs that the universities themselves identify
Building local capacities	Capable of sustaining development efforts after support ends, through training local trainers
Documenting and disseminating local success stories	To benefit from them in other contexts, while recognizing the universities' ownership of these experiences

Table (39) sets out the recommendation to adopt the modified model in support programs.

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