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Moderation role of government acts, laws and policies between economic factors and risk management: A case study of Saudi Arabia contractors

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A B S T R A C T

In construction projects, contractors have prioritized risks due to abandonment of operations and events, interruptions, time, and cost overruns. Construction hazards are linked to the ambiguity and unpredictability of the timely delivery of a project, with standard quality and within an allowable budget. The bid process is heavily reliant on economic considerations which include the exchange market, rate of interest and cost inflation for equipment and workforce. Project failure takes place if economic considerations have not complied for effective management of risks in construction. The research framework is founded on Organization Control Theory and focused on the PLS-SEM approach which addresses the effect of economic factors with moderating government regulatory procedures on the management of risks in construction within 303 large (higher than 250 workers) Saudi Arabian contractors. In the PLS-SEM approach, complicated models are effectively analyzed with higher statistical power. The findings show that economic factors and government regulatory procedures have a favorable impact on the management of risks in the Saudi Arabian development industry. Additionally, moderating government regulatory procedures has a favorable correlation to the management of risks in the Saudi Arabian construction sector. By addressing economic considerations, this study enables practitioners, experts and stakeholders involved in construction industries to conduct effective management of risks in the construction sector.

1. Introduction

According to Crane et al. (2013), the hazard is the possibility of an unpleasant, undesirable, or harmful consequence associated with an activity. The basic processes in the management of risks include recognition, evaluation, remediation, surveillance and replying (Ripley, 2020). Risk always exists and no human action is risk-free (Szymański, 2017). According to El-Sayegh (2008), risk factors (e.g., drawings, resources, managerial, manpower and machinery) linked with construction projects have received significant attention, leading to cost overruns and schedule delays for contractors. In development projects, it is essential to fulfill objectives by categorizing, assessing, and responding to hazards. It is achievable by developing a hazard assessment plan that makes effective usage of existing resources (Zou et al., 2007). However, inefficient, insufficient, and defective risk management in development projects has resulted in late delivery with higher costs than planned budget (Andi, 2006). Wang et al. (2004) reported in the development sector that it is impossible to completely avoid all hazards since they are intricate and need multiple actions and procedures for accomplishment.

The inability and incompetence of construction leaders to handle project hazards through effectively managing risks have led to a significant degree of delays and cost overruns, causing increased costs than the estimated budget and delayed time than the scheduled time frame (Thuye et al., 2007). In construction projects, the significance of hazard management has

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been discussed and debated around the world, such as research conducted in Indonesia (Andi, 2006), the Republic of China (Gao et al., 2019), State of Kuwait (Kartama & Kartamba, 2001), Malaysia (Sambasivan & Soon, 2007), India (Ling & Hoi, 2006), Nigeria (Aibinu & Jagboro, 2002), Vietnam (Thuye et al., 2007) and Islamic Republic of Pakistan (Hameed & Woo, 2007). In every country, managing risks in construction projects is distinct and focuses on financial, socio-economic and environmental factors. A significant percentage of managing risks is reliant on the uniqueness of the contractors operating in a certain region (Andi, 2006). In any country, Dikmen et al. (2008) theorized that the effects of key indicators of construction risks lead to unsatisfactory and insufficient risk management practices used in many construction projects. As a result, key hazard factors such as inferior quality, kitchen sink syndrome, interruptions and over expenditure prevent a project from attaining its goals. However, all of them were unable to inspect the adequacy and degree of managing risks, which includes materials, administration, economics, drawings, machinery, and manpower (Walker, 2015; El-Sayegh, 2008).

In Saudi Arabia projects, some key hazard factors include drawing deflects, kitchen sink syndrome, modifications in the scope of work and unsuitable contractual intervals which necessitate a significant level of competence for managing risks (Littlejohn & Foss, 2009). Construction projects are indispensable to the progress of every nation. The provision of essential services, such as healthcare, foodstuffs, and schooling to the public is only achievable with adequate and well-developed infrastructure, which is constructed by contractors. In 2020's third quarter, the Kingdom of Saudi Arabia's construction industry contributed 23.27% to investments (GFCF). Also, the construction sector GDP grew to 30.163 billion Saudi Riyals in the Kingdom of Saudi Arabia (Statistics, 2021). Conversely, managing risks is unsuccessful due to the lack of quality in the construction sector, as measured by economical hazard factors such as materials, administration, drawings, manpower, finances, and machinery.

2. Literature Review

2.1 Kingdom of Saudi Arabia's Development Sector

One of the largest oil exporting countries is the Kingdom of Saudi Arabia, its economy is thriving and the building sector is flourishing. The construction scope in the Saudi Arabian industry has increased with the expansion in population causing the government to focus on the development of new cities. Foreign-based construction corporations are restricted from applying for investment licenses under Saudi Arabia Vision 2030 because of the stringent rules set by the Saudi Arabian administration for participating in developmental projects. Three fundamental approaches for funding any construction project in the Saudi Arabian region are conventional finance, project finance and sharia-compliant financing (Husein, 2014). A country's strategic program is reliant on the development of economic cities, intending to grow transportation systems, clean technologies, advanced industrial manufacturing, information technology and medical services. Economic city construction is a massive building project involving significant manpower, machinery and investments. The Kingdom of Saudi Arabia has formed the Saudi Green Building Forum (SGBF) with an objective to reduce its reliance on oil and promote energy-efficient buildings due to the high electricity usage of HVAC systems, which account for 68% of the country's overall power usage (International Trade Administration, 2020).

2.2 Project Management

Non-routine and non-recurring operations constrained by resource, performance and time parameters predicted to satisfy customer goals and objectives is called a project (Larson, 2010). A project is made up of defined objectives, starting and finishing time durations, available funds, quality and performance requirements with time intervals. It is an intermediate effort for creating a distinct service, product or outcome (PMI, 2008). The methodical, systematic, and structured use of existing resources to accomplish specific objectives while complying with established restrictions is referred to project management (Haughey, 2014).

2.3 Risk Management

The likelihood and possibility that an activity may lead to an unpleasant or undesirable event is known as risk (Crane et al., 2013). Fundamental techniques for managing risks include indicating and evaluating, mitigating, observing and replying (Ripley, 2020). For executing risk management efficiently, plans are accompanied with an indication of hazard factors by evaluating them, resulting in the replying process with observation and surveillance of hazard factors. A positive hazard increases the likelihood of project performance, and a negative hazard decreases the likelihood of project performance (PMI, 2017).

2.4 Risk Factors

Bajwa and Syed (2020) assessed 29 hazards in the Saudi Arabian development market by employing a positivist approach. The main variables influencing project performance are political and economic hazards. Farid et al. (2020) used a comprehensive literature analysis to assess 283 hazard factors in the development sector of Pakistan. It was based on a qualitative research design with a descriptive approach using the conduction frequency analysis method. The main hazards causing delays and cost overruns are poor fiscal management, unavoidable hurdles, and lacking decision-making. An investigation on pavement construction was conducted by Kowacka et al. (2019) using disturbance analysis, technical and specialized information and documents obtained from highway firms. The analysis revealed that incorrect attitudinal systems, lacking GESUT dataset and incorrect project designing are key hazards for late delivery of pavement projects.

Memon et al. (2014) examined procurement procedures and methods utilized in MARA huge development projects using descriptive statistics. The research concluded that cash flow, financial barriers and material cost variations are crucial hazards for project performance. Utilizing a descriptive statistics approach, Abd Karim et al. (2012) analyzed 25 hazard factors in the Muar and Batu Pahat districts of Malaysia. The findings show that material shortages, delayed material delivery, inadequate technologies, unskilled manpower and financial challenges are the main cause of project delays. Bachayo et al. (2022) analyzed procurement and drawings hazards in Hyderabad and Karachi districts of Pakistan and discovered that these factors had a major influence on project cost. Utilizing the Relative Importance Index (RII) method, Devi and Ananthanarayanan (2017) analyzed 68 hazards in Indian non-infrastructure projects. The outcomes demonstrate that kitchen sink syndrome, granting contracts to the lowest bidder and development deferrals are the key contributors to project delays. By employing the significance index technique, Memon et al. (2017) analyzed 23 hazards in the Pakistan development sector and revealed that lack of safety awareness among the company's management, a failure to provide complete technical guidelines in the execution of building processes and insufficiency of technical advancement for improving safety have caused hazardous situations in building activities.

In the Malaysian development sector, Ismail et al. (2014) identified 35 risk factors using a comprehensive literature analysis and concluded that inadequate supervision and management on site, unskilled vendors and scheduling disruptions are the prime contributors to project delays. In the construction sector, Nagapan et al. (2012) employed a triangulation approach to analyze 81 hazards (63 linked to tangible and 73 linked to non-tangible wastes). The outcomes assist contractors and stakeholders in avoiding and reducing tangible and intangible wastage. In Saudi Arabia railway projects, Gopang et al. (2020) used the frequency index method to assess 36 hazards. The outcomes indicated that an unskilled workforce, mistakes in drawings and inadequate decision-making are prime reasons for railway project delays. In the Egyptian construction industry, MATLAB application was employed by Sharaf and Abdelwahab (2015) for analyzing 73 hazards and classified them into 12 categories. The outcomes indicated that client-related hazards are the significant causes of project interruption. Using historical datasets, feedback from practitioners and analysts and cross-case analysis in the Bahraini development projects, Abusafiya and Suliman (2017) quantitatively evaluated 45 hazards. The outcomes indicate that the prime reasons for construction delays in Bahrain's development projects are drawings alterations, poor judgment and delays in scheduled operations. Employing PIPS and IMT framework in Saudi Arabian projects, Algahtany et al. (2016) analyzed 7 hazards and developed a unique hazard evaluation system. The study concluded that adopting this system leads to an 80% reduction in supervision and a 40% improvement in efficacy. In Chinese development projects, Tang et al. (2007) analyzed 32 hazards using the Dilemmas analysis approach. This study demonstrates that safety and health, miscommunication, shortage of advanced equipment, conflicts and disputes, unexpected site interruptions, and meddling from managing staff are the main causes of failure of projects.

2.5 Economic Factors

Project financial viability is impacted by the economic components. It is the outcome of ineffectual planning for the nation's progress relying on unpredictably changing economic circumstances (Maina & Gathenya, 2014). Contractors are reliant on economic hazards since tendering procedures focus on them and lack of compliance would contribute to project delays and disruptions (Mirkovic, 2018). In the development sector of the UAE, El-Sayegh and Mansour (2015) found unpredicted price hikes and inflationary trends are hazards, which influence project performance. Akanni et al. (2015) highlighted economic issues which include fluctuations in prices of materials and manpower, frequent alternations in regulatory procedures and limited net cash flow in Nigerian infrastructure projects. Khahro et al. (2023) asserted that economic factors play a significant role in project performance. Antón et al. (2011) highlighted incorporating economic hazards in predicting tax hikes and bond yields for major development projects. During tendering, there is a high possibility of cuts in profitability when economic hazards are not considered by the construction company which highly influence the project performance (Liu et al., 2017; Kansal & Sharma, 2012).

2.6 Construction Risk Management

Construction hazards are characterized in a variety of different ways e.g. plans, monetary, materials, stakeholders, contractors and interior and exterior hazards (Rehman et al., 2017; Rehman & Ishak, 2021; El-Sayegh, 2008; Rehman & Ishak, 2022; Stephen & Raftery, 1992; Jarkas & Haup, 2015; Garrido et al., 2011). In any development project, machinery and manpower, monetary, plans and drawings, materials and administration-linked hazards are key contributors to delays and interruptions.

2.7 Government Acts, Laws and Policies

Maina et al. (2017) utilized inferential analysis and SEM method for investigating the influence of governmental activities and operations on hydrological investments and recoveries for project accomplishment and found that lower returns on metropolitan hydro investments deter financiers from participating in Kenya's development projects. In Malaysia, Taofeeq et al. (2020) utilized the SEM method for investigating the influence of governmental activities and operations on project performance and established a strong correlation of governmental activities and operations with hazard level, physical fitness, job practice, and competency. In the development sector of Nigeria, Adeleke et al. (2016) utilized the SEM method for analyzing the impact of governmental activities and operations on project success and found that governmental activities and operations have a strong correlation with economic hazards and hazard assessment. In the Scottish development sector, Gibb (2011) analyzed governmental activities and operations using policy assessment and found that governmental activities and operations have a robust correlation with residential unit rental prices.

In the Chinese development sector, Niu (2008) used the Cobb–Douglas function method to analyze issues and challenges in residential regulatory procedures and revealed that alternations in residential regulatory procedures had a significant effect on residential projects. According to Ismail et al. (2012), residential units in Malaysia are affected by governmental regulatory procedures which have an impact on a hazard assessment.

3. Conceptual Framework

Fig. 1 represents the study's conceptual framework diagram.

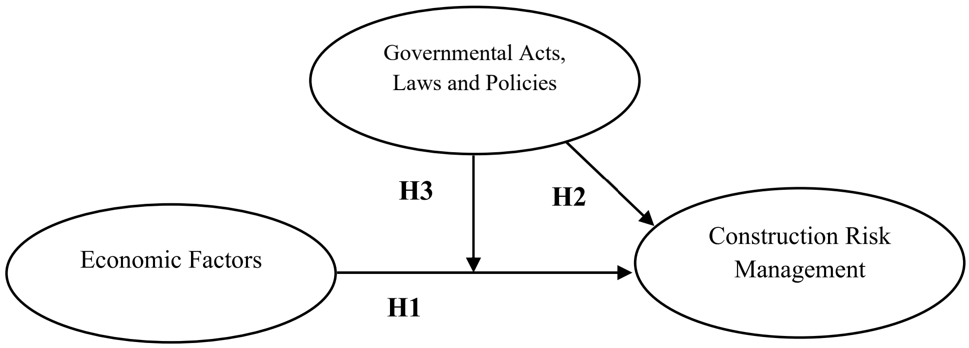

Fig. 1. Conceptual Model

H_1: *Economic factors have a substantial connection with risk management among Saudi Arabian contractors.*
H_2: *Government Acts, laws and policies have a substantial connection with risk management among Saudi Arabian contractors.*
H_3: *Government Acts, laws and policies moderate economic factors and risk management among Saudi Arabian contractors.*

4. Methodology

4.1 Current study's Epistemological Nature

The positive paradigm approach where survey data collected is empirically and statistically analyzed is the cornerstone of this quantitative research (Creswell et al., 2004; Apuke, 2017; Rostami, 2016).

4.2 Population

According to Saudi Contractor Authority (SCA, 2021), 361 large firm-sized contractors account for 8.9% of all contractors. These large firm-sized contractors comprise sole proprietors, general partnerships, LLCs, and corporations. Due to higher business costs and higher hazards, these large firm-sized contractors are suitable compared to small contractors. Directors, project leaders, site managers, engineers, superintendents, technicians and others constitute the population.

4.3 Sampling

As each class in the population represents a distinct and definite likelihood of occurrence, a simple random sampling technique is adopted. This study employed Hair et al. (2018) method and used G*Power 3.1.9 in conjunction with Yamane's (1967) formula, Krejcie and Morgan's (1970) formula and Cochran's (1963) formula and found that 190 questionnaires are needed for analysis (Aarons, 2021).

4.4 Data Collection

The survey questionnaires were distributed to the potential participants by the authors. One participant from each large sized firm contractor is adequate to satisfy the requirement of this study. Out of 370 questionnaires circulated, 303 questionnaires were analyzed in SmartPLS with a return rate of 82%.

4.5 Variable Measurement and Operationalization

This study followed (Moshood et al., 2020; Dinu, 2012) and utilized a 5-point Likert scale to assess the magnitude of hazards. Table 1 represents the sources of construct items.

Table 1
Constructs Measurement and Operationalization

Constructs	Variables	Indicators	Items	Source
Economic factors	Economic factors	4	Cost hikes have no influence on building resources. During developmental activities, there is no cost variation in manpower and machinery. The rate of exchange has no impact on building materials. Interest rates have no effect on project performance.	(Adeleke, et al., 2018)
Construction Risk Management	Administrative or management risk	4	The safety checks are satisfactory. Relevant planning and scheduling are accessible at the initial stage of project implementation. Quality control procedures implemented on the site are satisfactory. On-site, competent supervision and management experts are present.	(Adeleke, Nasidi, & Bamgbade, 2016)
	Equipment and labor risk	5	Immediate response on equipment maintenance and repair. There are sufficiently qualified and experienced technicians present. On-site, there are advanced and sufficient number of machinery present. Motivating and encouraging workers is practiced by the company. Substantial manpower is available in the company.	(Adeleke, Nasidi, & Bamgbade, 2016)
	Design risk	4	There is no revision of designs from implementation to the finishing stage. There are no faults in designing parameters. Technical designing inaccuracies and incompleteness are prevented Employees in the designing section are skilled and competent.	(Adeleke, Nasidi, & Bamgbade, 2016)
	Financial risk	4	Contractual amendments following a bid are not permitted. Our firm does not suffer from financial damages. There is no issue related to costs rising in our firm. Our firm does not appreciate pay interruptions.	(Adeleke, Nasidi, & Bamgbade, 2016)
	Material risk	4	In our firm, building supplies are sent quickly to the site. Materials are examined to ensure quality in accordance with the project criteria. The building markets have a considerable source of materials. In our firm, building material categories are not switched from starting to the ending phase of the project.	(Adeleke, Nasidi, & Bamgbade, 2016)
Government Acts, Laws and Policies	Rules and regulations	5	Introduction of new rules by the government increases the risk level related to construction. Organization practices obtaining government permits for construction. Time consumption for design approval and material supplies as per government regulations. Obtaining environmental accreditation certificate for construction. Government policies cause reduction of material cost.	(Adeleke, et al., 2018)

4.6 Statistical Analysis

This research statistically analyzed the data collected using SmartPLS v3.3.3 which is based on the PLS-SEM method where iteration of explained variance of an endogenous construct is optimized (Hair Jr et al., 2014). This technique is based on a casual prediction of relationships in a complicated model where data distribution assumptions are ignored (Hair et al., 2019). CB-SEM is associated with common factors for estimating the structural model with circular relations, whereas PLS-SEM is a composite and versatile technique that flexibly and effectively analyzes complicated models (including non-linearity and moderation) with greater statistical power (Sarstedt et al., 2014; Hair Jr et al., 2014).

5. Analysis and Findings

5.1 Demographics of the Participants

Table 2 shows the participants' demographics.

Table 2
Demographics of the Participants

Demographic Variable	Description	Frequency	Percent (%)
Gender	Male	215	71
	Female	88	29
Position	Directors	7	2.3
	Project Leaders	16	5.3
	Site managers	27	8.9
	Engineers	109	36
	Superintendents	25	8.3
	Technicians	34	11.2
	Others	85	28.1
Experience	< 1 year	24	7.9
	1 – 5 years	42	13.9
	6 – 10 years	141	46.5
	11 – 15 years	56	18.5
	> 15 years	40	13.2

5.2 Demographics of the Companies

Table 3 shows the companies' demographics.

Table 3
Demographics of the Companies

Demographic Variable	Description	Frequency	Percent (%)
Contractor Specialty	Mining	22	7.3
	Managing and treating wastage	27	8.9
	Building development	131	43.2
	Designing	26	8.6
	Highly specialized construction	31	10.2
	Landscaping and building maintenance	66	21.8
Contractor Ownership	Sole proprietors	52	17.2
	General Partnerships	61	20.1
	LLCs	159	52.5
	Corporation	31	10.2
Contractor Existence	< 1 year	8	2.6
	1 – 3 years	30	9.9
	4 – 6 years	77	25.4
	7 – 10 years	95	31.4
	> 10 years	93	30.7
Employees	250 – 275	35	11.6
	276 – 300	82	27.1
	301 – 325	75	24.8
	326 – 350	72	23.8
	> 350	39	12.9

5.3 Measurement Model Assessment

The measurement model is shown in Fig. 2.

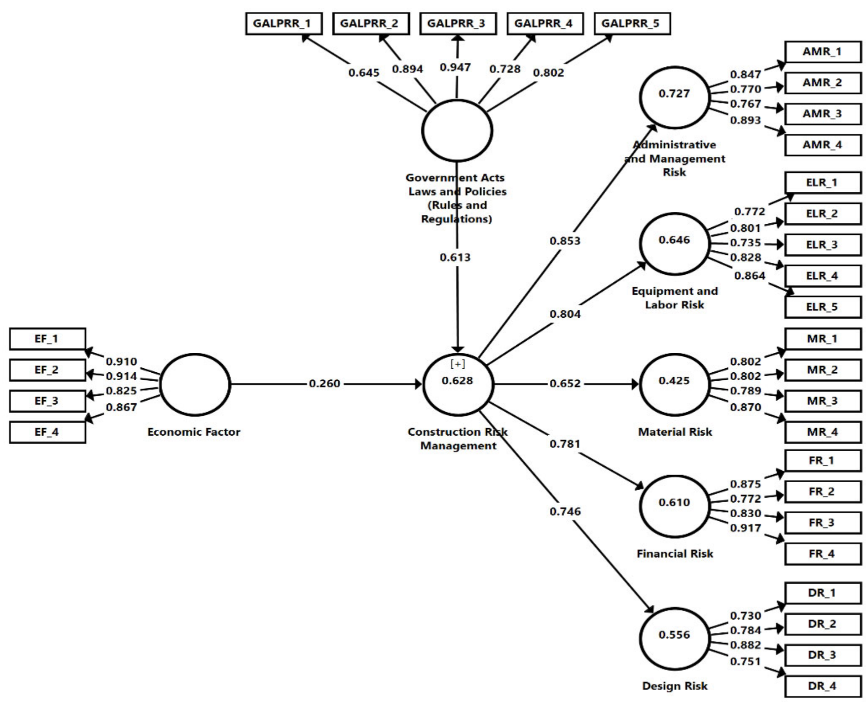

Fig. 2. Measurement Model

The measurement model is assessed based on Composite Reliability (CR), Cronbach's Alpha (α) and Average Variance Extracted (AVE) values (Rahman et al., 2022). The results obtained for CR, α and AVE as well as loading values for the parameters are presented in Table 4. This study meets quality requirements for Internal Consistency Reliability ($0.6 < CR < 0.95$ and $\alpha > 0.7$) (Hair et al., 2019).

Table 4
Results of PLS-SEM algorithm

Constructs	Items	Loadings	Cronbach's Alpha	CR	AVE
Economic Factor	EF_1	0.910	0.903	0.932	0.774
	EF_2	0.914			
	EF_3	0.825			
	EF_4	0.867			
Administrative and Management Factor	AMR_1	0.847	0.839	0.892	0.674
	AMR_2	0.770			
	AMR_3	0.767			
	AMR_4	0.893			
Equipment and Labor Factor	ELR_1	0.772	0.861	0.899	0.642
	ELR_2	0.801			
	ELR_3	0.735			
	ELR_4	0.828			
	ELR_5	0.864			
Material Factor	MR_1	0.802	0.833	0.888	0.666
	MR_2	0.802			
	MR_3	0.789			
	MR_4	0.870			
Financial Factor	FR_1	0.875	0.871	0.912	0.723
	FR_2	0.772			
	FR_3	0.830			
	FR_4	0.917			
Design Factor	DR_1	0.730	0.798	0.868	0.623
	DR_2	0.784			
	DR_3	0.882			
	DR_4	0.751			
Rules and Regulations	GALPRR_1	0.645	0.864	0.904	0.657
	GALPRR_2	0.894			
	GALPRR_3	0.947			
	GALPRR_4	0.728			
	GALPRR_5	0.802			

5.3.1 Convergent Validity

Cheah et al. (2018) stated that the amount to which construct measurements are correlated with other measurements of the same construct refers to convergent validity. This study used Fornell and Larcker (1981) guidelines for meeting the quality requirement for convergent validity (CR > 0.6 and AVE > 0.5).

5.3.2 Discriminant Validity

Discriminant validity is the measure of the extent of empirical measurements of two or more constructs differentiated from one another, validating distinctive and unique constructs (Hair et al., 2017; Rönkkö & Cho, 2022; Memon et al., 2023). For the attainment of discriminant validity, this study employed Henseler et al. (2015) (HTMT.85 < 0.85), Chin (2010) and Mora et al. (2012) Cross loadings (outer loadings > its cross-loadings) and Fornell-Larcker (1981) (other construct correlations < construct AVE square) criterion as shown in Table 5.

Table 5
Discriminant Validity

Fornell-Larcker Criterion							
Constructs	**AMR**	**DR**	**EF**	**ELR**	**FR**	**GALRR**	**MR**
AMR	0.821						
DR	0.591	0.789					
EF	0.568	0.43	0.88				
ELR	0.598	0.474	0.514	0.801			
FR	0.555	0.52	0.406	0.529	0.85		
GALPRR	0.705	0.569	0.581	0.572	0.577	0.81	
MR	0.501	0.341	0.429	0.4	0.37	0.5	0.816

HTMT							
AMR							
DR	0.698						
EF	0.643	0.478					
ELR	0.668	0.541	0.555				
FR	0.64	0.605	0.45	0.598			
GALPRR	0.814	0.656	0.649	0.643	0.648		
MR	0.589	0.389	0.481	0.448	0.432	0.585	

Cross Loading							
Constructs	**AMR**	**DR**	**EF**	**ELR**	**FR**	**GALRR**	**MR**
AMR_1	**0.847**	0.56	0.477	0.568	0.441	0.579	0.46
AMR_2	**0.77**	0.443	0.516	0.291	0.404	0.517	0.388
AMR_3	**0.767**	0.439	0.397	0.449	0.422	0.574	0.362
AMR_4	**0.893**	0.492	0.483	0.612	0.546	0.64	0.431
DR_1	0.42	**0.73**	0.174	0.375	0.333	0.315	0.146
DR_2	0.327	**0.784**	0.218	0.202	0.297	0.327	0.134
DR_3	0.596	**0.882**	0.37	0.526	0.447	0.543	0.34
DR_4	0.463	**0.751**	0.531	0.328	0.519	0.547	0.389
EF_1	0.631	0.44	**0.91**	0.591	0.388	0.559	0.451
EF_2	0.417	0.309	**0.914**	0.453	0.339	0.532	0.366
EF_3	0.431	0.437	**0.825**	0.293	0.338	0.428	0.372
EF_4	0.479	0.312	**0.867**	0.425	0.355	0.513	0.299
ELR_1	0.483	0.458	0.47	**0.772**	0.465	0.418	0.361
ELR_2	0.372	0.302	0.323	**0.801**	0.375	0.464	0.225
ELR_3	0.304	0.341	0.286	**0.735**	0.308	0.293	0.194
ELR_4	0.523	0.363	0.437	**0.828**	0.479	0.543	0.378
ELR_5	0.643	0.418	0.496	**0.864**	0.459	0.532	0.395
FR_1	0.5	0.489	0.315	0.501	**0.875**	0.455	0.256
FR_2	0.344	0.382	0.212	0.358	**0.772**	0.336	0.314
FR_3	0.498	0.443	0.483	0.444	**0.83**	0.596	0.349
FR_4	0.527	0.448	0.352	0.483	**0.917**	0.552	0.343
GALPRR_1	0.538	0.446	0.317	0.24	0.308	**0.645**	0.305
GALPRR_2	0.444	0.438	0.453	0.449	0.447	**0.894**	0.452
GALPRR_3	0.67	0.558	0.524	0.544	0.548	**0.947**	0.484
GALPRR_4	0.373	0.3	0.507	0.536	0.432	**0.728**	0.408
GALPRR_5	0.764	0.529	0.521	0.5	0.549	**0.802**	0.366
MR_1	0.45	0.212	0.338	0.47	0.292	0.332	**0.802**
MR_2	0.4	0.306	0.31	0.296	0.299	0.425	**0.802**
MR_3	0.307	0.229	0.277	0.198	0.248	0.351	**0.789**
MR_4	0.456	0.355	0.453	0.313	0.357	0.512	**0.87**

5.4. Structural Model Assessment

A structural model evaluation follows the evaluation of the measurement model which includes the significance of Path Coefficients, Coefficient of Determination (R^2), Effect Size (f^2), Predictive relevance (Q^2) and Moderating Effect (Hair Jr. et al., 2017). Fig. 3 represents a structural model with government Acts, laws and policies (Rules and Regulations) (EF*GALPRR) as moderator.

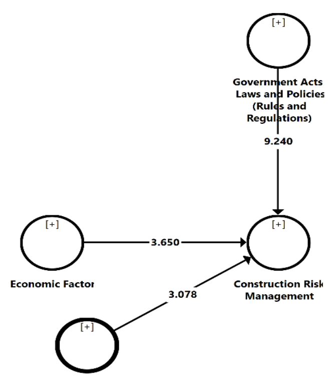

Fig. 3. Structural Model

Table 6
Results of Bootstrapping

	β	Sample Mean (M)	STDEV	T-Statistic	P-Value	Decision
Economic Factors →Construction Risk Management	0.269	0.285	0.074	3.650	0.000	Accepted
Government Acts, Laws and Policies→ Construction Risk Management	0.557	0.552	0.060	9.240	0.000	Accepted
Economic Factor * Government Acts, Laws and Policies →Construction Risk Management	0.163	0.154	0.053	3.078	0.002	Accepted

In order to statistically estimate path coefficients to determine the significance of relation between economic hazards with hazard management in Saudi Arabian development projects along with governmental regulatory procedures, this study used a non-parametric approach with a bootstrap of 303 cases, 5000 subsamples and two-tailed test (5% level of significance) (Hair et al., 2017). In Table 6, hypothesis testing results are displayed in which all three hypotheses are supported.

Hypothesis 1, which states that economic factors have a substantial connection with risk management among Saudi Arabian contractors is accepted ($\beta = 0.269$ and $p < 0.05$).

Hypothesis 2, which states that government Acts, laws and policies have a substantial connection with risk management among Saudi Arabian contractors is accepted ($\beta = 0.557$ and $p < 0.05$).

Hypothesis 3, which states that government Acts, laws and policies moderate economic factors and risk management among Saudi Arabian contractors is accepted ($\beta = 0.163$ and $p < 0.05$).

In PLS-SEM, for estimating the structural model's in-sample predictive capacity, the coefficient of determination (R^2) plays a significant role in statistically predicting endogenous construct (Hamilton et al., 2015; Rigdon, 2012; Lewis-Beck & Lewis-Beck, 2016; Bakr et al., 2012). It ranged from 0 to 1 with 0.1 as the lowest accepted value (Hair et al., 2019). This study has R^2 value 0.673 representing substantial in-sample predictive capacity following the Chin (1998) criteria ($R^2 \geq 0.67$ significant, $0.67 > R^2 \geq 0.33$ moderate, $0.33 > R^2 \geq 0.19$ low and $R^2 < 0.19$ extremely low), where economic hazards and governmental regulatory control procedures jointly predict 67.3% variance in risk management among Saudi Arabian contractors.

The empirical evaluation of the magnitude of the quantifiable relationship between the constructs is determined by effect size. This study followed Cohen (1998) recommendation (effect size ≥ 0.35 significant, 0.35 > effect size ≥ 0.15 moderate, 0.15> effect size ≥ 0.02 low and effect size < 0.02 extremely low) and evaluate the effect size 0.149 of economic hazards, which moderately affects risk management in Saudi Arabian construction sector.

This study used the Stone-Geisser test for determining out-of-sample predictive power (Stone, 1974; Geisser, 1974). Cross-validated redundancy Q^2 value following Chin's (2010) criteria ($Q^2 > 0$), for this model, is 0.252, which is obtained by applying a blindfolding approach representing significant predictive power (Sarstedt et al., 2014).

5.5 *Moderation Effect*

The primary goal of moderation is to quantify and test the economic factor's differential effect on construction risk management as a function of government initiatives, regulations, and policies (Memon et al., 2019). The strength of moderation of government regulatory control procedures in this study was determined using the product indicator method (Becker et al., 2018). This study has followed Dawson (2014) for interpreting two-way interaction effects by plotting graphs as shown in Fig. 4 where the independent variable is economic factors, moderator is government Acts, laws and policies (rules and regulations) and the dependent variable is construction risk management. Figure 4 illustrates how Saudi Arabian government initiatives, regulations, and policies reinforce the link between economic hazards and risk management in the development sector.

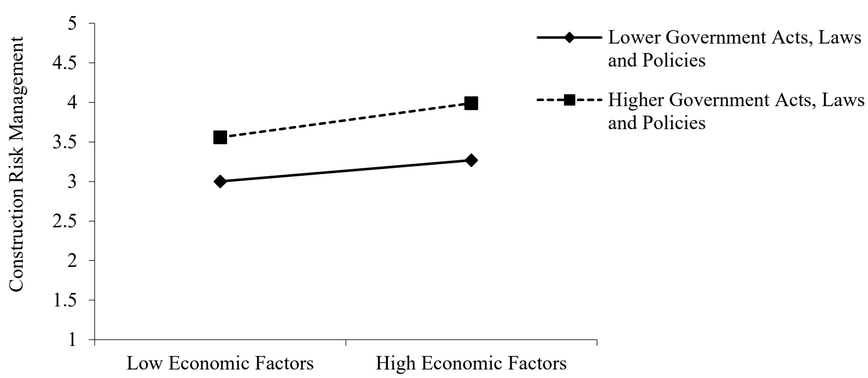

Fig. 4. Moderation Effect

This study followed Henseler et al. (2009) to calculate the magnitude of moderation of government initiatives, regulations, and policies in the Saudi Arabian construction sector. Following the recommendation of Henseler et al. (2009), the R^2 values of the structural model were obtained by running PLS algorithm calculations on SmarPLS with moderator and without moderator. The construction risk management's effect size is estimated based on the R^2 when the government initiatives, regulations, and policies are incorporated into and omitted from the structural model using Eq. (1) (Henseler et al., 2009).

$$Effect\ size\ (f^2) = \frac{R^{2\ (Model\ with\ Moderation\ variable)} - R^{2\ (Model\ without\ Moderation\ variabe)}}{1 - R^{2\ (Model\ with\ Moderation\ variable)}} = \frac{0.673-0.644}{1-0.673} = 0.089 \quad (1)$$

Cohen (1998) recommended effect size ≥ 0.35 significant, 0.35 > effect size ≥ 0.15 moderate, 0.15> effect size ≥ 0.02 low and effect size < 0.02 extremely low. The Saudi Arabian construction industry's effect size value for risk management is 0.089, which falls into the moderate level.

6. Conclusion and Recommendations

This research supports the key theoretical concept and added to the developing body of knowledge by presenting additional affirmation for the moderate influence of governmental regulatory control procedures on the link between economic hazards and risk management in the Saudi Arabian development sector. The present study makes three original contributions. Economic hazards and government Acts, laws and policies have a substantial connection with risk management and government Acts, laws and policies moderate economic hazards and risk management among Saudi Arabian contractors. By addressing economic considerations, current research enables practitioners and experts employed in development projects to perform risk management efficiently. This study uses a cross-sectional approach rather than a longitudinal design, that excludes causal inferences from survey samples. In the future, for the purpose of assessing construction risks, a longitudinal design approach is proposed. To comprehend risk management procedures in the future, it is suggested to evaluate all types of contractors (very small, small and medium) affiliated with the Kingdom of Saudi Arabia.

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