

The Role of Human Resources Management in Infrastructure Projects in Jordan

by

Ahmad ABUJRAIBAN

MANUSCRIPT-BASED THESIS PRESENTED TO ÉCOLE DE
TECHNOLOGIE SUPÉRIEURE IN PARTIAL FULFILLMENT FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY
Ph.D.

MONTREAL, FEBRUARY 2, 2023

ÉCOLE DE TECHNOLOGIE SUPÉRIEURE
UNIVERSITÉ DU QUÉBEC



Ahmad Abujraiban, 2022



This Creative Commons licence allows readers to download this work and share it with others as long as the author is credited. The content of this work can't be modified in any way or used commercially.

BOARD OF EXAMINERS

THIS THESIS HAS BEEN EVALUATED

BY THE FOLLOWING BOARD OF EXAMINERS

Mr. Gabriel Assaf, Thesis Supervisor
Department of Construction Engineering, École de technologie supérieure

Mr. Kamal Al-Haddad, President of the Board of Examiners
Department of Electric Engineering, École de technologie supérieure

Mr. Constantine J. Katsanis, Member of the jury
Department of Construction Engineering, École de technologie supérieure

Mr. Ghaleb Sweis, External Evaluator
University of Jordan

THIS THESIS WAS PRESENTED AND DEFENDED

IN THE PRESENCE OF A BOARD OF EXAMINERS AND PUBLIC

ON DECEMBER 22, 2022

AT ÉCOLE DE TECHNOLOGIE SUPÉRIEURE

ACKNOWLEDGMENT

I would like to express my thanks to my supervisor Prof. Gabriel Assaf for his excellent supervision during the fulfillment of my Ph.D. requirements. Your understanding, and trust motivated me to go forward. Your help and support will forever remain a major contributor to my achievements.

I would like to thank my committee members as well, Prof. Kamal Al-Haddad, president of the board of examiners, Prof. Constantine J. Katsanis, member of the jury, and Prof. Ghaleb Sweis, external examiner for their comments and suggestions.

Other thanks are extended to my family for their wise advice and spiritual support throughout my journey. I am truly grateful to my friends back home for their support and encouragement in critical times, from thousands of miles away, through completing this research.

I am also grateful to my cousin Hicham and his wife Aya who have been by my side all these past years and have played a determining role in my life.

Le rôle de la gestion des ressources humaines dans les projets d'infrastructure en Jordanie

Ahmad ABUJRAIBAN

RESUME

L'industrie de la construction et des infrastructures est l'un des secteurs les plus critiques de Jordanie. Cependant, l'industrie souffre de plusieurs défis, tels que le manque de recours humains qualifiés et la pénurie de compétences qu'ils possèdent pour effectuer leur travail. En conséquence, les entreprises de ce secteur ont montré une faible performance des employés et des projets. L'infrastructure de la Jordanie vise à relever les défis de ce secteur vital en fournissant des programmes planifiés de formation et de développement de carrière, Planification stratégique de leurs ressources humaines et adoption de nouvelles technologies qui soutiennent les fonctions des ressources humaines. L'adoption de l'analyse des ressources humaines (ARH) a augmenté dans le monde entier. A été constaté que l'adoption des (ARH) a un impact positif sur le rendement des organisations. Cependant, on sait peu de choses sur les facteurs qui influencent l'adoption de la technologie (ARH), ainsi que l'effet réel de la planification stratégique et de la formation sur la performance des employés et des projets dans l'industrie de la construction en Jordanie. Par conséquent, la présente étude examine la stratégie d'influence de la planification des ressources humaines, dimensions de la formation et du développement de carrière, et adoption de ARH sur la performance des employés et des projets dans les entreprises d'infrastructure et de construction en Jordanie. Afin d'atteindre l'objectif de l'étude, trois études distinctes ont été menées dans l'industrie de l'infrastructure et de la construction en Jordanie.

Dans la première étude, l'enquête quantitative a été distribuée aux professionnels de la construction d'infrastructure à qui on a demandé de remplir le questionnaire. AMOS (Analysis of Moment Structures) ou (Analyse de la structure du moment) a été utilisé pour analyser les données de (172) enquêtes.

VIII

Selon la recherche, la formation et le développement ont un impact substantiel sur la performance des employés. L'entreprise doit maintenir le développement de carrière des employés pour améliorer le rendement et la carrière des employés.

Ce document souligne l'importance du développement et de la formation dans le secteur de la construction et améliore les niveaux de performance des employés et des organisations.

Une deuxième étude a été menée pour voir si la planification stratégique améliorerait la gestion des projets de construction.

L'échantillon de l'étude était composé de (120) employés de compagnies de sous-traitance d'infrastructure, qui ont été divisés en groupes non chevauchants. Dans cette étude, il a été démontré que la planification stratégique était un facteur essentiel pour améliorer la performance des ressources humaines, avec des résultats différents en fonction de l'âge, du capital et de la taille d'un projet d'une entreprise.

La troisième étude a examiné les antécédents et les impacts de l'adoption sur la performance du projet. Pour ce faire, nous avons développé un cadre conceptuel déductif basé sur les théories de la technologie, de l'organisation de l'environnement (TOE) et de la vue basée sur la source (RBC).

Au total, 198 questionnaires ont été remplis par la population d'intérêt de l'industrie jordanienne de la construction.

Dans l'étude, huit facteurs ont eu un impact significatif sur l'adoption de HRA. En outre, l'adoption de HRA peut améliorer de manière significative la performance du projet. Il semble que les premiers adoptants comprennent les obstacles à la mise en œuvre des HRA et les avantages potentiels de leur mise en œuvre sur la base de preuves empiriques.

Mots-clés : Industrie des infrastructures, Performance, Formation et développement, Planification stratégique, Analyse des ressources humaines.

The Role of Human Resources Management in Infrastructure Projects in Jordan

Ahmad ABUJRAIBAN

ABSTRACT

The construction and infrastructure industry is one of the most critical sectors in Jordan. However, the industry suffers from several challenges, such as the lack of qualified human resources and the shortage of skill sets, they possess to perform their jobs. As a result, the companies in this sector have shown low employee and project performance. The Jordan Infrastructure companies aim to address the challenges of this vital sector by providing planned training and career development programs, strategic planning for their human resources and adopting new technology that supports the human resources functions. The adoption of human resources analytics (HRA) has been increasing worldwide. The adoption of HRA has been found to have positive impacts on organizations' performance. However, little is known about the factors that influence the adoption of HRA technology, as well as the actual effect of strategic planning and training on employee and project performance in the construction industry in Jordan. Therefore, the current study examines the influence of strategic human resource planning, training, and career development dimensions, and HRA adoption on the employee and project performance in infrastructure and construction companies in Jordan.

In order to achieve the study aim, three separate studies were conducted in the infrastructure and construction industry in Jordan. In the first study, the quantitative survey was distributed to infrastructure construction professionals who were asked to complete a questionnaire. AMOS (Analysis of Moment Structures) was used to analyze the data from (172) surveys. According to the research, training and development substantially impact an employee's performance. The company must maintain employee's career development to improve employee performance and careers. This paper highlights the importance of development and training in the construction sector and improves employee and organizational performance levels.

A second study was conducted to see if strategic planning would improve the management of construction projects. The study sample consisted of (120) employees in infrastructure contracting companies, which were divided into non-overlapping groups. In this study, strategic planning was shown to be an essential factor in improving human resource performance, with different results depending on a company's age, capital, and project size.

The third study examined the antecedents and impacts of adoption on project performance. In order to accomplish this, we developed a deductive conceptual framework based on the technology-organization-environment (TOE) and resource-based view (RBV) theories. A total of 198 questionnaires were completed by the Jordanian construction industry population of interest. In the study, eight factors were found to impact HRA adoption significantly. Additionally, HRA adoption can enhance project performance in a significant manner. It appears that early adopters understand the barriers to implementing HRAs and the potential benefits of their implementation based on empirical evidence.

Keywords: Infrastructure industry, Performance, Training and Development, Strategic Planning, Human Resources Analytics.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
CHAPTER 1 RESEARCH FOCUS AND OBJECTIVES	5
1.1 Problem Statement.....	5
1.2 Scope and objectives	7
1.3 Thesis overview.....	7
1.4 Significance and contribution of the study.....	8
1.5 Methodology	9
1.5.1 Introduction	9
1.5.2 Research design	10
1.5.3 Sample size	11
1.5.4 Data collection.....	12
1.5.5 Data analysis	13
1.5.6 Questionnaire design.....	13
1.5.7 Pilot Study and Pre-Test	14
1.5.8 Ethical considerations	14
CHAPTER 2 BACKGROUND AND LITERATURE REVIEW	17
2.1 Introduction	17
2.2 Definitions of study constructs	17
2.2.1 Project Management and Project Success	17
2.2.2 Employee performance	18
2.2.3 Training and career development	18
2.2.4 Human resources analytics.....	19
2.2.5 Organization performance.....	20
2.3 Infrastructure and construction industry	20
2.4 Strategic human resources planning in the construction industry	22
2.5 The Strategic Dimension of Training and Development on Employee Performance	23
2.6 Human resource analytics adoption	24
2.7 HRA and Project Performance.....	25

2.8	The impact of training and career development on employee performance.....	26
2.9	Related theories.....	28
2.9.1	Resource-based view theory (RBV).....	28
2.9.2	Technology–organization–environment (TOE) framework	30

CHAPTER 3 EFFECT OF STRATEGIC DETERMINANTS OF TRAINING AND DEVELOPMENT ON EMPLOYEE PRODUCTIVITY: AN EMPIRICAL STUDY ON THE INFRASTRUCTURE CONTRACTING COMPANIES..... 33

3.1	Abstract.....	33
3.2	Introduction.....	34
3.3	Research Background.....	37
3.4	Literature review and hypotheses development.....	41
3.4.1	The effect of training on employee performance	41
3.4.2	The impact of career development on employee performance	42
3.4.3	The impact of training and development on performance	43
3.4.4	Conceptual Model	43
3.5	Methodology	45
3.5.1	Participants	45
3.5.2	Sampling.....	46
3.5.3	Measurement	46
3.5.4	Collinearity Test	47
3.6	Results.....	48
3.6.1	Factor Analysis.....	48
3.6.2	Hypothesis Verification	49
3.6.3	Hypothesis Testing	51
3.7	Research contributions and implication.....	56
3.8	Discussion.....	56
3.9	Conclusions.....	59
3.10	Theoretical and practical implications.....	60
3.11	Limitations and future research directions.....	61

CHAPTER 4 EFFECT OF STRATEGIC PLANNING OF HUMAN RESOURCES IN MANAGEMENT PERFORMANCE

4.1	Abstract.....	63
4.2	Introduction.....	64

4.3	Literature Review	67
4.3.1	Strategic planning of human resources.....	67
4.3.2	Human Resources Planning.....	67
4.3.3	Finding and Selecting Personnel	68
4.3.4	Training and Development.....	68
4.3.5	Performance Management.....	68
4.3.6	Compensation Management.....	69
4.3.7	Career Management	69
4.3.8	Project Management Experience.....	69
4.4	Hypothesis Development.....	70
4.4.1	Strategic Planning for Human Resources and Project Management Performance	71
4.4.2	Strategic Planning for Human Resources and Project Management Time.....	72
4.4.3	Strategic Planning for Human Resources and Project Management Cost.....	72
4.4.4	Strategic Planning for Human Resources and Project Management Safety	73
4.4.5	Strategic Planning for Human Resources and Project Management Quality	74
4.4.6	Control Effect.....	75
4.5	Methodology	76
4.5.1	Research Model	77
4.6	Findings.....	77
4.7	Discussion	84
4.8	Conclusion.....	86
CHAPTER 5 THE ADOPTION OF HUMAN RESOURCES ANALYTICS IN CONSTRUCTION PROJECTS IN JORDAN: ANTECEDENTS AND CONSEQUENCES		89
5.1	Abstract	89
5.2	Introduction	90
5.3	Theoretical Background.....	93
5.3.1	Adoption of human resources analytics.....	94
5.3.2	HRA's potential for project management.....	95
5.3.3	Underpinning Theories.....	96
5.3.4	Conceptual Model and Hypotheses Development.....	99
5.3.4.1	Technological impact on HRA adoption	99
5.3.4.2	Organisational impact on HRA adoption.....	101

5.3.4.3	Environmental impact on HRA adoption	104
5.3.4.4	HRA impact on project performance.....	106
5.4	Research Method.....	108
5.4.1	Data collection, measurement scales, and sampling.....	109
5.5	Results.....	111
5.5.1	Measurement Model	112
5.5.2	Assessment of Structure Model	115
5.6	Discussion.....	119
5.6.1	Key findings	119
5.6.2	Implications for research.....	122
5.6.3	Implications for practice	123
5.7	Limitations and future research	124
5.8	Conclusion	125
	CONCLUSION.....	127
	RECOMMENDATIONS.....	129
	LIST OF BIBLIOGRAPHICAL REFERENCES.....	131

LIST OF TABLES

	Page
Table 3. 1 Eigen values, mean, SD and total variance of the items described in the study ...	48
Table 3. 2 Effect of Implementation of training policy and the employee's performance	51
Table 3. 3 Effects of training process stages and the employee's performance	52
Table 3. 4 Effect of training programs on performance quality	52
Table 3. 5 The model's latent and constituent variables.....	53
Table 3. 6 Indicators of perfect fit to training and development on employee's performances (CFA)	55
Table 4. 1 Variables Reliability	79
Table 4. 2 Fitness Indices.....	81
Table 4. 3 The Regression Coefficient and Significance.....	82
Table 4. 4 Differences in Company Age	83
Table 4. 5 Differences in Company Capital.....	83
Table 4. 6 Differences in Company Size Projects	84
Table 5. 1 Summary of the demographic profile.....	110
Table 5. 2 Factor Loading.....	113
Table 5. 3 Discriminant Validity	115
Table 5. 4 Hypothesized Direct Effects of the Variables.....	117
Table 5. 5 Predictive power and predictive relevance of the model.....	118

LIST OF FIGURES

	Page
Figure 1. 1 Research onion	11
Figure 2. 1 Resource-based view theory framework	29
Figure 2. 2 TOE adoption theoretical framework.....	31
Figure 3. 1 Hypothesized model of the current study.....	44
Figure 3. 2 Generated dendrogram of all workers underwent the study.....	49
Figure 3. 3 Ratings for the training and development components and the employee's performance of Jordanian infrastructure contracting companies.....	51
Figure 3. 4 Structural model (CFA).....	56
Figure 4. 1 Research model	77
Figure 4. 2 Strategic Planning of HR Components.....	78
Figure 4. 3 Project Management Performance Components	78
Figure 4. 4 Path Coefficients Model.....	80
Figure 5. 1 Conceptual Framework	108
Figure 5. 2 A structural model to evaluate the direct effects of variables	116

LIST OF ABBREVIATIONS

CFA	Confirmatory Factor Analysis
EFA	Exploratory Factor Analysis
SEM	Structural Equation Modeling
GDP	Gross Domestic Product
RBV	Resource-Based View
TOE	Technology-Organizational-Environmental
T&D	Training and Development
AOMS	Analysis of Moment Structures
PCA	Principal Component Analysis
VIF	Variance Inflation Factor
HRP	Human Resource Planning
ERP	Enterprise Resource Planning
FL	Factor Loadings
ICT	Information and Communications Technology
HRM	Human Resource Management
PLS	Partial Least Squares
SEM	Structural Equation Modelling
HRA	Human Resources Analytics

INTRODUCTION

The construction industry is a significant economic pillar of the economy in developed or developing countries. The construction industry spends about \$10 trillion annually on goods and services. In spite of this, the industry's productivity has lagged behind other sectors for decades, and it has the potential to close the productivity gap by \$1.6 trillion. It supports millions of jobs across the country, generates significant tax revenues, and helps ensure a reliable supply of buildings for businesses and homes for people (Barbosa et al., 2017). The industry is also a crucial driver of innovation and technological advancement. The construction industry comprises several subsectors, including building construction, engineering services, architecture, and construction management (Lee et al., 2020).

Human capital plays a major role in the success of the construction industry. The industry relies on skilled workers to complete projects, and the quality of the workforce is a key determinant of the industry's success (Bahr & Laszig, 2021; Nikulsheeva et al., 2021). Over the past few decades, the industry has experienced a shortage of workers with construction trade skills, which has increased the industry's competitiveness (Rahim et al., 2016; Silva et al., 2018). The shortage of skilled workers has led to higher labour costs, which has negatively impacted the industry's productivity and competitiveness (Ho, 2016; Oke et al., 2017). To address the shortage of skilled workers, the industry has invested in education, training, and apprenticeship programs aimed at increasing the industry's labour productivity (Abdel-Wahab, 2012; Mohd et al., 2019).

In addition, the industry players started to rely on strategic planning for their training and career development programmes to increase their overall performance. In essence, several studies asserted the importance of these strategies in enhancing the productivity of employees and the overall project performance (Irfan et al., 2020; Loo, 1996; Tabassi et al., 2012). There is evidence that project management training improves project outcomes. Moreover, project management training creates value for organisations that perform projects (Irfan et al., 2020; Mitki & Herstein, 2007).

Apart from regular training and career development, the companies have started utilising new technologies that help them improve their human resources practices and make informed decisions regarding related employee acquisition, retention and growth (Qamar & Samad, 2021). Data analytics is among these new technologies that are adopted in order to achieve this goal. Besides ERP systems, some companies started using more specialised technology called human resources analytics or workforce analytics (Moussa & El Arbi, 2020). Human resources analytics is a data analytics technology that is used to improve the performance of the workforce (e.g. to increase the production output of employees) and better understand worker behaviour (e.g. to increase the productivity of employees) (Tursunbayeva et al., 2018). The technology is used to develop workforce strategies that are designed to increase the productivity of employees, improve the performance of the workforce, and reduce workforce attrition rates (Fernandez & Gallardo-Gallardo, 2020).

The construction and infrastructure companies in Jordan are not immune to the shortage of skilled workers. The lack of human capital further exacerbates the shortage of skilled workers. This human capital shortage impacts the industry's productivity, competitiveness, and overall performance. Companies have started investing in human capital in order to address the shortage of skilled workers and increase the industry's productivity.

In addition, the adoption of new technology has been slow and is still not widespread (Matarneh & Hamed, 2017; Sweis et al., 2015). This has hindered the companies' ability to implement technology-enabled human resources practices, negatively impacting the industry's productivity and competitiveness. This gap in the adoption of technology has also hindered the industry's ability to implement workforce analytics, which has negatively impacted the industry's workforce productivity, competitiveness, and overall performance (Zeidan & Itani, 2020). However, more companies are starting to adopt technology-enabled human resources practices to enhance their workforce productivity and decision-making process, which will positively impact the industry's workforce productivity and decision-making process (Kryscynski et al., 2018). This will, in turn, positively impact the industry's workforce

productivity and decision-making process, which will, in turn, positively impact the industry's projects and overall performance (Garcia-Arroyo & Osca, 2021; Ilmudeen, 2021).

CHAPTER 1

RESEARCH FOCUS AND OBJECTIVES

1.1 Problem Statement

Construction is one of the major economic pillars, including building, repairing, and renovating all major infrastructure and real estate projects. Many corporations are also involved, including real estate developers, professionals, contractors, and government officials (Akadiri et al., 2012; Barbosa et al., 2017). Civilised societies rely heavily on public infrastructure to support economic, social, and political activities (Prodi & Sautter, 2018). Numerous studies indicated that infrastructure services are critical in achieving sustainable development (Adshead et al., 2019; Fay et al., 2011; Thacker et al., 2019). The GDP increases and the quality of life in the country improve as a result (Fasoranti, 2012). However, infrastructure contracting companies in Jordan face several challenges, such as limited access to training and development services, high costs, and the long time required to prepare for the market (Al Balkhy et al., 2021; Zaid Alkilani et al., 2013). They face a critical dilemma: how to retain their best employees, who are in high demand for specialised skills and capabilities, without jeopardising their ability to operate efficiently and effectively (Albalkhy & Sweis, 2022). Decision makers face the daunting task of balancing the needs of their organisations with the requirements of their employees, who seek to maximise their compensation and career opportunities. Furthermore, they are struggling to effectively achieve a high project performance due to high employee turnover and effective human resources management and practices (Ayoub et al., 2022; Sweis & Jaradat, 2021).

To encounter this problem and dilemma, infrastructure and construction companies started to adopt several strategies to improve their human resources practices towards improving their project performance (Al Balkhy et al., 2021; Albalkhy & Sweis, 2022). Some of these strategies include investing in training and development programmes, creating career paths and programmes that promote career progression, and creating incentives that improve the productivity of their employees (Jeschke et al., 2017; Tabassi et al., 2012; Woods, 2012). Thus,

it is crucial to investigate how strategic planning of their training and development programmes and career development can influence their project performance metrics such as cost, budget, time, quality and scope.

Additionally, companies worldwide have begun to adopt the wide spread of new technologies that can assist them in managing their human resources more effectively in such a dynamic and multi-project environment (Hamouche, 2021; Zangiacomi et al., 2020). Among the technologies that can help them make better decisions are data analytics, particularly human resources analytics (Cherry, 2016; Gurusinghe et al., 2021). In essence, data analytics is the process of extracting knowledge from large volumes of data in order to make better decisions (Wenzel & Van Quaquebeke, 2018). Data analytics enables companies to understand their workforce better and make better decisions, such as which employees to retain and let go of (Garcia-Arroyo & Osca, 2021). Data analytics can also be used to identify the most productive employees and provide them with incentives such as increased salaries and better working conditions (Akter et al., 2016). This has positively impacted their project performance metrics such as cost, budget, time, quality and scope (Tursunbayeva et al., 2018). In the literature, several studies have advocated that business can improve their decision-making related to their labour by using HRA (Jiang & Akdere, 2021; Shet et al., 2021; Witte, 2016). Furthermore, several studies found that data analytics can lead to better project performance (Mangla et al., 2020; Marzouk & Enaba, 2019). These studies demonstrated that companies that used data analytics had a higher probability of attaining their performance objectives.

Construction is one of the industries that can benefit from analytics because its success relies heavily on how well it manages its human resources (Ahmed et al., 2018; Marzouk & Enaba, 2019). In this regard, HRA can be most helpful to those in the construction industry, which relies heavily on recruiting, training, and evaluating highly skilled workers (Bilal et al., 2019; Ng et al., 2001). Ahmed et al. (2018) claim that evidence-based decisions are more effective than gut feelings and intuitive judgments in managing construction projects.

Based on the above discussion, the current thesis investigates how strategic human resource planning affects the performance of construction companies as a whole. Furthermore, it examines the impact of training and career development planning on the performance of the organisation and investigates the antecedents and consequences of HRA analytics within this infrastructure sector.

1.2 Scope and objectives

According to the current study's problem, the main objective is to examine the impact of strategic human resource planning, training and career development, and HRA on infrastructure companies' performance. To achieve the main objective, the following objectives have been developed.

- 1- To examine the influence of strategic training and career development dimensions on employee performance in infrastructure companies in Jordan.
- 2- To examine the influence of strategic human resources planning dimensions on project management performance in infrastructure companies in Jordan.
- 3- To investigate the antecedents and consequences of adopting HRA in construction projects in Jordan.

1.3 Thesis overview

Most chapters of this PhD thesis have already been published or submitted as independent journal papers. As described in the outline below, the dissertation is followed by an overall discussion and conclusion.

Chapter 1: Provides an overview, an outline of the research problem, a statement of the aim and objectives, and a description of how the research was conducted.

Chapter 2: Provides a summary of the relevant literature review, namely a synthesis of the literature deemed relevant to this study.

Chapter 3: Provides the first paper titled “The Strategic Dimension of Training and Development on Employee Performance: An Empirical Evidence for Infrastructure Contracting Companies in Jordan.” In the study, training and development significantly affect the performance of employees. The company must maintain employee career development to improve employee performance and career development continuously.

Chapter 4: Provides the second paper titled “Effect of Strategic Planning of Human Resources in Construction Project Management Performance: A perspective of Infrastructure Contracting Companies in Jordan.” It was found that strategic planning affected human resource performance during construction projects, with differences depending on the size of the project, the size of the company, and the ages of the companies.

Chapter 5: Provides the third paper titled “The Adoption of Human Resources Analytics in Construction Projects in Jordan: Antecedents and Consequences.” In this paper, the findings revealed that HRA adoption is significantly affected by technological, organizational, and environmental factors. HRA adoption can also significantly enhance the performance of projects, according to the results.

1.4 Significance and contribution of the study

The significance of the study is that it is the first to examine the impact of strategic human resource planning, training, and career development dimensions on infrastructure companies’ performance in Jordan. It also contributes to the literature in two ways. First, it advances our understanding of the relationship between HR and performance in infrastructure companies. Second, it demonstrates the potential impact of strategic HR on project management performance in infrastructure companies in Jordan.

The current study contributes to the field of HRM by addressing the gap in the existing literature by examining the impact of strategic HRM dimensions on employee performance in infrastructure companies in Jordan. The study also contributes to the field of project management by examining the influence of strategic HR dimensions on project performance in infrastructure companies in Jordan. The study also contributes to the field of HRA by investigating the antecedents and consequences of adopting HRA in construction projects in Jordan. The adoption of HRA has been found to have positive impacts on organizations' performance. However, little is known about the factors that influence the adoption of HRA practices in the construction industry in Jordan.

This study is the first to examine the impact of strategic HRM dimensions on employee performance in infrastructure companies in Jordan, which fills the gap in the literature and contributes to the field.

1.5 Methodology

1.5.1 Introduction

The purpose of this section is to explain a research plan and to describe the procedures to be used in the study. These procedures involve a sampling method, a data collection method, and a data analysis method. It would be possible to accomplish the stated research objectives, address research questions, and ultimately test research hypotheses using the methods used. To ensure the validity and reliability of the model, the study explained the procedures for developing the measuring model.

It has also discussed the method for pre-testing for the criterion validity, content validity, and face validity of the instrument, as well as the procedure for exploratory factor analysis (EFA) for filtering the items and assessing their dimensionality. The questionnaire for the field study has been determined by the results of the EFA. Field study data sample size determination has been discussed. As a final step, we discussed the methods of analysis for field study data, such

as descriptive analysis of respondents, Confirmatory Factor Analysis (CFA) for validating the constructs, and Structural Equation Modeling (SEM) for testing the research hypotheses.

1.5.2 Research design

In this study, Saunders et al. (2007) used a research onion to select appropriate methods and techniques (Figure 1.1). There are different layers, and each layer explains a method or approach. A positivist philosophy is adopted for this study since it suggests not tampering with data but instead using it as it is received from respondents without any manipulation (Crossan, 2003). The deductive approach is selected from the second layer because, in this approach, existing theories are tested rather than developing novel ones (Reyes, 2004), and as suggested by Zikmund et al. (2013), it is suitable for quantitative studies; thus, the mono method quantitative method is selected from the third layer. As well as this, data has been collected through a structured questionnaire, which is the fourth layer of the research onion. Moreover, data were collected only once, rather than multiple times - a time horizon called cross-sectional (Hair et al., 2007). The data collection and analysis sections explain the last layer.

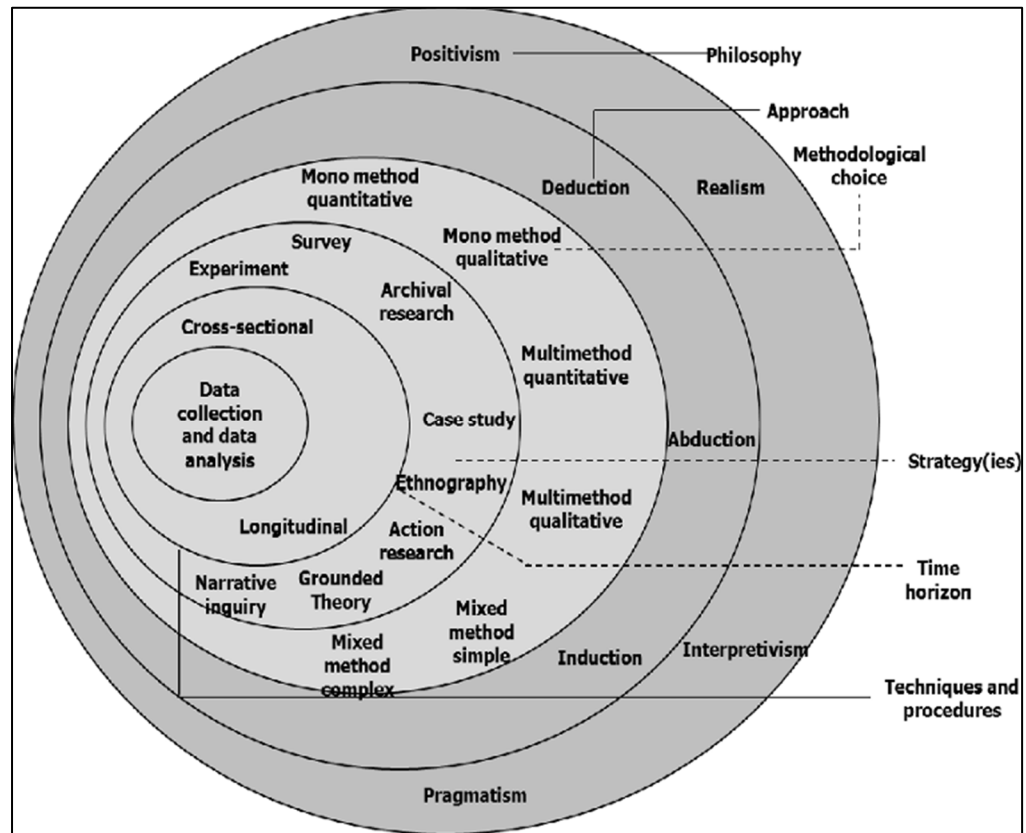


Figure 1. 1 Research onion

1.5.3 Sample size

Based on the number of indicators and factors for each factor in the model analysed, the sample size required for this analysis was calculated. For models with three or more indicators per factor, Anderson and Gerbing (1984) recommend a sample size of at least 150 (N=150) to achieve convergent and correct results. Several authors have suggested sample sizes between one hundred (N=100) and two hundred (N=200) for models with two to four variables (Loehlin, 1992).

1.5.4 Data collection

Data was collected using a structured questionnaire. Some respondents were contacted via phone or social media, or WhatsApp applications before data collection began. Both paper-based and electronic forms were used to collect data in all three relevant studies in this thesis. Google forms were used to create the questionnaire and share its link with respondents. The respondents' emails were taken from LinkedIn and contacted. In order to participate in this study, each respondent must be willing to do so.

The first objective of the study was conducted on a sample of 172 infrastructure construction professionals in Jordan. The data was collected over a period of 3 weeks. As stated earlier, we applied two approaches to data collection, including a paper-based and electronic form.

The second objective of the study was conducted on 120 HR professionals in infrastructure companies in Jordan. Similar to the first study, both paper-based and electronic-based questionnaires were used to collect the data from respondents. The data was collected over a period of 5 weeks.

In the third objective of the study, data was collected using cross-sectional surveys, and the conceptual framework was tested using these surveys. Data collection for this study was conducted using a convenience sampling method among project managers, human resources employees, and big data specialists involved in their companies' construction projects in Jordan. This method is suitable when identifying the target population is difficult.

Data was collected using paper surveys and online surveys. The paper-based questionnaire was distributed physically by a Jordanian consulting company, whereas the online questionnaire was distributed electronically by the authors in collaboration with a Jordanian consulting company. Within two months, 288 responses were received.

1.5.5 Data analysis

After collecting data from respondents, the next crucial step is to analyse the collected data based on various statistical tools (Bryman & Cramer, 1992). In the statistical analysis, outliers and missing values were checked by using frequency distributions on the entire dataset. Dash et al. (2012) and Matuska et al. (2013) used a similar method for analysing demographic characteristics.

A partial least squares path modelling technique was used for testing the study model using SmartPLS version 3.0 and AMOS 28 (Ringle & Sarstedt, 2016). We chose this approach because it is exploratory in nature, and formative constructs will be incorporated into the research model. Accordingly, Ringle and Sarstedt (2016) consider this method to be acceptable since the proposed relationship between the variables has never been tested before. Furthermore, SmartPLS and AMOS have been shown to be the most effective software tool for handling both formative and reflective structures in research models (Mertler et al., 2021; Mustafa et al., 2020).

This study included two types of measures; external model evaluation (i.e. measurement model) and internal model evaluation (i.e. structural model). Measurement models measure variables' reliability and validity, while structural models assess the significance of path coefficients in study models (Henseler et al., 2009).

1.5.6 Questionnaire design

In order to make a decision, it is necessary to use constructs and questions that involve measurement. According to Collis and Hussey (2003) as well as Saunders et al. (2007), the content of each problem is relevant, and there are three steps in the design: (i) Identifying the questions to ask; (ii) Make sure the question form and wording are appropriate for each question; (iii) Preparation of a detailed questionnaire and the design of a series of questions.

For this analysis, constructs were selected along with a set of items derived from the literature for each construct. Following the definition of the constructs, a collection of measurement items/indicators was defined for testing each construct. A particular measurement has been taken into consideration when choosing or making these items. The latent variable they underpin must be represented by a homogeneous scale of complete items. DeVellis and Thorpe (2021) suggest that the corresponding build of each object should reflect its content.

1.5.7 Pilot Study and Pre-Test

Several changes have been made to the initial draft of the questionnaire in order to address any issues and eliminate any ambiguities. Using the information collected from a subset of participants was crucial to determining the validity and reliability of the measures (Hertzog, 2008). Although the participants in the study's pilot test were the same as those who provided the actual data for the study (Bradburn et al., 2004), three academics and professionals completed the questionnaire for the pre-test evaluation. It was necessary to rephrase ambiguous questions, determine how long a questionnaire would take to complete, change the order of the questions in the questionnaire from easy to difficult, and finally assess the measure's validity and reliability before it was used to collect study data.

1.5.8 Ethical considerations

During the research process, ethical considerations are considered necessary (Tharenou et al., 2007). Throughout this entire study process, the researcher did not engage in any illegal activities. In order to obtain a specific response, the researcher did not bribe the respondent. Additionally, this research study has been conducted with the utmost care so that no one gets injured. No one has been forced to participate in this study, so all respondents willingly filled out the questionnaire. In order to appreciate the work and effort of previous authors, their work has been cited appropriately.

In order to prevent a conflict of interest, the researcher did not use friends, family, or significant others as respondents. The researcher did not use data that others have collected without their consent.

CHAPTER 2

BACKGROUND AND LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to review the literature concerning the variables of the study. In addition to definitions, history, importance, and types, the literature included information on the concerned variables. Moreover, each construct is thoroughly described in terms of its predictors and outcomes. A detailed description of each variable is provided in this chapter. In addition, this chapter prepares the ground for the next chapter, which focuses on hypothesis development. As a result, this chapter has explored various related theories that directly or indirectly explain the relationship between the variables studied in this chapter.

2.2 Definitions of study constructs

In this part, the main research constructs were defined, and the main theories that explain the construct were identified. The literature review was also used to explain the background behind the construct and also to explain the current state of the research in the field.

2.2.1 Project Management and Project Success

As a basis for discussing project management's role in achieving success, Munns and Bjeirmi (1996) looked at current definitions of projects and project management. The definition of project management is simply "the process of controlling the achievement of the project objectives." It is a process of planning, controlling, and coordinating the activities and resources needed to bring a project to a successful conclusion. A project management definition is one that describes management philosophy, guiding principles, and methods to meet customer service needs as well as product needs (Berkley & Saylor, 1994). In these definitions, project management is emphasised as an activity of management, as it is not only management of the output of the project but also customer service demands after production. In

turn, project success was defined as achieving the agreed-upon objectives and producing the required output on time, within budget, and to specifications (Alnasseri, 2015). In brief, the term "project success" refers to three types of performance: (i) meeting the predetermined deadlines, costs, and quality criteria, (ii) the effectiveness of the project management process, and (iii) satisfying stakeholder expectations (Baccarini, 1999). A third definition requires an understanding of the product in order to define project success. Baccarini (1999) makes the argument that the first two definitions focus on project management and the third on product success.

2.2.2 Employee performance

Performance is typically defined in organizations as how much an individual contributes to the organization's goals (Islam & Rasad, 2005). Employee performance is defined as the level of effort, skill, and productivity exhibited by an employee (Avunduk, 2021). It is measured using a variety of criteria, such as the quality and quantity of work produced, the speed of delivery, and the degree to which an employee adhered to office policies (Dhlewayo et al., 2021; Mapes et al., 1997; Muscalu & Şerban, 2014). While employee performance is a critical aspect of any organization, it has been surprisingly difficult to measure. According to Uddin et al. (2013), various features of employee performance are used to measure employee performance, including employee appraisals, respect for employees, motivation and training, organizational structures, and culture. Due to this, organizations have the option of choosing different features of employee performance based on their business goals.

2.2.3 Training and career development

Training has been defined differently by different academics. Many authors between 1960 and 1969 described the training as a method for enhancing job-related skills and knowledge so that a person could perform their job better. As an example, Becker (1962) believes that training increases employee productivity (Somasundaram & Egan, 2004). As a result, they disregarded training as a means of learning that can permanently alter an employee's behaviour. The

training process was described by many authors as both a method for imparting knowledge to employees and as a tool for altering employee behaviour after 1970. Considering Campbell, Dunnette, Lawler & Weich's (1970) definition of training, it is the process of gaining knowledge, abilities, and attitudes that are meant to last a lifetime (Somasundaram & Egan, 2004). In 1985, Holder (1985) defined training as a process for improving performance within a particular profession (Kuruppu et al., 2021). According to Hassan et al. (2013), training is a deliberate procedure intended to increase the performance of individuals at work. By enhancing employee satisfaction and organizational growth, training acts as a nerve that promotes efficient and effective workplace operations (Kulkarni, 2013). In order for organizations to succeed in the market, training plays a crucial role in gaining a competitive advantage. Kulkarni (2013) states that training improves the ability of employees to do their jobs to the highest standard.

In turn, career development is defined as the use of initiatives, training, and development opportunities made available by employers to enhance the careers of their employees (Lalli, 2009). To assist employees with putting their career plans into action, career development programs often include career paths, professional maps, education, and training (Van de Ven, 2007). Developing career goals, aspirations, goals, and goals were described as career planning. The process of setting career goals, identifying and utilizing educational and developmental opportunities, hiring a career coach, receiving career counselling, and seeking advice and direction from respected peers, managers, and subject matter experts all have an influential role in career planning (Schulz & Enslin, 2014).

2.2.4 Human resources analytics

HRA is considered a part of big data analytics in the literature (Bassi, 2011). People analytics, also known as workforce analytics, talent analytics, human capital analytics, and human capital analytics, is a subject of research that involves academics, practitioners, and technology providers in the human resources field (Falletta & Combs, 2020). In a nutshell, HR Analytics is a set of advanced analytics techniques that help to make better decisions in the field of human

resources (Tursunbayeva et al., 2018). HR Analytics uses big data and advanced analytics to make decisions about people, helping to improve the efficiency of the HR function. HR Analytics is used to help make decisions on a wide range of topics in the field of HR, including recruitment, retention, performance management, employee engagement, and workforce planning (Van den Heuvel & Bondarouk, 2017). Data mining, predictive analytics, and contextual analytics are examples of analytical techniques used in people analytics (HR analytics) to help managers make better decisions about their employees (Fernandez & Gallardo Gallardo, 2020).

2.2.5 Organization performance

Performance history can be divided into several categories. Etzioni (1960) thought organizations had been regularly evaluated based on their accomplishment or failure to achieve predetermined objectives. Lorsch (1970) offers an alternative method for gauging organizational performance, one that takes into account both the employees and the environment in which the company operates. During the 1980s, performance was defined as an organization's capacity to think about both its means and purposes. According to Adam Jr (1994), employee performance quality affected organizational performance significantly in the 1990s. A company's performance in the first ten years of the 21st century was mainly defined as its capability to utilize its resources effectively to accomplish goals consistent with the company's goals while also considering the relevance of those resources to its customers. In this definition, efficiency, effectiveness, and relevance have all been taken into account. Accordingly, organizations that consistently meet the needs of their stakeholders are effective and perform well (Jenatabadi, 2015).

2.3 Infrastructure and construction industry

The infrastructure and construction industry is responsible for much of the modern world — from roads, bridges and tunnels to power plants, wastewater treatment facilities, airports and more (Kumar, 2022). It is also one of the largest industries in the world. Roads, airports,

sewers, power plants, sewage treatment facilities, water treatment facilities, dams, bridges and tunnels — all these things and more were built by the infrastructure and construction industry (Barbosa et al., 2017).

Historically, the infrastructure and construction sector has been one of the least efficient industries. One-third of the world's economic growth has been attributed to the construction industry and one-fourth to manufacturing (Razkenari et al., 2020). However, the construction industry is prone to cost overruns and scheduling problems. Furthermore, the building industry needs goods that are quicker, cheaper, and of higher quality. The construction industry has reached a point where no specific solutions are possible, especially given the growing labour shortage that is raising labour prices, decreasing efficiency, and lowering quality. Technology, research, and digitalization investments have been low, industries have fragmented, contractual arrangements are convoluted, building standards have become complex, and other problems have contributed to low construction productivity (Barbosa et al., 2017; Razkenari et al., 2020).

In Jordan, the infrastructure and construction industry is also a major economic force (Sweis et al., 2015). The majority of construction in Jordan is government-funded, but the private sector is also active. Most of the construction in Jordan is concentrated in the major cities and on the major highways and roads. Still, the industry is also expanding into other areas such as healthcare, education, retail and tourism. Roads, airports, sewers, power plants, sewage treatment facilities, water treatment facilities, dams, bridges and tunnels — all these things and more were built by the infrastructure and construction industry (Al Balkhy et al., 2021).

According to Arif et al. (2017) and Bekr (2018), Jordan's construction industry is one of the most influential sectors of the economy. As a major employer and contributor to the country's gross domestic product (GDP), it contributes significantly to its GDP (Shurrab et al., 2018; Sweis & Jaradat, 2021). As the industry has grown, skilled workers have become scarce (Alqirem et al., 2018). For this reason, Jordanian construction companies should optimize their human resource management to plan, recruit, and train their workforce more effectively (Moussa & El Arbi, 2020).

2.4 Strategic human resources planning in the construction industry

For Industry to be implemented successfully and maximize its potential to boost productivity, strengthen its competitive edge, and stay up with international trends, effective human resource management is essential (Ozkan-Ozen & Kazancoglu, 2021). Businesses needing to determine how to analyze performance and what procedures to follow to achieve maximum productivity can find strategic human resource management an essential strategy. The present literature is heavily devoted to studies related to the human aspects of Industry 4.0. The topics covered include workforce development, human resource management, and employee capabilities (Muscalu & Şerban, 2014; Ozkan-Ozen & Kazancoglu, 2021).

One way to improve human resource management in the construction industry is to strategically plan the human resources needed to meet the current and future needs of the industry (Bartlett et al., 2016). One way to do this is through a strategic human resources planning process, which involves identifying the skills required to be successful in the industry and then planning and recruiting a workforce with those skills (Bagheri, 2016). This strategy has been used by construction companies in Jordan to plan their workforce, recruit skilled workers, and train those workers to be even better builders and contributors to the economy (Al-Qudah et al., 2020).

The dynamic changes in the construction sector brought about by Industry 4.0 require a more strategic approach to human resource management (Bagheri, 2016). In fact, many scholars have argued that the successful implementation of Industry 4.0 will require a major shift in how organizations manage their human resources (James et al., 2022; Margherita, 2022). This shift will be necessary to ensure that organizations have the right mix of skills and knowledge in order to capitalize on the opportunities and challenges posed by Industry (Agarwal et al., 2021).

2.5 The Strategic Dimension of Training and Development on Employee Performance

According to Jehanzeb and Bashir (2013), human resource strategies, including training strategies, affect how organizations manage and implement human resource functions and, thus, how they perform in general. In order to achieve a competitive advantage, training strategies have to be integrated into larger frameworks that include organizational strategies. In order to make the right strategic decisions, the organization must visualize its future visions, draw its policies, define its long-term goals (Monday et al., 2015), and identify its strengths and weaknesses. Training is now considered one of the most important yet basic means of forming appropriate human resources in terms of quantity and quality, so it has become a form of investment in human capital. In other words, it helps individuals obtain the information and administrative and technical skills they need to be successful at their jobs, which in turn contributes to the positive performance of organizations (Ogbu & Osanaiye, 2017). It is based on ensuring that all of the resources of the organization, including human resources, are coordinated to ensure the implementation of the company's main strategy.

Anitha (2014) emphasizes that the comprehensive and integrated approach to strategic human resource management involves coordination between all the organization's resources, including human resources. Another supplementary value will certainly emerge from the integration of all the resources of the organization. An organization cannot create all of these resources alone, so strategic management is a key to a good training function.

There is a rapid change in the environment in which organizations operate. In addition to internal environmental factors, including human, material, and informational factors, there are also external environmental factors, such as economic, social, technological, or political factors, that are constantly changing, and organizations must therefore adopt clear strategies to maintain their competitive advantage as a result of this (Li et al., 2019). The relationship between the human resources strategy and an organization's global position has been shown in many studies, according to Uzoamaka and Innocent (2017). Moreover, organizations using an integrated human resource strategy achieve high-quality outcomes and perform their work

better (Thang et al., 2010). Adapting to challenges, rapid changes, and technological developments in light of globalization by optimizing and applying the appropriate methods available in this field. Considering the above, we conclude that most researchers who have studied the strategic approach to human resources focused on partnering with this resource in strategic planning. Currently, companies that apply global practices are shifting their focus from traditional approaches that were only focused on the performance of daily tasks to a more strategic approach that focuses on global practices (Jha, 2016). To ensure raising workers' skills to perform the organisation's various functions effectively, the organization must develop a clear strategic plan for human resources along with sub-plans, including activity and training functions (Goswami & Saha, 2021).

2.6 Human resource analytics adoption

Recent studies revealed a slow adoption of HRA by organizations. There are many fundamental reasons why human resource practitioners are slow to adopt new technologies, whether it is on an individual level (Marler & Boudreau, 2017) or an organizational level (Shet et al., 2021). A lack of required skills, management support, analytics, culture, and technology makes HR specialists reluctant to implement advanced HRA, according to Kapoor and Kabra (2014). Furthermore, because of their unfamiliarity with big data analytics, they may be hesitant to adopt it. Researchers found that few human resource managers had experience using big data analytics tools (Saxena et al., 2021). It remains unclear (Belizón & Kieran, 2022) how HRA can add value to the organization based on its strategic positioning and contribution to its operational deliverables across the organization since it is the most recent innovation in human resources management. It may also be challenging for human resources professionals to adopt these tools if they are unfamiliar with the statistical and mathematical analyses required (Shet et al., 2021). The perceived complexity of big data analytics may also discourage them from adopting it. Human resource professionals, for instance, believe that big data analytics is too complicated to understand, according to Fernandez and Gallardo Gallardo (2020).

There is growing interest in factors influencing HRA adoption as well as their implications for corporate performance (Aydiner et al., 2019). Although more companies invest in HRA, it seems to be a small part of their overall investments. Since HRA is not widely adopted (Singh & Muduli, 2021), quantifying its impacts on organizational success is difficult. Thus, no solid scholarly paradigm has been developed to understand HRA adoption within organizations (Dahlbom et al., 2020; Margherita, 2022). The fact that HRA is becoming more common in businesses is despite the fact that there is a startling lack of research on the topic (Margherita, 2022). According to the existing literature (McCartney & Fu, 2022), however, HRA cannot be applied to practical business processes.

In spite of the lack of adoption of data analytics by human resources, further research is needed to prove their effectiveness, acceptance, and adoption in various sectors (Shet et al., 2021). Therefore, two crucial questions need to be addressed: Why do human resources organizations seem so slow to adopt big data to help them drive their businesses forward? In what ways does the adoption of innovative technology affect the performance of a project?

2.7 HRA and Project Performance

Al-Dmour et al. (2017) describe HRM as a crucial component of a company's success. Amit and Belcourt (1999) argued that it provides a competitive advantage to an organization by contributing to its success. The way HRM strategies and policies are implemented affects work experience and employment relationships (Bodla & Ningyu, 2017). Several studies have shown that HRM practices influence project performance (Huemann et al., 2007; Wickramasinghe & Liyanage, 2013). As a result, employee management practices have been found to have an indirect impact on project performance (Keegan et al., 2018).

According to related studies, HRA plays an important role in recruiting and retaining talent in the human resource domain. Various employee benefits, such as healthcare, retirement plans, and supplemental expenses, can be provided through HRA (Belizón & Kieran, 2022). In essence, HRA is an emerging practice that focuses on quantitatively analysing employee data

to identify potential and current performance issues (Larsson & Edwards, 2022). HRA has been shown to improve HR practices by providing data-driven insights (Gurusinghe et al., 2021), improving employee productivity (Gaur et al., 2019), reducing attrition and turnover rates (Gobble, 2017), and improving employee engagement and satisfaction (Qamar & Samad, 2021). HRM practices can be improved using these data-driven insights (King, 2016). In addition, HRA can be used to assess the value of human capital and HRM practices and ensure that they are aligned with strategic objectives (Huselid, 2018; Larsson & Edwards, 2022).

The availability of skilled workers has also been shown to affect the performance of construction projects (Hussain et al., 2020). There is evidence that HRA enhances workers' skills and improves their talent (Gurusinghe et al., 2021; Zang & Ye, 2015). HRA can be argued to improve HR practices and boost worker skills by implementing HRA in HR practices. In light of the fact that HRA falls under big data analytics, this argument is also supported by studies examining big data analytics' impact on project performance (Gunasekaran et al., 2017; Mangla et al., 2020). Using big data analytics to enhance decision-making enhances a variety of aspects of project performance, according to Mangla et al. (2020).

2.8 The impact of training and career development on employee performance

Human resource management has been shown to be associated with company performance in previous studies (Stavrou & Brewster, 2005; Stavrou et al., 2010). Organizational effectiveness is enhanced by training design, according to Khan et al. (2011). It was also found by Thang et al. (2008) that training may result in an increase in sales. Additionally, training increases the productivity of a manufacturing company. According to Ramazani and Jergeas (2015), assessing project management development might help to train and prepare future project managers. Furthermore, Enshassi and Burgess (1990) stressed the importance of training building site managers who interact with Middle Eastern workers. In contrast, Detsimas et al. (2016) hypothesized that workplace training has a significant impact on job growth.

Rui et al. (2015) claim that managers' training programs always affect their staff's performance. Furthermore, a training program could increase worker efficiency and productivity. According to Barker and Ingram (2011), employees' ability to perform directly impacts a company's success and keeps it competitive. There are many factors that influence how well employees perform, including compensation and bonuses, fringe benefits, recognition, working conditions, empowerment, attitudes toward work, communication style, the flexibility of working hours, and job expansion (Manzoor, 2012).

In the construction industry, training is critical for employees to perform their job functions (Tabassi et al., 2012). Construction training is important for employees to learn the specific skills and knowledge required to perform their job functions (Ghodrati et al., 2022; Manzoor, 2012). For example, construction employees need to learn the specific skills and knowledge required to perform their job functions, such as the required equipment and safety measures (Ghodrati et al., 2022).

Managers play an important role in ensuring that employees receive the training they need to perform their job functions (Ozkeser, 2019). Managers are responsible for designing training programs that are appropriate for their employees and for ensuring that employees receive the training they need to perform their job functions (Dos Santos et al., 2018).

Moreover, the management research revealed that the training and development of employees would, in turn, influence the overall organizational performance (Mozael, 2015). Specifically, the research found that when employees are well-trained and up to date on changes in their field, they are more likely to be creative and innovative. They also tend to be less likely to make mistakes, which can lead to improved efficiency and productivity. Overall, these findings suggest that providing employees with adequate training opportunities is an important way to help organizations stay ahead of the curve and improve their performance overall (Anam Amin & Lodhi, 2013; Potnuru & Sahoo, 2016).

Meanwhile, Farooq and Khan (2011) found that efficient training activities improved the quality of completed work and the efficiency of those receiving training, thereby improving production. Training and feedback help improve employee performance by highlighting strengths and weaknesses. Tahir et al. (2014) assert that training can be expensive for the organization, making it imperative to identify employees who lack the skills or knowledge required for training. It is important for management in an organization to identify areas of poor performance or actual skill and knowledge gaps before implementing training programs.

2.9 Related theories

This section presents the underpinning theories that informed the development of research assumptions and conceptual frameworks. As such, two main theories were employed: resource-based view theory (RBV) and technology-organizational-environmental framework (TOE).

2.9.1 Resource-based view theory (RBV)

A resource-based view (RBV) has emerged as one of the most important explanations for enduring firm performance variations. It was only after extensive theoretical development and dissemination in the 1980s and 1990s that basic RBV logic started to have an impact on empirical research in the field. Resource-based thinking also influenced work in non-strategic management disciplines, such as human resource management, marketing, management information systems, and operations research (Barney & Arikan, 2005). RBV is a powerful way to understand how people make decisions and the role of resources—such as money, time, and information—in shaping their decisions. The theory is based on the idea that the availability of resources is central to making decisions (Hoopes et al., 2003). When faced with a decision, people utilize their available resources to produce the best decision. The theory has been applied to a wide range of decision domains and has been shown to be useful for making decisions in domains where they have not been studied before (Coates & McDermott, 2002). Figure 2.1 shows the resource-based view theory framework.

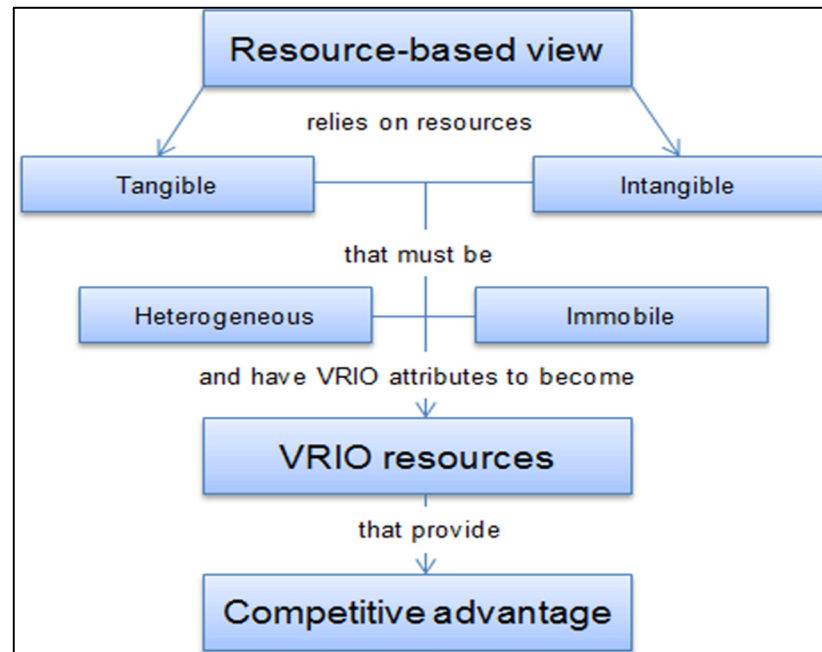


Figure 2. 1 Resource-based view theory framework

It has been widely accepted that the RBV is a key theory in strategic HRM. In strategic management literature (Boon et al., 2018; Wright & McMahan, 1992), the RBV is used to explain how HR systems can be a source of competitive advantage. Since individual HR practices are easily detectable and copied, they cannot provide a source of sustained competitive advantage. However, systems of HR practices can be more difficult for rivals to copy due to their causal ambiguity and social complexity (Becker & Huselid, 1998). In addition to the RBV, strategic HRM academics have used the behavioural perspective (Schuler & Jackson, 1987) to argue that HR systems are designed to encourage acceptable employee behaviour based on the context of the organization. As a result, HR systems enhance corporate performance by developing and preserving priceless human capital assets (Jiang et al., 2012). In addition to the requisite knowledge and abilities, the HR system must also elicit desired employee behaviours because employees have agency over their behaviour (Schuler & Jackson, 1987).

2.9.2 Technology–organization–environment (TOE) framework

To understand the organizational factors that affect a firm's adoption choices, Tornatzky and Fleischer developed the technology-organization-environment (TOE) framework in 1990. In accordance with the TOE paradigm developed by Tornatzky et al. (1990), there are three key contexts that influence how an organization adopts and accepts new technology. In order to increase organizational productivity, the technological environment takes into consideration internal and external technologies (Lippert & Govindarajulu, 2006).

Organizational context is established by identifying the resources that can assist the adoption of the innovation. There are various characteristics of an organization, such as its size, scope, formalization, interconnectedness, and complexity, as well as its human resource capabilities and accessibility. In addition to the industry in which a firm operates, its competitors, access to outside resources, and government relationships, the environment in which it operates influences its performance (Lippert & Govindarajulu, 2006; Tornatzky et al., 1990).

The Technology–Organization–Environment (TOE) framework is a useful way to think about the broader context in which an organization's technology operates. It describes an organization's technology as a set of tools that are used to accomplish a particular goal and how those tools interact with other systems and processes in the organization (Maduku et al., 2016). The framework's starting point is the environment in which technology is used, and it provides a way to think about the full system in which technology operates. The framework can be used to better understand where to focus when working on a particular technology problem, or it can be used to guide a technology project and evaluate its impact on the organization as a whole (Shet et al., 2021). Figure 2.2 shows the TOE adoption theoretical framework.

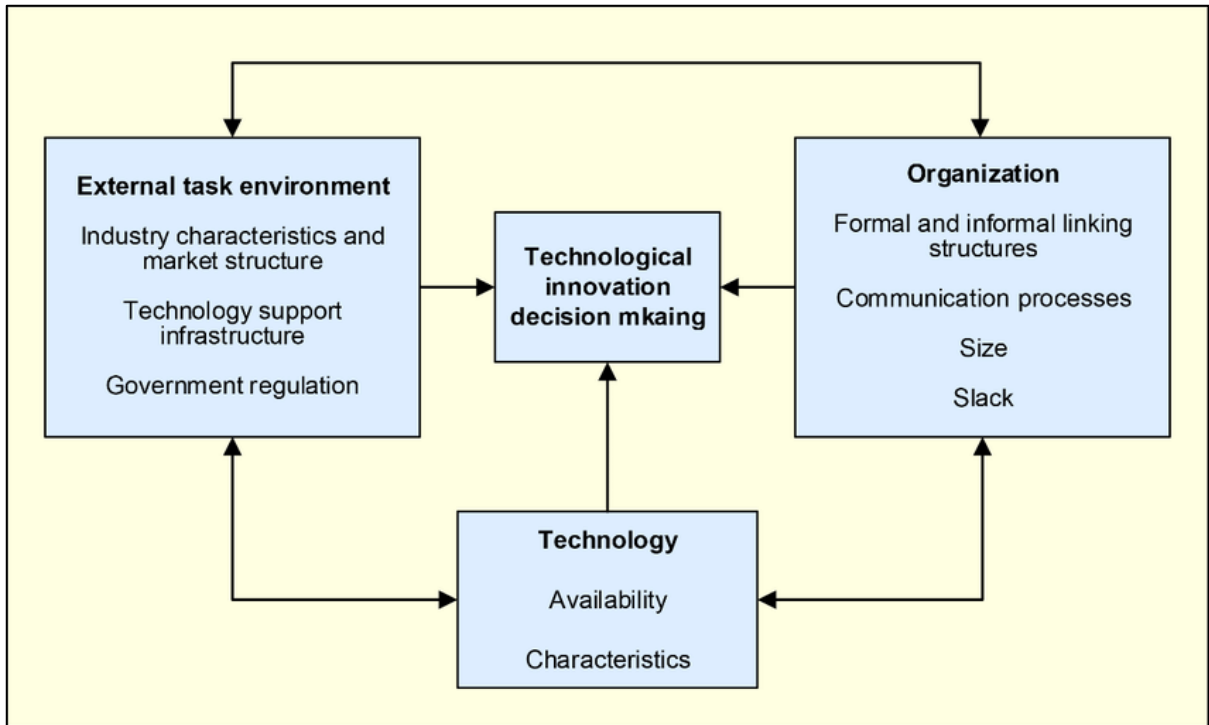


Figure 2. 2 TOE adoption theoretical framework. Tornatzky et al., (1990)

CHAPTER 3

EFFECT OF STRATEGIC DETERMINANTS OF TRAINING AND DEVELOPMENT ON EMPLOYEE PRODUCTIVITY: AN EMPIRICAL STUDY ON THE INFRASTRUCTURE CONTRACTING COMPANIES

Ahmad Abujraiban¹, Gabriel J. Assaf¹

¹Department of Construction Engineering, École de Technologie Supérieure
1100 Notre-Dame Ouest, Montréal, QC H3C, Canada.

Article submitted to *the International Journal of Engineering Business Management*,
October 2022

3.1 Abstract

For training and development T&D to be effective, it must be planned and organized to achieve specific goals that contribute to achieving the goals of the company, and it must be directed to all employees, their categories, and at all administrative levels of the company. Hence, this paper highlights the importance of top management on the strategic dimension of the corporate training function, leading to improved employee performance, productivity, organizational goal achievement, and company competitiveness. A questionnaire was designed and administered to infrastructure construction professionals to assess the potential influence of T&D on employee productivity. Then, the data from (172) surveys were analyzed using Analysis of Moment Structures AOMS to build a practical model on the effect of T&D on the performance of the employee in infrastructure contracting companies. A flexible design was created which investigated the correlation between three independent variables (training process stages, diversity of training programs, and management support) and one dependent variable which presented performance quality of employees. The dimensions of the three independent variables were composed of six items that fairly cover the aspect of each one while the target variable (performance) was made up of 12 items. According to PCA analysis, the management support variable captured 70% of the study's variance. Additionally, with a mean

score of 3.14, training program diversity got the highest overall score. According to analysis, the study sample was divided into three groups: A contained 50% managers/supervisors and 50% employees, B contained 30% managers/supervisors, and C contained 80% employees. The research findings indicated that T&D have substantial impacts on the employee's performance in the aforementioned sector. Therefore, the company must maintain employee career development, so that they can continuously improve the employee's performances and careers. Thus, this paper contributes to the improvement of the organizational and employee performance levels, as well as providing the decision-makers and policymakers with the importance of development and training in the construction sector.

Keywords: *Training; Development; Performance Quality; AOMS; Infrastructure Contracting Companies.*

3.2 Introduction

The theory of human capital developed by Becker (1964) emphasizes the importance of human resources and is one of the most important determinants of economic and social development (Johnson and Bartlett, 2018). According to (Sugianingrat, et. al., 2019), employee performance is a key factor in achieving the organization's goals, and employee satisfaction with their job will lower work turnover. All of these factors have a significant impact on the employee's performance and aid the employee in achieving their individual goals. Training and development contribute to improving the level of employee performance. This changing behavioral phenomenon may frustrate the employee's motivation and enhance his energy and level of participation, removing inefficiency and fatigue. Therefore, training and development contribute to making the employee exert his utmost efforts to achieve organizational goals that raise the general performance of employees (Susomrith, et.al, 2019). Training and development are one of the main reasons for developing and improving the performance and efficiency of employees by providing them with the information and knowledge they lack, developing their abilities and skills, and modifying their attitudes and behavior towards work in order to raise the level of efficiency, improve performance, and increase productivity to the highest level of quality and speed. Therefore, training is of paramount importance as a key element of human resource development (Tu, et.al, 2011).

Swanson and Holton (2001) indicated that training is “a process of systematic development of knowledge and experience related to the work of people for the purpose of improving performance”. Since employees are key factors for the success or failure of the organization, the performance of employees is not a fixed phenomenon, but it rather changes and fluctuates according to external factors (Washington, et.al, 2003). Training and development therefore help employees perform consistently under a variety of conditions, and consistent performance may help increase a trainee's self-efficacy or self-management skills (Saira et.al, 2020).

Albrecht and Marty, 2020 believe that employees must be sufficiently familiar with multiple skills, must be well trained, and that the success of training and development requires attention in planning, implementation, and follow-up because of the importance of training as an essential component in human resource development. The organization must also adopt this approach as a strategic mechanism in which it seeks to motivate employees to achieve predetermined goals. According to (Latham, 2011), it requires the organization to work continuously to improve the performance of its employees to face and overcome competition, as competitiveness depends on the concept of performance that is related to training and development, and when employees receive adequate training and development, this helps to improve their performance in carrying out the tasks assigned to them (Lennick & Kiel, 2007). One of the most important factors for a company's success is human resources, as they carry out the company's activities (Yong et al., 2020). In each unique environmental context, companies must develop and use their human resource potential as much as possible to provide optimal output. Good performance is a manifestation of employee work and is usually used to evaluate members as well as the organization. Thus, companies must improve employee performance (Nasution et al., 2020). Every company or organization must also provide the necessary evaluation tools for employee performance. The results of the evaluation can be used as information for management decisions about the increase in salary/remuneration of employees and the level of performance (Noe and Kodwani, 2018).

This study investigates at how individuals performing in one of Jordan's main industries- the infrastructure contracting industry-perform in relation to training and development as a strategic dimension. The foundation and skeleton of any development is infrastructure. The quality of life and the advancement of humanity are therefore dependent on it, even though it presents a significant barrier to investment and economic growth. This industry is also seen as having the greatest impact on job growth. The building industry is expanding and has a substantial impact on a nation's economy. As a result, the primary goal of this study is to examine the effects of training and development as a strategic factor on employee performance.

Objective of the current study

The goal of the current study is to determine how strategic training and development factors affect employee productivity in Jordan's thriving infrastructure contracting industry. Speaking of Jordan's training and development environment makes sense as well. All employees in this active sector can participate in some training and development programs for public entities thanks to the ministry of public works. One of the most significant industries in Jordan is infrastructure contracting, and it is crucial to teach and rehabilitate individuals if this industry is to continue and succeed (Ahmad et al., 2017). The current study aims to ascertain the impact of training and development in a number of construction corporations operating in Jordan and the factors impacting employee performance, effectiveness, and efficiency in light of the pressing need for training and development. The results of the current study will help identify the factors that influence training and how it affects workers' ability to do their jobs effectively and efficiently in the infrastructure contracting industry. The impact of training and development on the productivity, effectiveness, and efficiency of personnel inside a large infrastructure contracting service company will be examined in one of the most prestigious empirical studies.

3.3 Research Background

According to the skills, abilities, and talents of the workforce, employee training is developed. Relevantly, employee career development aims to improve the conceptual and functional capabilities of employees in accordance with their needs, the situation, and the company.

Companies must meet these requirements when employees deserve them. In addition to that, most developing countries are not rich in natural resources, so their stages of development are rather limited. These countries rely on their human resource wealth, which has motivated them to invest in training employees and rationalizing their use in order to achieve the necessary increases in production and development. Then, based on the solid foundations of training work, they raise society's level of performance in order to achieve these countries' development goals. A special model is needed for developing countries and at the same time, these countries should be characterized by a revolution in the world of technology and information (North et al., 2014).

Additionally, the identification of training needs is the basis of the training process, and their successful identification helps in progressing the training in the right direction. Identification of training needs is an ongoing and evolving process that changes according to the changing economic and social conditions of society and the development plan (Fayyad et al., 2010). Failure to provide effective career development training for employees is also counterproductive for businesses, as the company risks devaluation (lower performance levels) and losing its most valuable asset, i.e., employees. In fact, undervaluing and losing employees has a knock-on effect on the company's productivity and profits. However, Paais and Pattiruhu (2020) pointed out that the determination of employee performance results from the work process planned according to time and place based on the employees and organizations involved in the circumstances. For example, in infrastructure contracting companies that use training and career development systems, employee performance levels are generally about the same as in other companies. The success of the companies is primarily how this outcome is reflected. This study investigated the impact of employee training and development on the

productivity of Jordanian infrastructure contracting firms' employees. Amoy et al. (2019) assert that training is meant to enhance performance in certain occupations for which they are accountable or in positions connected to their jobs. The writers also made a novel distinction between training and development.

Development, in particular, is a progressive learning process used by managers to systematically master abstract and theoretical concepts. Furthermore, Saz-Gil et al. (2020) stated that development necessitates the implementation of all learning and development activities. The author stated that goals should be long-term and assist employees in achieving their personal and organizational objectives. Based on Bashir and Jehanzeb (2013), training and development express the efforts of companies to provide resources for employees to learn and produce high-level, job-relevant skills. Alternatively, some experts use training and development as dual or interchangeable terms (Obisi & Ph, 2011). Training or coaching aims to increase knowledge and skills, change employees' attitudes and behaviors, and increase productivity and company success. On the other hand, development can relate to the needs of employees and organizations in the future.

All organizations evaluate employee performance in formal or informal ways. Some examples of variables in organizational performance evaluation include: (1) organizational work standards, (2) employees' actual performance, (3) employee performance can be defined as a method that involves providing feedback to the employees to eliminate performance deficiencies and motivate them (Paul, et al., 2006). While performance evaluation and its measurement tools are related, they are still different tools. Performance evaluation offers suggestions about what changes to make to increase performance (Pai, et.al, 2014).

Benchmarking is another performance metric that assesses an organization's current state and determines whether or not it has met its objectives. Nonetheless, it is impossible to determine whether the enterprise is successful or unsuccessful based solely on this metric. A detailed performance appraisal, on the other hand, allows one to make an informed decision about whether the enterprise is successful or not (Wiggins, 2011). In addition to that, employee

evaluation is essential to employees as well as organizations. Successful employees want to see the reward for their work. Unfortunately, when employee evaluation is not based on accurate data, the morale and enthusiasm for work decrease.

Training is one of the HR functions, which enhances employees' knowledge, abilities, and attitudes. Scholars affirmed that motivation is another human resource function that embraces employee behaviors, which eventually enhances companies' profitability and productivity (Sweis et al., 2019). Employees are driven to expect a target and a reward to be achieved in the course of action. Therefore, it is vital to understand how to inspire people to reach their objectives (Jatarona, 2018).

Tai (2006) said that workers would have outstanding performance in their work provided they had the necessary abilities and were taught. Companies thus require adequate training to keep the necessary competency in their personnel. Paynes and Schrader (2004), accordingly, mentioned the methodical approach to successful training and evaluation is the first step. Then, the aims are developed, followed by the determination of the approaches and techniques to be used.

Previous research has shown a favorable link between the management of HR and corporate success. For instance, Khan et al. (2011) demonstrated the favorable impact imparted by training design on organizational performance. Moreover, the need for training among building site managers dealing with multicultural employees in the Middle East has been explained by Detsimas et al. (2016) who suggested that training in employment has a substantial influence on employment growth.

Milhem et al. (2014) also demonstrated that training is an important activity in employee education, where the learning process is carried out in the short term to increase knowledge, attitudes, and skills. Improved employee education assists businesses in meeting their objectives and staying competitive. As a result, training is an essential activity for improving

current as well as future employee performance, along with company performance. This finding backs up a previous study that discovered training has an effect on performance.

The validity of training to improve employees' performance can be determined by determining if the training produces a satisfactory investment return, which is an important component of the organization's future growth strategy. Coaches, participants, materials, methods, objectives, and the environment are all training factors that can affect employee performance (Kumari et.al, 2014).

The Strategic Dimension of Training and Development on Employee Performance

Jehanzeb and Bashir (2013) Human resource strategies, including the training strategy, have an important role in changing the practices associated with the functions of human resource management and thus affecting the performance of the organization in general. Especially in the field of achieving competitive advantage, the training strategy must work in a larger framework that includes the strategy at the level of the organization as a whole, which is an initial visualization of the organization's future visions, drawing its policy, defining its long-term goals (Monday et.al, 2015), and indicating strengths and weaknesses, with the aim of making the right strategic decisions. Today, training has become an investment in human capital, as it is considered one of the most important yet basic ways to form suitable human resources in terms of quantity and quality, as it works to provide individuals with information and administrative and technical skills necessary to perform their work efficiently and effectively, and this is thus reflected positively on the work and performance of organizations (Ogbu and Osanaiye, 2017).

Anitha, (2014) basic idea behind the comprehensive and integrated approach to strategic human resource management is coordination between all the resources of the organization, including human resources, to ensure that everything it does will lead to the implementation of its main strategy, and there is no doubt that the integration of all the resources of the organization with each other will eventually lead to the emergence of another supplementary value. None of these resources can be created alone, and this is one of the primary benefits of strategic management for a good training function in an organization.

The environment in which organizations operate is changing rapidly. The internal environmental factors, whether they are human, material, or informational, as well as the external environmental factors, (Li et.al, 2019) whether they are economic, social, technological, or, political, are in constant change, and this matter, thus imposes on organizations the need to adopt clear strategies in order to preserve their competitive advantages. According to Enyioko and Ikoro (2017) Competitiveness, many studies have shown the existence of a relationship between the human resources strategy and the global position of organizations. Also, organizations that use an integrated human resources strategy perform their work and develop better and achieve high-quality levels (Thang, et.al, 2010).

Optimizing and applying the best methods in this field in order to be able to face challenges, rapid changes, and technological development in light of globalization. We conclude from the foregoing that many researchers who dealt with the strategic approach to human resources focused on partnering with this resource in the strategic planning process, as the traditional approach that was confined to the performance of the daily business has begun to become extinct, and in present times, the focus has shifted for many companies that apply global practices (Vinita, 2016). In this field, it is moving towards the existence of a clear strategic plan for human resources and the presence of sub-plans, including the activity and training function, in order to ensure raising the skills of workers in order to perform the various functions of the organization, efficiently (Goswami and Saha, 2021).

3.4 Literature review and hypotheses development

3.4.1 The effect of training on employee performance

Employee performance should improve according to the training courses to which they belong, and training contributes to providing and supporting employees to perform better. Haryono et al. (2020) showed that training and promotion had a positive and significant impact on job motivation. Further training, promotion, and job motivation had a positive and significant impact on job performance but job motivation did not play any significant role in mediating

the effect of training and promotion on job performance. Meanwhile, Kaur et al. (2018) indicated that both training and soft skills had a significant impact on employee performance. Interestingly, interpersonal skills have a relatively greater impact on performance than training. Additionally, Hanaysha (2016) noted that employee training has a significant positive impact on organizational commitment. However, employee training has an impact on performance; the following hypothesis can thus be tested:

H1: Training will be positively related to employee performance.

3.4.2 The impact of career development on employee performance

A career development is a series of positions held by a person during their employment in a corporate environment through education and training. HR management provides career development primarily to improve and increase employee effectiveness so that they can make the best contributions to the company's performance and goals. According to Markos et al. (2010), an organization's efficiency and effectiveness depend on its HR's good and bad development. Thus, the organization's employee career development program is essential for the organization's advancement. This influence is especially significant, given that knowledge and technology are rapidly growing.

Career development is one of the most important factors that influence performance. Ismail and Rishani (2018) demonstrated that career development fully mediated the relationship between performance appraisal satisfaction and creative behavior in light of developments in the business environment and technology. Career development, according to Napitupulu et al. (2017), has a direct positive effect on perceived organizational support, motivation, and emotional commitment. However, career development does not have a direct impact on performance. In addition to that, Jyoti and Sharma's study (2015) revealed that guidance functions significantly affect the career development of call center employees. Moreover, mentoring culture and mentoring structure harmonize the relationship between mentoring functions and career development. However, these findings theoretically suggest that career development may depend on the extent to which an organization can provide perceived organizational support and motivation in enhancing emotional commitment and performance (Monday et.al, 2015). The following hypothesis can be proposed:

H2: Career development will be positively related to employee performance.

3.4.3 The impact of training and development on performance

Whereas an employee's performance is represented by their training and development, practitioners must understand the value of participatory factors in order to compete effectively at the national and global levels through effective implementation of the participatory strategy (Metto and Kimutai, 2017). Additionally, training and development are based on the premise that employees' attitudes, skills, behavior, abilities, and competencies need to be improved in order to achieve the set organizational goals and objectives. Siddiqui and Sahar (2019) found the possibility of practical inclusion for managers and employees alike, as they can increase the level of participation in the company through the process of strategic and tactical communication and through fulfilling the training needs of employees to meet the requirements of current job settings.

Nwaeke and Obiekwe (2017) indicated that the main objective of employee training and development is to develop employees' skills, knowledge, and competencies, which are vital in enhancing organizational effectiveness, productivity, and profitability, as well as in developing some competitive advantage over competitors.

Moreover, Asfaw et al. (2015) found that training and development have a positive relationship with the effectiveness of employee performance. It is desirable that the administrative office maintain the provision of training and development activities for employees and ensure that employees participate in planning, identify the need of skill or skill shortages, and evaluate training and development programs. Accordingly, the following is the hypothesis:

H3: Training and development will be positively related to employee performance.

3.4.4 Conceptual Model

Employee training represents an organization's primary lever for enhancing its human resources. It is regarded as one of the best techniques for boosting worker productivity,

informing new hires of organizational goals, keeping the best workers on board, and managing market and business changes (Bassi & McMurrer, 2008). However, businesses frequently hesitate before allocating funds for their employees' training and development. This predicament is partly brought on by the challenge of determining how this expenditure would affect organizational and financial outcomes (Bassi & McMurrer, 2008). The phenomenon being studied is typically described, explained, predicted, or controlled by an explicit or implicit theory in most research studies. Although a conceptual model is more abstract than a theory and a theory may be derived from a model, the framework is deduced inductively from the theory. Theories are frequently related to conceptual models and frameworks (Burns & Groves, 2001). By integrating theoretical and research concerns about training & development and career development and their relationships with job performance, effectiveness, and efficiency in the construction organization, the current study examined a model (Figure 3.1) that was derived from a survey of the literature.

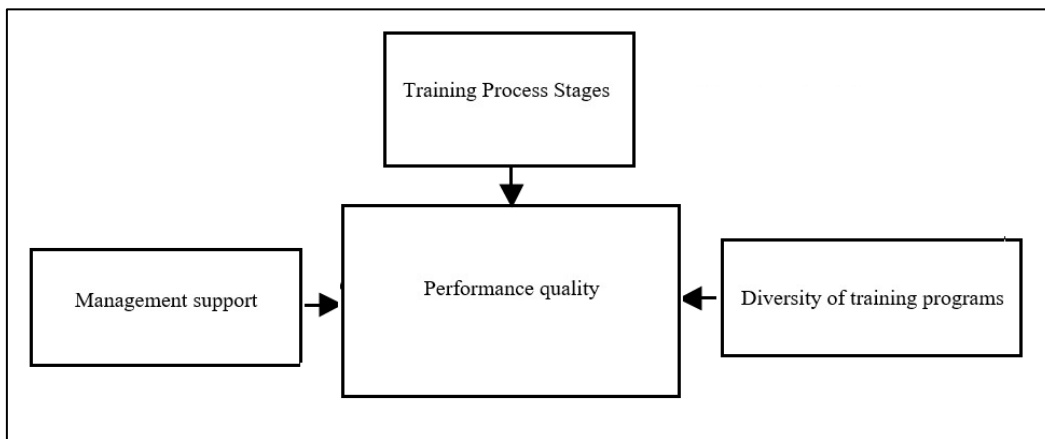


Figure 3. 1 Hypothesized model of the current study

The study also made the assumption that the factors under investigation—such as the stages of the training process, management support, and the variety of training programs—are interconnected and capable of supporting performance quality, effectiveness, and efficiency in the organization either singly or collectively.

3.5 Methodology

3.5.1 Participants

According to Suárez et al. (2017), a quantitative research method is one that describes in detail the issues that need to be solved and for which a hypothesis is made by the conclusions from the data processing results made by the researchers. This research method is a quantitative descriptive research method. The participants in this study were HR representatives from Jordanian infrastructure contracting companies. According to Yang et al., the sampling strategy utilized in this study was accidental sampling (2021). The Slovin formula was used to collect samples for this sampling technique. The sample consisted of 172 employees in the construction services sector who worked for numerous construction services companies in Jordan, and what was taken thus reflected the HR in the field of construction services.

Demographic factors including gender and age were recorded as control variables in the study. The study's core participants primarily came from managerial positions in numerous Amman-based construction enterprises (Jordan). They were the only ones who needed to be targeted because they were anticipated to give a thorough response regarding the strategic significance of training and development in the company. Additionally, there were many managerial staff at the company headquarters, thus the research purposefully selected more managers than non-managers as participants in order to obtain the broadest representation. 61% of them were in mid-management, 27% were on the front lines, and 12% were from upper management. 72% of the 172 participants were men, while 21% were women.

Furthermore, the results found that education levels were the highest for bachelor's degree holders and the lowest for diploma holders. In addition, the majority of respondents were employees while the smallest fraction of respondents were unit heads. In terms of work experience, results show that most respondents had been working for less than 5 years, while 27.9% had 6 – 10 years of work experience, and the lowest percentage was among those working between 10 and 15 years.

The analysis was also performed on the second moderator variable, which is competitiveness, and the obtained values ranged between 0.819 and 0.854 for the study tool. Further, the result of the implementation of training policy score was 0.842.

For Cronbach's Alpha results: stages of training process scored 0.854, the quality of training programs scored 0.827, and the performance quality scored 0.819. As shown, the values were all higher than 0.60, which means that there is internal consistency between the questionnaire items (Zikmund, 2013).

3.5.2 Sampling

The respondents were managers working for various construction firms in Amman, Jordan, and there were 172 people in total. To collect data, a mail survey was carried out between December 2019 and February 2020. The company's identity would not be revealed for ethical concerns, as was promised. The surveys were initially distributed to 100 managers, and the responders were chosen at random. Regarding the mailing of the surveys, 50 were returned due to incomplete addresses or respondents who had relocated to unidentified areas. From the original 172 surveys sent out, 172 were undeliverable. Of the remaining 98 surveys, 54 responses were received, and 43 of those were determined to be complete. 50% was the actual response rate, which was deemed satisfactory. Each participant received a letter from the researcher outlining the context of the study, which was attached to the questionnaire. The responders' identities and contact details weren't inquired about. Following ethical approval, the questionnaires were mailed to all employees. Employees received assurances regarding the privacy of their answers.

3.5.3 Measurement

Figure 3.1 shows the instrument's three independent and one dependent variables. There were a total of four variables, each with its own set of items, totaling 30 questions. Six items made

up the dimension for management support, training process stage, and diversity of training programs. The employee's performance dimensions had a total of 12 items. A thorough examination of the literature was done to verify the reliability of the self-administered structured questionnaire. According to Stevens (1996), there must be about 20 respondents for each variable in order to frame an instrument and subsequently collect data in a quantitative study. This also supports the statistical power of the study. The study's effective sample size was 43, with 3 independent factors and 1 dependent variable, each with 6 items, to determine the degree to which these items explained the dependent variables. As a result, the instrument is justifiable. Job performance was the dependent variable, and management support, the stage of the training process, and the diversity of training programs were the independent variables. The 5-point Likert scale, which ranges from extremely high to very low, was utilized for all items. Each construct's items were direct, easy-to-understand, and short sentences. The extent to which each participant agreed with each question was indicated by a check mark next to it (scale was provided at the beginning of the questionnaire). Additionally, the questionnaire was distributed to six subject-matter experts in order to confirm the accuracy and dependability of the data. SPSS for Windows 11.5 was used to examine the data that was obtained. Cronbach's alpha value was calculated to gauge the items' reliability. Factor analysis was carried using principal component analysis PCA to get the highest alpha value. The analysis of Pearson correlations and linear regression were applied to test the hypothesis.

3.5.4 Collinearity Test

Collinearity is a condition in which some independent variables are highly correlated. In fact, the total number of items making the independent variables was 18 and hence checking collinearity among variables is necessary for better results. In order to determine the presence of a collinearity problem in the relationship between the independent variables, the Variance Inflation Factor (VIF) was calculated. The VIF statistically quantifies the severity of multicollinearity in an ordinary least squares regression analysis. The VIF shows how much the variance of an estimated regression coefficient increases because of collinearity. For training and development, the VIF values are less than five and range between 4.49 and 7.28.

According to Kaiser (1981), the VIF value = (1/Tolerance) must be less than 10. In particular, the implementation of training policy scored 4.49, stages of training process scored 7.28, and the quality of training programs scored 6.23. These findings do not indicate a strong relationship between training and development, and there is no collinearity problem in these variables.

3.6 Results

3.6.1 Factor Analysis

Factor analysis by principal component analysis and other statistical parameters are presented in Table 3.1. Moreover, the clustering of workers based on their answers on the questionnaire are provided in Figure 3.2.

Table 3. 1 Eigen values, mean, SD and total variance of the items described in the study

Variables	Eigen values	variance %	Mean	SD	Management support	Training Process Stages	Diversity of training programs	Performance quality
Management support	17.5	69.4	2.93	1.12	1.0			
Training Process Stages	0.13	7.3	3.04	1.29	0.87	1.0		
Diversity of training programs	0.09	4.3	3.14	1.31	0.85	0.91	1.0	
Performance quality	0.06	2.1	2.82	1.16	0.78	0.82	0.81	1.0

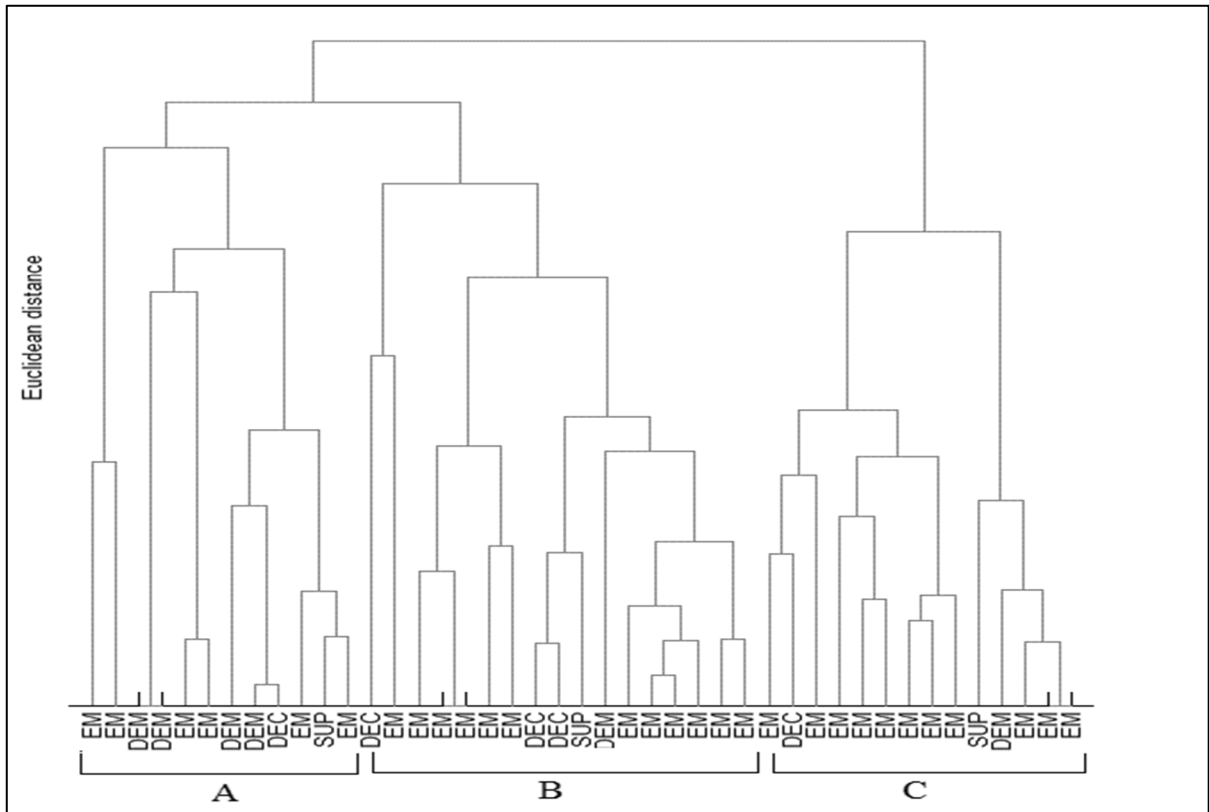


Figure 3. 2 Generated dendrogram of all workers underwent the study.

EM Employee, DEM Department manager, DEC Department Chief,
SUP Supervisor

3.6.2 Hypothesis Verification

This paper's results section analyzes the relationships between the variables and the tested hypotheses, which requires specific statistical techniques. However, the means and standard deviations of the sample's estimates regarding the dimension variable "implementation of training policy" ranged between 2.74 and 3.28, with a mid-range evaluation score, and item 6 came first, which represents "The administration allocates a special budget for training its employees at all levels of administration." This variable had a mean of 3.28, with a middle degree. Item 2 ranked last, representing "Top management in the company is interested in training strategies while designing the training plan for its employees." It had a mean of 2.74 with a middle degree, and the dimension as a whole had a mean of 2.93 with a mid-range evaluation score.

In addition, the means and standard deviations of the sample's estimates about the items of the dimension "Stages of training process" ranged between 2.88 and 3.21, with a high evaluation score. Furthermore, item 2 came first, representing the idea that "Training programs are designed based on clear and written objectives," with a mean of 3.21 and a middle degree. Item 3 ranked last, which states that "Trainees are selected based on prior identification of the skills and knowledge necessary to practice their jobs," with a mean of 2.88 and a middle degree. Overall, the mean of the dimension as a whole is 3.04, with a mid-range evaluation score.

The means and standard deviations of the sample's estimates about the items of the dimension "quality of training programs" ranged between 2.98 and 3.23, with a middle evaluation score. Additionally, item 2 came first, which states that "The company provides various training programs throughout the year," with a mean of 3.23 and a middle degree. Item 5 ranked last, which states that "The company is interested in using technology in training programs," with a mean of 2.98 and a middle degree. Ultimately, the mean of the dimension as a whole is 3.14, with a mid-range evaluation score.

The means and standard deviations of the sample's estimates regarding the variables of the "Performance quality" dimension ranged between 2.91 and 2.65, with a high evaluation score. Item 6, specifically, came first, which states that "The company's HR can be minor," with a mean of 2.91 and a middle degree. Item 9 ranked last, which states that "HR in the company are committed to abiding by regulations, instructions and work ethics." It has a mean of 2.65 and a middle degree. Finally, the mean of the dimension as a whole is 2.82, with a mid-range evaluation score.



Figure 3. 3 Ratings for the training and development components and the employee's performance of Jordanian infrastructure contracting companies

3.6.3 Hypothesis Testing

H0_1: Is there a relationship between infrastructure contracting companies' training policy implementation and the employee's performances?

To determine the relationship between infrastructure contracting companies' training policy implementation and the performance quality, a regression model was run. Table 3.2 shows that the values of the correlation coefficient (R) is 0.779^a, while the determination coefficient (R²) is 0.606. These results demonstrate a positive relationship between implementing the training policy dimensions and performance quality. Conversely, the value of Beta (the slope parameter in the regression model) for training policy implementation is 0.809. Furthermore, the value of t-calculated is 16.185, which is larger than t-tabulated at 1.65 with a significance level or p-value of 0.05.

Table 3. 2 Effect of Implementation of training policy and the employee's performance

Dimension	R	R ²	B	B	T	Sig
Implementation of training policy	.779 ^a	0.606	0.809	0.779	16.185	0.000

Accordingly, the study supports the first hypothesis, which states that there is a relationship between infrastructure contracting companies' training policy implementation and the employee's performances.

H0_2: Is there a relationship between training process stages and performance quality?

To answer H0_2, another regression model was run. Table 3.3 shows that the correlation coefficient (R) value is 0.825, and the determination coefficient (R^2) is 0.680. These results indicate a positive relationship between stages of training process and performance quality. The value of Beta for training process stages is 0.743 regarding performance quality. The values of t-calculated is 19.023, which is larger than t-tabulated (1.65) at a significance level of 0.05.

Table 3. 3 Effects of training process stages and the employee's performance

Dimension	R	R^2	B	B	T	Sig
Stages of training process	.825 ^a	0.680	0.743	0.825	19.023	0.000

Accordingly, the study supports the second hypothesis, which states that there is a relationship between training process stages and performance quality

H0_3: Is there a relationship between the quality of (1) training programs and (2) the employee's performances of Jordanian infrastructure contracting companies?

To address H0_3, another regression model was run, and the results are presented in Table 3.4. This table shows that the correlation coefficient (R) value is 0.812^a, and the determination coefficient (R^2) is 0.660. These results indicate a positive relationship between the quality of training programs and employee performance. Conversely, the Beta value for training programs' quality is 0.717. For these three dimensions, the value of t-calculated is 18.153, which is larger than t-tabulated (1.65) at a significance level of 0.05.

Table 3. 4 Effect of training programs on performance quality

Dimension	R	R^2	B	B	T	Sig
Quality of training programs	.812 ^a	0.660	0.717	0.812	18.153	0.000

Accordingly, the study supports the third hypothesis, which states that there is a relationship between the quality of (1) training programs and (2) the employee's performances of Jordanian infrastructure contracting companies.

Table 3.5, on the other hand, presents the factor loadings for the model's latent and constituent variables. Factor loadings (FL) for each factor show that the variables well-represent all factors. Slight differences were observed for the two factors' variables depending on their placements on factors. For instance, the company's HR can complete the work with a high

level of accuracy and quality (FL: 0.925), as it had a stronger association with employee's performances. A similar evaluation criterion was applied for both factors, and the conclusion is that the variables for each factor were all found to be valid indicators. Nonetheless, they have slightly different placements on their representing factors. Thus, the components selected for each construct were valid indicators, and best describe their construct. This finding shows that this is a solid model with valid indicators.

Table 3. 5 The model's latent and constituent variables

No	Model variables	Fac. load	Cronach's Alpha
F1	Implementation of training policy		0.842
Item1	Senior management in the company is fully convinced to adopt positive ideas for training strategies	0.831	
Item2	Top management in the company is interested in training strategies while designing the training plan for its employees	0.834	
Item3	Implementing training strategies is among top management's priorities in the company	0.824	
Item4	Top management in the company seeks to find new methods for improved training strategies	0.847	
Item5	Senior management trains the company's employees at specialized training agencies	0.758	
Item6	The administration allocates a special budget for training its employees at all levels of administration	0.772	
F2	Stages of training process		0.854
Item7	The training needs of the employees are determined through periodic performance evaluation	0.880	
Item8	Training programs are designed based on clear and written objectives	0.903	
Item9	Trainees are selected based on prior identification of the skills and knowledge necessary to practice their jobs	0.859	
Item10	Competent trainees with appropriate qualifications are selected to cover training programs	0.880	

Item11	The method of evaluating the effectiveness of the training session is used after the end of the training	0.83 9	
Item12	The selection is made, training is done with great care and with previous experience	0.91 9	
F3	Quality of training programs		0.827
Item13	The company plans training programs in advance	0.89 3	
Item14	The company provides various training programs throughout the year	0.83 2	
Item15	The company has programs that help raise the quality of training provided to HR	0.92 2	
Item16	The company provides HR with a set of training programs that contribute to improving and developing employees' skills and capabilities	0.92 1	
Item17	The company is interested in the diversity of training methods provided to HR	0.87 4	
Item18	The company is interested in using technology in training programs	0.89 3	
F4	Performance quality		0.819
Item19	The company's HR possesses the knowledge and skills necessary to get the job done	0.84 6	
Item20	The company's HR has good communication skills with superiors and subordinates	0.84 9	
Item21	The company's HR is sufficiently prepared to take responsibility	0.86 5	
Item22	The company's HR can get the work done on time	0.87 0	
Item23	The company's HR can complete the work with a high level of accuracy and quality	0.92 5	
Item24	HR can simply work in the company without complicating the procedures	0.90 3	
Item25	The company's HR can solve work problems and withstand work pressures	0.88 0	
Item26	The company uses an incentive system to encourage employee to improve HR performance	0.75 5	
Item27	The company's HR are committed to abiding by the company's regulations, instructions, and ethics	0.90 8	
Item28	Standards for evaluating performance are adjusted according to the performance quality	0.88 9	

Item29	HR are committed to applying the company's approved quality standards	0.915	
Item30	The company applies the highest quality standards in its program implementation	0.890	
Overall			0.881

Table 3.6 shows the indicators of overall alignment with the scale of eco-management. The values of GFI and AGFI indexes were 0.905 and 0.767, respectively. The comparative alignment indicator values were 0.788 for the NFI index, 0.864 for the TLI index, and 0.979 for the CFI index. These values are close to the value of the correct one. Likewise, the RMSEA value is 0.069, which is close to zero.

Table 3. 6 Indicators of perfect fit to training and development on employee's performances (CFA)

Index	Default model	Independent Model
RMSEA	0.069	0.189
χ^2	781.334	3689.067
DF	388	435
χ^2 /DF	2.014	8.481
GFI	0.905	0.323
AGFI	0.767	0.169
NFI	0.788	0.000
TLI	0.864	0.000
CFI	0.979	0.000

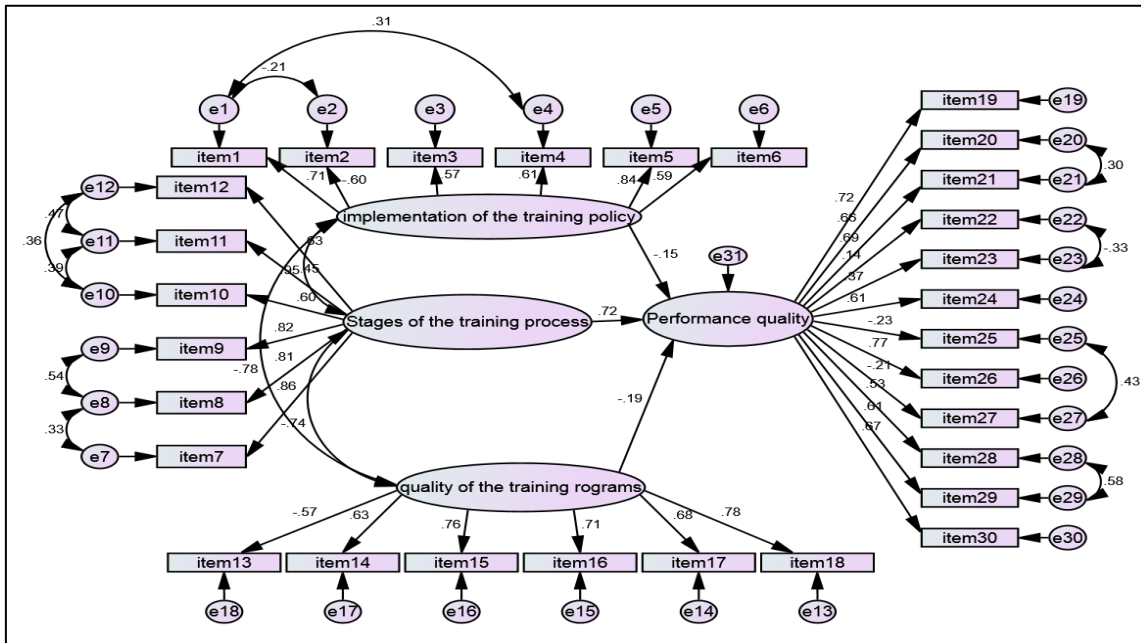


Figure 3. 4 Structural model (CFA)

Figure 3.4 shows a confirmatory analysis of training and development on performance quality. The results show the compliance quality and the validity of the paragraphs of the training and development scale.

3.7 Research contributions and implication

The importance of this study emanates from its focus on the impact of training and development on improving the employee's performances of Jordanian infrastructure contracting firms. This data can be used in comparative studies with other companies, and the study opens up new avenues for future research, contributing to the enrichment of university libraries. Furthermore, by examining the relationship between the study's variables, it is discovered that this study works to clarify the impact of training and development on improving the quality of performance of infrastructure contracting companies. In addition to that, knowing the strategies used during the pandemic and their effectiveness, and by comparing them with employee satisfaction, job performance, and company performance, give companies a scope to invent new ideas to face crises.

3.8 Discussion

As summarized in Table 3.1, the component analysis identified four variables with Eigen values, percentages of variance, means, and levels of correlation. Only one of these, the management support variable, had an Eigen value that was bigger than 1. About 70% of the variance explained in the study was captured by this variable. In order to get higher alpha ($>.7$) values, inconsistent items with low factor coefficient values were eliminated using factor analysis. Alpha values greater than 0.7 are generally acceptable for further analysis. Table 3.1 also shows the descriptive statistics, reliability ratings, and coefficient values for each variable. By evenly weighing the mean scores of each item, the mean scores were determined. The study discovered that 3.14 was the highest mean score for training program diversity. This suggests that a variety of training programs may be essential for increasing staff productivity and effectiveness inside a firm. Performance quality had an average rating of 2.82. This suggested that improving individual performance required job analysis. The analyzed variables' mean scores were greater than 2.5, indicating their significance in helping infrastructure contracting companies see training as a wise investment. According to Table 3.1, the highest correlation between variables was 0.91 and between the variety of training programs and the stages of the training process.

The reported dendrogram (Fig 3.2) indicated that the 43 employees can be grouped into three clusters. Group A contains 6 employees, 4 Department manager, 1 supervisor, 1 Department Chief. Group B contains 12 employees, 1 Department manager, 1 supervisor, 3 Department Chief. Group C contains 11 employees, 1 Department manager, 1 supervisor, 1 Department Chief. It is logical that four groups should be generated, as four types of employees were in the study, as mentioned previously. But having three groups indicates that a number of managers, chiefs and supervisors have been integrated with the employees. Let's start with group B, which included 16 participants, or 37% of the total participants. It was expected that the percentage of employees in group B is high, as they making high input in the study, while the percentage of managers has reached 25%. Based on the collected data, the most employees gathered in group B have a long work experience (more 16 years) and this would explain their separation with other managers or supervisors. Another interesting point regarding group A is the large percentage of managers which reached to 50%. This may be attributed to their overlapped

background on their experience in this sector. Finally, what distinguishes group C was the presence of the highest percentage of employees, at approximately 80%, and this is, of course, due to the closeness of their work experience.

The main motive of this study is to determine the impact of the strategic dimension of training and development on the employees' performance in infrastructure contracting companies sector through three dimensions of training and development policies, stages of the training process, and training programs. Based on the analysis results of the impacts of training and development on improving Jordanian infrastructure contracting companies' performance: positive relationships were found between the implementation of training policy dimensions and the employee's performances for training policy application (0.186), training process stages (0.355), and training program quality (0.266) on employee's performances. The results also indicated a positive impact on training and development and performance. Moreover, the results show that training and development have a positive influence on performance quality. This finding is consistent with Sweis et al. (2016) who found that organizational performance improves after discovering the practices of quality management. The practices of quality management include applying training policy and training program follow ups that affect employees' performances.

The findings indicate that companies should provide training programs for employees to improve their knowledge, abilities, and skills, ultimately increasing their performance. Having this training will enhance employee performance and support the company's success. With an adequate training program, employees will increasingly understand and master their profession. In addition, it can create benefits for the employees and increase company profits.

The results indicate that career development has a marginally significant effect on employee performance. Having a career development program in place thus improves employee performance and allows some employees to advance up the career ladder. To improve future employee performance, the company must consider and improve this career development factor. Moreover, Erari et al. (2014) showed that career development has a positive effect on

employee performance. Finally, Manggis et al. (2018), Napitupulu et al. (2017), and McDowall & Saunders (2010) showed that career development impacts employee performance.

This paper focuses on the strategic dimension of corporate training function and training and development. This is because training is a long-term investment for the most important company resources (HR) by developing employee skills and knowledge. The findings demonstrate that employee training improves employees' performance and productivity, increasing the company's ability to meet its goals and be competitive. Furthermore, this paper contributes to Jordanian business enterprises in general by providing the results, showing what factors apply to them, and which should be applied. For instance, adopting a training strategy is a major step in defining the future vision of HR management. Thus, it contributes to improving the performance levels of the organization as well as of employees and contributing to achieving a competitive advantage for these organizations.

3.9 Conclusions

The paper investigates the impact of training and development in improving the employee's performances of infrastructure contracting companies in Jordan. The findings indicate that partial training does not have a significant effect on performance. Conversely, partial career development significantly affects performance.

PCA analysis indicated 70% variance explained in the study was captured by management support variable. Moreover, training program diversity had the highest mean score with a value of 3.14. Analysis indicated that the study samples was classified into three groups: A which contained 50% employees and 50% managers/supervisors, B 30% managers/ supervisors while C was rich with employees 80%.

This relationship exists partly because competency, training, and career development simultaneously affect employee performance. Training and development also play a major role in improving the quality of Jordanian infrastructure contracting companies. However, the researcher recommends that companies pay attention to training activities and select trainers

who are masters in their fields. Companies must determine whether these training activities increase employee knowledge and capabilities, since efficiency is a determining factor in improving performance.

Companies should increase employee efficiency as this will help companies to make corrections to the programs and job descriptions. Moreover, through career development, the company provides employees with the means to improve their performance, along with improving the company's performance. Therefore, the company must still maintain employee career development so that these employees can continuously improve the employee's performance and careers.

3.10 Theoretical and practical implications

Training and development is the most successful way to motivate human resources and retain business. Training has been identified as an important and resolute element through the practices that emerged in the research on the high-performance work system. The results of the study showed the impact of the strategic dimension of training and development on the performance of workers in infrastructure contracting companies. The study presented the theoretical literature related to employee performance in the contracting sector by evaluating the importance of the different dimensions of training and development examined in the study. Jordanian contracting companies spend a lot of money investing in human capital through training and developing its capabilities. The results of the study will be of great benefit to them when designing their appropriate training programs to raise the performance of employees. Better training and development contributes to organizational growth, increased profitability, and company sustainability. Also, a company that attaches great importance to training and development as a strategic dimension for improving employee skills will have the highest competitive advantage among its competitors.

3.11 Limitations and future research directions

The current study has multiple limitations. First: For the links discovered between the different dimensions of training and development, it was important to determine whether they were causal links or not. Second: Individual differences must be taken into account in future studies while evaluating employee performance. Third: The selected sample was relatively small, so researchers in the future must adopt a larger sample in order to obtain more comprehensive and better results. Fourth: The participants in the study work in infrastructure contracting companies, so it is difficult to generalize the results of this study to other sectors. Therefore, future researchers must collect data from several sectors and organizations. Finally, the study used the survey method, as a result, researchers in the future should use the qualitative method to understand the dimensions that were used more deeply.

CHAPTER 4

EFFECT OF STRATEGIC PLANNING OF HUMAN RESOURCES IN MANAGEMENT PERFORMANCE

Ahmad Abujraiban¹, Gabriel J. Assaf¹

¹Department of Construction Engineering, École de Technologie Supérieure
1100 Notre-Dame Ouest, Montréal, QC H3C, Canada.

Article Published in *Civil Engineering Journal*, August 2022

4.1 Abstract

Strategic planning is an important stage in the administrative process, as it is considered a specific thinking process and style of work that enables the company to choose the best alternatives that correspond to the company's capabilities and the goals it seeks to achieve. This study aimed to find out the impact of strategic planning for human resources with its dimensions (environmental variables, needs assessment, dealing with results, human resources plan), on the performance of project management with its dimensions (time, cost, safety, quality), and to determine the strategic interaction between (HRP) On the performance of project management in infrastructure contracting companies, and its role in facing the company to external challenges. The study used the descriptive approach through which the researcher developed a scale to answer the questions of the study. The study sample consisted of (120) employees in infrastructure contracting companies, they were divided into non-overlapping groups. The results showed the impact of strategic planning for human resources on the performance of the construction project management, and its contribution to raising the level of readiness of construction companies in facing external challenges and enabling them to compete with international companies, in addition to the contribution of strategic planning in facing the negative effects resulting from the Corona pandemic. The results are according to the company's age, capital, and the size of the company's project. The results of the study also

showed that strategic human resource planning helps project management officials in the early detection of expected danger areas and attract well-equipped workers with the appropriate skills to work efficiently.

Keywords: *Strategic Planning, Human Resources, Construction Project, Management Performance, Infrastructure Contracting Companies, and AMOS.*

4.2 Introduction

The construction industry is one of the main pillars of the economy, which includes all the activities of building major infrastructure and real estate, along with repairing and modifying any existing projects. It also includes various corporate stakeholders, such as real estate developers, professionals, contractors, and government officials (AbdElaal et al., 2022). Moreover, infrastructure is the backbone and lifeblood of all activities of economic, social, and political life in civilized societies. This was confirmed by many studies, which indicated the positive impact of the availability of infrastructure services, due to their importance in achieving sustainable development (Aryanto et al., 2015). It contributes to an increase in the GDP, which is reflected in the standard of living conditions in the country (Bonifaci et al., 2016). Considering the uncertainty surrounding the organization at present, it has become necessary for it to estimate its future needs of human resources (HR) with different skills, competencies, and specializations to choose the best ways to provide these needs based on the strategic planning of human resources. This planning process mainly focuses on forecasting using scientific quantity methods of *was* or *how*. The main objective of strategic planning for human resources at the enterprise level is to obtain suitable HR in the right place and at the right time to achieve performance efficiency. The institution is towards the future, but rather its intellectual energy and the motivation of its members (Dhamdhere, 2015). Additionally, strategic human resource planning (HRP) depends on identifying external opportunities and threats in the environment, and the internal strengths and weaknesses of the organization that may lead to abundance or scarcity in the future (Waring, 2016). Therefore, organizations are becoming increasingly aware that the success of the strategic planning process is largely tied

to the extent to which people working in human resource management participate in the process, especially those responsible for managing construction projects (Lim et al., 2017).

Strategic planning is an important stage in the performance of organizations, as it represents a method of thinking and a comparison between methods and methods of work to choose the best alternatives that are suitable with the available capabilities on the one hand, and the nature of the desired goals to be achieved on the other hand. It will be the future conditions, and the readiness to develop plans and programs that ensure the achievement of goals under the expected conditions and competition in performance between organizations (Dani.; et.al, 2022). Strategic management in our time has become the focus of contemporary management that depends on external and internal environmental factors that affect organizations and the efficiency of their performance. (Oludele, 2021).

The construction industry is a basic industry that affects every aspect of life. The construction sector is considered one of the most important economic sectors in terms of fixed capital formation, national production and the size of its workers (Garengo, et., al 2021). This sector constitutes an essential axis of development because of its important role in advancing growth, creating more job opportunities, and stimulating economic activity in many industries and other related activities. Studies indicate that more than a hundred industries and activities are related to this sector, some of which are related to the pre-construction phase, others are related to the construction phase, and some are related to the post-construction phase (Biondi, 2022).

The construction sector contributes to the movement of the national economy of any country because if the construction work is not the main element in the work of any project, it will be part of its business in one way or another, represented in the infrastructure and structural work of all sectors of transport, energy, communications, housing, education, and, health. Therefore, strategic human resource planning is imperative in organizations to determine human resource needs (Nurudeen, 2022). It is also necessary in case of an internal reorganization of the company, as this can burden the organization with the increase of specific specializations or when new types of competencies and skills are used. This does not mean at all that it is not

necessary to carry out the strategic planning process in the case of stable or modern enterprises, where the deficit or surplus of human resources must be forecast (Hadden et al., 2022).

Therefore, strategic planning has become one of the most important modern concepts in contemporary management to achieve efficiency in performance, and to determine the current and future capacity of the organization in a world characterized by change and intertwining, which requires effective use of strategic planning, especially the infrastructure construction sector, due to the specificity of this sector, since infrastructure projects are implemented through tenders. Which may be international at times, and allow well-known international contracting companies to enter into local bids, which increases competition between local and international companies, and increases the burden on local companies, in addition to the great difference in capabilities between international companies and local companies in all respects (human , technology), and the extent of their reliance on strategic planning as a scientific method to achieve goals by exploiting opportunities with the highest levels of efficiency and effectiveness while avoiding risks and obstacles through developing a specific strategy to adapt to it, and put in place mechanisms capable of using the available resources in light of the various risks that companies are exposed to, especially during the spread of the COVID-19 and the consequent increase in the prices of materials, goods, and shipping costs, in addition to tightening the precautionary inspection procedures to combat the spread of the virus.

From this point of view, we focused in this research on the importance of strategic planning for human resources as a function of human resources management in improving performance and raising the level of readiness of local companies, as the human resources department assesses the needs of the company based on the volume of work to be accomplished, and the need to determine future work requirements in each Department within the company, in order to achieve a high level of performance. The study also aims to find out whether there is an impact of the dimensions of strategic planning for human resources on the performance of project management in its dimensions based on specific demographic variables (company age - company capital - project size).

4.3 Literature Review

Despite the literature's largely positive assessment of the phrase, enterprise resource planning, the controversy over its definition remains. An enterprise resource planning system (ERP) is a piece of software that provides a comprehensive view of all business operations in a company and acts as a link between them. This software will likely be derived from the company's database and will serve as an interface for all units (Baporikar, 2022). Additionally, enterprise resource planning systems ensure that information retrieved from company data is stored on a common platform and is sent in the right way and right place (Papke-Shields & Boyer-Wright, 2017). An Enterprise resource planning system has a centralized structure that revolves around routing, storing, collecting, and updating business information (Lengnick-Hall & Lengnick-Hall, 2006). Nowadays, companies prefer to strengthen managerial decision-making capabilities by reducing managerial levels as well as the number of employees, rather than hiring more people (Aiyetan & Das, 2022). Therefore, there is a need for a human resources information system that allows employees to access and use their information in a short amount of time to perform HR operations more functionally. These systems free HR managers and allow them to guide their employees in line with strategic goals.

4.3.1 Strategic planning of human resources

There is a practical view of strategic management as well, as it aims to manage innovation and creativity to improve efficiency and effectiveness. In this area, strategic planning is a form of knowledge management in a project or institution and its effective use (Dhamdhere, 2015).

4.3.2 Human Resources Planning

The evaluations of the individuals in the database, as well as proposals for promotion and training, must be used in the HRP process. It's used to make judgments like which staff will be promoted to higher positions, what type of training the person should receive when promoted to a higher position, and what external resources should be employed if the person is unable to

advance to a higher level (Ehie & Madsen, 2005). During the planning phase, quick access to personnel information in the system will guarantee that the HRP process is done efficiently (Cooke et al., 2020).

4.3.3 Finding and Selecting Personnel

Human resources information systems also guide HR managers during the process of identification and selection of HR, in which both internal and external resources are used. As part of job analysis, the system compares job requirements and vacant seats with candidates within the company to determine which resources must be used to cover the personnel requirements. If internal resources are insufficient to meet personnel needs, a pool of candidates is created in the system, and the applicant's eligibility is evaluated. The system compares job requirements and vacant seats with candidates within the company as part of a job analysis to determine which resources must be used to cover the personnel requirements (Bratton et al., 2021). The information obtained from the system is used to identify the right personnel for that position. Therefore, placing the right people in the right places in the company can increase the effectiveness of the organization (Veysel & Mentese, 2013).

4.3.4 Training and Development

Human resource managers focus on the individual training history of employees by tracking the training and trainees' performance in the system. This will determine the type of training needed by different employees and train the employees accordingly. (Zheng & Ma, 2021).

4.3.5 Performance Management

Also, with the development of information technology, it has become easier to establish processes of personnel performance appraisals, training, selection, defining the qualifications, and job requirements that an employee must have for each position in the system, and how many employees meet the job requirements are determined during the period (Walker, 1982).

The data obtained as a result of performance management assists in the implementation of HRM activities such as identification of training needs, personal career planning, personnel backup application, new job analysis arrangements, and productivity improvement through employee feedback (Bayindir & Şahin, 2007).

4.3.6 Compensation Management

The system evaluates possible alternative wages using appropriate statistical programs, develops wage plans, determines wage costs from collective bargaining agreements, and prepares budgets for each department (Awang, 2015). In addition to these, information from other HR features can be used to perform job classifications, display salary types, and determine rates for all departments. Thanks to this system, more accurate wage policies are to be determined through relevant job titles and time-based internal wage surveys (Majumder et al., 2021).

4.3.7 Career Management

A human resource information system includes self-assessment of employees' skills, knowledge, and interests, with the inclusion of employee development and assistance in decision-making about their career goals. By organizing job and employee assessment tests within the system, these results can be used to determine employment potential and capacity development (Bonifaci et al., 2016; Bratton et al., 2021). The system creates a list of actions and reduces the amount of time spent on these lists. (Walker, 1982).

4.3.8 Project Management Experience

While some consider project management to have started with the construction of the Pyramids and the Great Wall of China, many agree that the modern notion of project management originated with the Manhattan Project, in which the United States military created the atomic bomb. The modern project management technology arose from the development of business

principles developed by the increasingly complicated nature of businesses towards the end of the nineteenth century. Large-scale government projects were a driving force in the development of project management technology, notably during the mentioned times. When Frederick Taylor discovered that management methods could be scientifically analyzed and developed at the beginning of the 20th century, a new page was added to Understanding Management (Waring, 2016). Before Taylor's research, the only way to increase productivity was to make employees work harder and for long hours. Taylor has increased the efficiency of business processes by analyzing the simplest parts individually. Perhaps this is why he was credited on his tombstone in Philadelphia with the phrase "father of scientific management." In 1917, Henry Gantt invented the Gantt chart. This came in handy when creating a project calendar. The work of project engineers has become much easier since the introduction of computers. Gantt charts are extremely useful in the field of performance measurement because they can be used in addition to spreadsheets for planning, review, and in real-time.

In the 1970s, bundled software was widely utilized in huge military projects (Aungsuroch et al., 2022). However, computer drawing capabilities were not well developed at the time, and drawing tools were prohibitively expensive, limiting their use in projects. Project management packages are now employed in a large number of industries as the cost of computers has reduced, computers have become more common, and graphical drawing capabilities have increased.

4.4 Hypothesis Development

Internal and external environmental challenges are imposed on the business environment by infrastructure developments, and they necessitate changes to address them. At the manager and employee levels, this necessitates the use of HR in the preparation, development, and implementation of strategic planning.

4.4.1 Strategic Planning for Human Resources and Project Management Performance

Strategic HRP is the most critical part of construction project management performance. Because proper HRP and distribution undoubtedly contribute to improved overall performance. (Hollenbeck & Jamieson, 2015) stated in their study that many human capital phenomena and outcomes, such as recruitment, preparation, teamwork, communication, knowledge management, and employee satisfaction, are included in the network of relationships that exist between social capital and employees. Although social network analysis is not widely used in the field of human capital, it is well suited to help researchers and practitioners in understanding the complex relationships that drive an organization. (Papke-Shields & Boyer-Wright, 2017) report that the strategic planning characteristics can be effectively integrated into a generalized quality management framework, generating potentially useful insights into the relationship between project management behaviors and eventual project success.

According to (Majumder et al., 2021), proper project planning and scheduling can significantly improve project performance in the construction sector. Project performance can be improved by increasing the efforts invested in project planning, scheduling, and controlling activities. The organizational characteristics of construction companies and the project environment have a significant impact on planning and scheduling efforts. The company must be appropriately organized to maintain the relevant environmental context in project planning. However, the following hypothesis can be formulated:

H₀₁: *There is no statistically significant effect at the level of significance ($\alpha \geq 0.05$) for strategic planning for human resources with its dimensions (environmental variables, need assessment, dealing with results, human resources plan) on the performance of project management with its dimensions (time, cost, safety, Quality) for infrastructure companies in Jordan.*

4.4.2 Strategic Planning for Human Resources and Project Management Time

Strategic HRP is the primary regulator for the delivery of construction projects, given the importance of time in construction projects. (Zaid et al., 2018) show that green HRM practices have a direct impact on sustainable performance, with green supply chain management practices mediating this effect. Internal green supply chain management practices, in particular, mediate positively between green human resource management practices and long-term performance. (ALgah, 2021) indicates that strategic HR outsourcing activities appear to have long-term positive effects, which often lead to many positive results in terms of performance, such as operational cost efficiency and operational excellence of the company, which contributes to project progress and timeliness.

All sorts of goal-aligned and performance-based HRM activities (including rewards, training, appraisal, and recruiting) favorably enhance the speed with which a perceived agency objective is fulfilled (Lim et al., 2017). Furthermore, certain sorts of HR contribute to the agency's perceived mission accomplishment. Strategic awareness of an organization's valuable, limited, distinctive, and non-tradable resources can aid in the completion of the perceived federal agency's mission in both HRM and HR practices. The following hypothesis is proposed:

H_{01.1}: There is no statistically significant effect at the level of significance ($\alpha \geq 0.05$) for strategic planning for human resources with its dimensions (environmental variables, estimating the need, dealing with results, human resources plans) on the performance of project management with the dimension (time) of the structure companies. Infrastructure in Jordan.

4.4.3 Strategic Planning for Human Resources and Project Management Cost

Strategic human resources planning helps to control costs and avoid duplication of the work, as wasting HR adds additional burdens on the project. (Shojaei & Flood, 2017) also found that existing portfolio planning models can be improved by adding a random project flow generator that expands. This broadens the portfolio and strategic planning horizon to include unknown

future projects. The paper examines multiple modeling methods for the problem and identifies historical market indicators that are strong predictors of future project flow profiles.

The most essential characteristics for the company are the project's occurrence and lease, the estimated duration, and the expected cost, which are all outputs from the generator. In addition to this, (Bonifaci et al., 2016) focused their research on the role of financial value in assisting feasibility studies within the methodological framework of feasibility studies. However, this paper focuses on the strengths and weaknesses of a business project, as well as its reliance on external and internal factors by discussing the Palermo Strategic Planning case study. The importance of strategic planning regarding the role of financial valuation as a means of identifying weaknesses that may affect project execution and the need to leverage it to increase the chances of a successful strategic project emphasizes certain conditions. However, the following hypothesis can be formulated :

***H₀1.2:** There is no statistically significant effect at the level of significance ($\alpha \geq 0.05$) for strategic planning for human resources with its dimensions (environmental variables, need assessment, dealing with results, human resources plan) on the performance of project management with the dimension (cost) of the structure companies. Infrastructure in Jordan.*

4.4.4 Strategic Planning for Human Resources and Project Management Safety

The application of strategic planning and coordination in project management focuses on all aspects of HSE management, including the effectiveness of health monitoring programmes, safety prevention monitoring programmes, environmental monitoring plans, and occupational health and safety monitoring programmes. This type of management can also improve EHS management. In addition, (Baporikar, 2022) identified three major health and safety challenges in the early stages of construction projects: lack of efficiency, lack of prioritization, and lack of consequences. (Kobylkin & Zachko, 2020) stated that the main causes of emergencies are failure to apply safety-oriented management in project planning and emergency response, lack of clear project structuring, and failure to consider constant change and the impact of a turbulent project environment. However, the following hypothesis can be formulated:

H₀1.3: *There is no statistically significant effect at the level of significance ($\alpha \geq 0.05$) for strategic planning for human resources with its dimensions (environmental variables, need assessment, dealing with results, human resources plan), on the performance of project management with a dimension (safety) among companies that have structured infrastructure in Jordan.*

4.4.5 Strategic Planning for Human Resources and Project Management Quality

The project's quality dominates the company's survival in the market; the intensity of competition and the emergence of new companies require optimal planning to ensure the quality of project performance. On other hand, (Papke-Shields & Boyer-Wright, 2017) confirmed that there is a link between strategic planning and training quality. The study also showed that strategic planning is applied in institutions, which raises the quality of workers' performance, and thus, increases and advances the project's outputs. (Zheng & Ma, 2021) note that the project quality of constructed social infrastructure is a necessary measure of project sustainability. Planning, monitoring, and evaluation should be better developed to address quality defects and better controlled by decision-makers, project managers as well as contractors. That is, through strategic HRP. Moreover, (Zheng & Ma, 2021) concluded that there is an inverse and statistically significant effect of the dimensions of strategic planning obstacles (financial, organizational, and human) that have an opposite statistically significant effect on quality assurance, and the financial obstacles are of great importance. You have shown that, too. The organizational and human hurdles involve a lot of practice, but a lot of practice had to be done. However, the following hypothesis can be formulated:

H₀1.4: *There is no statistically significant effect at the level of significance ($\alpha \geq 0.05$) for strategic planning for human resources with its dimensions (environmental variables, need assessment, dealing with results, human resources plan) on the performance of project management with the dimension (quality) of the structure companies. Infrastructure in Jordan.*

4.4.6 Control Effect

Based on a literature review, it was found that demographic factors impact the performance of construction projects; since company age, the company capital, and the company projects size help improve the performance and quality of the project implementation. The contract may require the parties to avoid the fines that may result from a breach of delivery. Additionally, (Vardarlier & Ozsahin, 2021) found that combinations of independent variables (company size, institutional investors, debt ratio, company age, liquidity ratio, customer satisfaction, productivity, and level of financial leverage) were positive for companies. It has been shown to have a moral impact on financial performance. The survey also identified the need to develop and follow customer retention policies and strategies. Among these, (Thacker et al., 2019) showed that the most important aspect is that there is a statistically significant correlation between the dimensions of intellectual capital and strategic performance, as this relationship contributes to achieving outstanding strategic performance. In addition, (Aunguroch et al., 2022; Baporikar, 2022) shows that the size and profitability of a company can have a significant impact on income smoothness. Although leverage does not affect income reduction practice, the greater the size and profitability of a company, the more opportunities have to be implemented by the management for income relief measures. Management is responsible to outside parties regarding the basic management of the pursuit of stable profits to explain the company's good financial performance. However, the following hypothesis can be formulated:

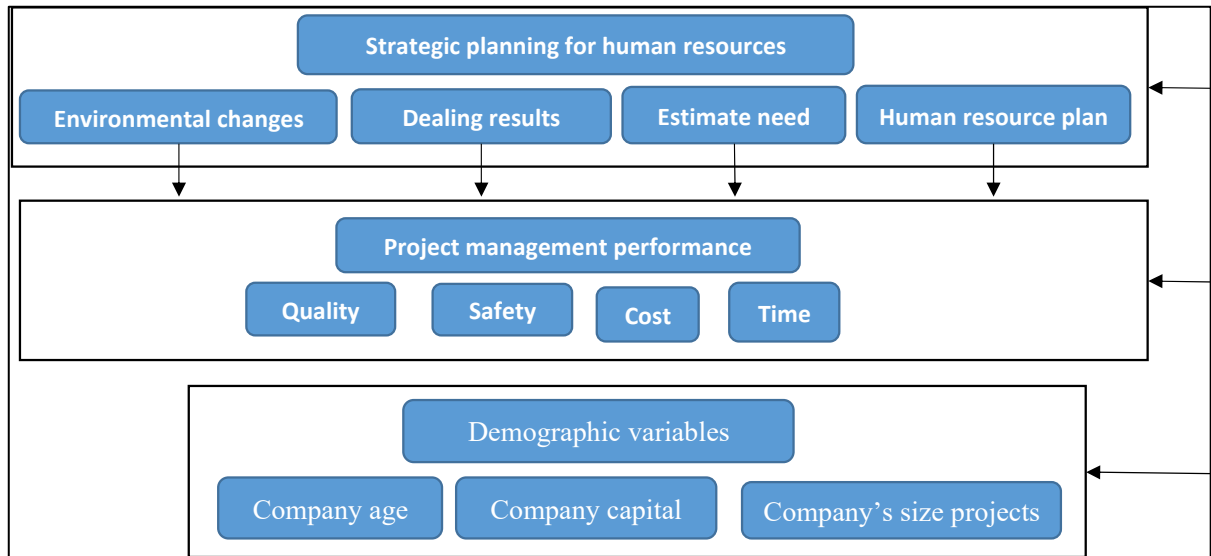
H₀₂: *There are no statistically significant differences at the level of significance ($\alpha \geq 0.05$) for strategic planning for human resources with its dimensions (environmental variables, need assessment, dealing with results, human resources plan), on the performance of project management with its dimensions (time, cost, safety, Quality) of infrastructure companies in Jordan is attributed to demographic variables (company age - company capital - company's size projects).*

4.5 Methodology

Enterprise resource planning (ERP) systems are a type of information system that has become popular among companies in recent years. Thanks to its modules, ERP systems bring together the functions of all departments under one roof and present them to all modules. In this way, it speeds up the flow of information by providing an instant display of updated information from both indoor and geographically remote units. It is a sub-module of ERP systems in HRBS. This research examines the effect of strategic planning for human resources on the performance of construction project management in infrastructure contracting companies in Jordan. The questionnaire form comprises two parts. In the first part, the first four questions aim to determine the demographic characteristics of the sample group, which include (age, professional qualification, job title, and experience). In the second part, the questions listed are generated using the scale prepared by (Bayindir & Şahin, 2007) according to the 5-point Likert scale. Where the second part consists of 24 questions about (Environmental Variables, Estimating the Need, Dealing with Result, and Human Resources Plan) accordingly, each paragraph of the tool is measured through Cost, Time, Quality, and Work safety respectively. As a result of a literature review, no topic scale was found (Hollenbeck & Jamieson, 2015); (Bratton et al., 2021). The scale was developed based on the data provided in the relevant parts of the books. A 5-point Likert scale was used to assess judgments.

4.5.1 Research Model

Figure 4. 1 Research model



4.6 Findings

The analytical process of the current study, including the demographic sample, was analyzed and presented to show the distribution of these factors. A total of 120 valid responses represent about (69.2%) and (30.8%) of men and women, respectively. This result interprets the superiority of masculinity among workers in the construction sector. The sample was slightly skewed to young adults with (43.3%) out of 52 respondents aged between 31-40 years old, followed by the group of respondents between 41-50 years old (30%). This indicates the ages working in this sector are younger, also the study has different age groups.

The majority of the sample occupation were bachelor's degree holders (51.7%), which indicates the importance of hiring university-educated staff with good work-related knowledge. The majority of years of experience among the participants were 15 years, and most of them had more than 15 years with a percentage of (42.5%) followed by those who had the experience of 11-15 years with a percentage of (27.5%), and this goes to confirm the stability of working in this sector. In terms of the job title, most of the participants were employees at lower management levels around (65.8%), and only (9.2%) were department managers.

The analysis process of the collected data also aligns with the suggested hypothesized model of the current research level. Figures 4.2 and 4.3 show the component of strategic planning of human resources, and they were abbreviated as (ENV = environmental variables, EST = estimating needs, DEAL = dealing with the results, HRP = human resources plan), and the figures show that all components are ranked around 3.25. Meanwhile, Figure 4.2 also presents the ranks for project management performance components, and they are abbreviated as (COST = cost, TIME = time, QUALITY = quality, SAFETY = Safety), and the figure shows that all components are also ranked around 3.25.

Figure 4. 2 Strategic Planning of HR Components

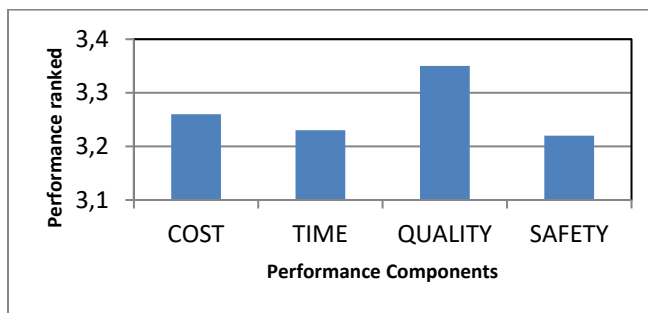
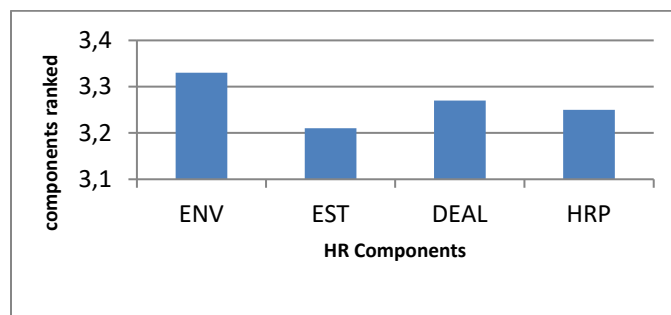


Figure 4. 3 Project Management Performance Components



The reliability of the scales used in this study was assessed, and the results showed greater reliable indicators, achieving the acceptable value of the internal consistency and factor loadings 0.70 and 0.60, respectively, as shown in Table 4.1. The values of reliability, as well as fit indices for all constructs involved in the suggested model, were confirmed. Reliability is

traditionally defined as the internal consistency of the constructs. As the reliability test was checked by using the most common test, called Cronbach's 'α' coefficient, in the current research. As stated, this test is satisfied if a value of over 0.7 is achieved for all variables. The given results of reliability analyses concluded that variables of both strategic planning of human resources and project management performance are reliable.

Confirmatory Factor Analysis (CFA) was also conducted to validate the measurement model, particularly for models that have more than one latent construct at one time. In this case, the measurement model of all constructs was validated at once and the item deletion process was executed for each construct by deleting the lowest factor loading item in each construct. This analysis is carried out to confirm these items are contributing factors in measuring their respective constructs. Results from CFA are used to assess the one-dimensionality, validity, and reliability of every construct. The Average Variance Extracted (AVE) and Composite Reliability (CR) were calculated to test the discriminant validity, and the results achieved acceptable values (Awang, 2015) as shown in the respective table.

Table 4. 1 Variables Reliability

Variable	Reliability scale (≥0.70)	Factor loadings (≥0.60)	AVE (≥0.50)	CR (≥0.60)
Environmental variables	0.89	0.82	0.50	0.66
Estimating the needs	0.84	0.77	0.55	0.68
Dealing with the results	0.79	0.79	0.62	0.73
Human resources plan	0.74	0.72	0.51	0.75
Cost	0.80	0.80	0.57	0.72
Time	0.82	0.71	0.60	0.69
Quality	0.78	0.84	0.64	0.70
Safety	0.77	0.84	0.62	0.77

SEM approach was also examined for the suggested hypotheses between the proposed variables, also it tests the link between the hypothesized relationship through the path coefficients drawn in Figure 4.4, which includes project management performance as an exogenous variable with four components: cost, time, quality, and safety. It also includes the strategic planning of HR as endogenous with four components: environmental variables, estimating the needs, dealing with results, and human resources plan. The respective figure indicates a single on the headed arrow, which represents the direction between the parameters of the model constructs as illustrated in the respective figure, which also shows the path coefficients which are similar to the regression weights in SEM. Furthermore, the study also adopted the SEM approach by using AMOS software which runs some of the common tests like Chi-square, common fitness indices CFI, good fitness indices GFI, and root mean square error of approximation RMSEA in order to check the model goodness of fit. According to Awang, the satisfied threshold of all tests should exceed 0.90 for CFI and GFI, meanwhile, the RMSEA is better to be lower e.g., less than 0.08, and the chi-square/degree of freedom less than 3 as stated in Table 4.2. The analysis of the proposed framework presents a ratio of chi-sq/df as 2.736, CFI as 0.963, RMSE as 0.079, and GFI as 0.955, and this concludes that the data presents a good fit to the model.

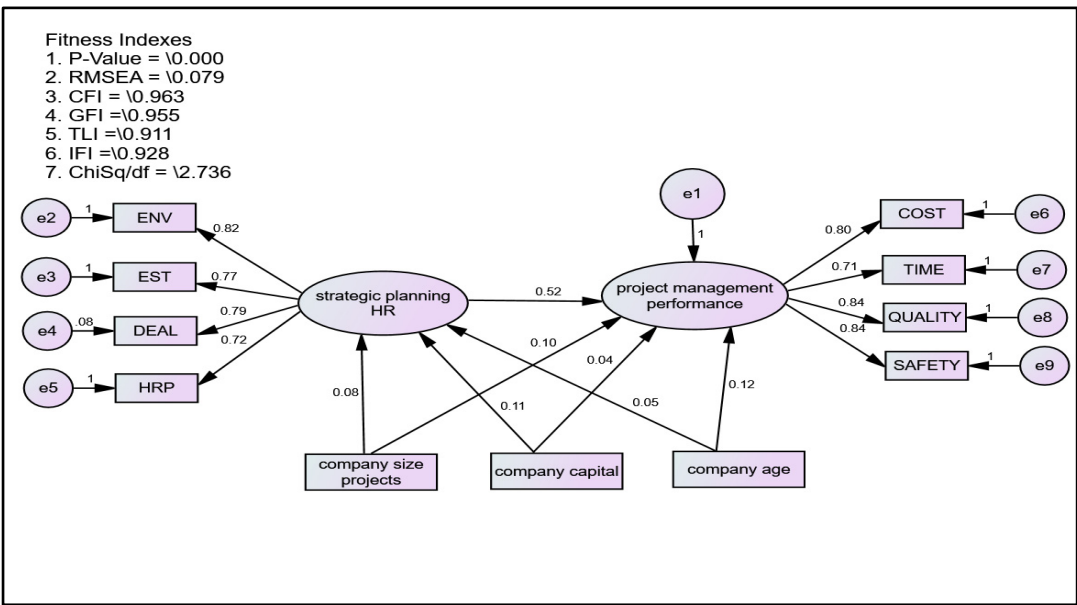


Figure 4. 4 Path Coefficients Model

Table 4. 2 Fitness Indices

Index	Required cut-off	SEM model
P-value	0.000	0.000
Comparative fitness index CFI	0.90	0.963
Goodness fitness index GFI	0.90	0.955
Tucker Lewis index TLI	0.90	0.911
Incremental fit Index IFI	0.90	0.928
Root mean square error of approximation RMSEA	0.080	0.079
Chisq/df	3.00	2.736

Further, in terms of hypotheses testing, the findings of the analysis revealed a statistically significant effect at the level of significance ($\alpha \leq 0.05$) for strategic planning for human resources with its dimensions on the performance of project management. The text output for the regression path coefficient is presented in Table 4.3, which provided the results of testing all hypotheses. Referring to the results of SEM output, the computed probability value (P-value) obtained by the MLE procedure is 0.000 which is less than the type 1 error being set at 5% (0.05). Thus, the obtained probability value indicates that the effect of the exogenous construct (strategic planning of human resources) on the endogenous construct (project management performance) is not significant at Type 1 error 0.05 ($P > 0.05$). Therefore, all proposed research hypotheses are empirically supported, statistically positive, and significant.

Table 4. 3 The Regression Coefficient and Significance

Endogenous Construct	<---	Exogenous Construct	Standardized Regression Coefficient	Regression Coefficient	P	Result
Project management performance	<---	Strategic planning of HR	0.521	0.116	0.000	Supported
Cost	<---	Strategic planning of HR	0.121	0.165	0.006	Supported
Time	<---	Strategic planning of HR	0.129	0.241	0.000	Supported
Quality	<---	Strategic planning of HR	0.278	0.367	0.000	Supported
Safety	<---	Strategic planning of HR	0.383	0.387	0.000	Supported

The second main hypothesis states that there are no statistically significant differences in the dimensions of the strategic planning for human resources on the performance of project management with its dimensions based on the identified demographic variables (e.g. company age - company capital - projects size). The results showed no significant differences by using the Mann-Whitney U test since the data did not achieve the normal distribution ($P \leq 0.05$), which is recommended inferential nonparametric statistical approach used in the studies to identify if there is a statistically significant difference between the groups (Garson, 2012). The independent variables in this study are categorical, the company age, which is classified into two groups called new companies and old companies (<10 years and >10 years), and no respondents were in more than one group. The mean rank is presented to show if there is a statistically significant between the respective group of new and old companies $p = 0.028$ as shown in Table 4.4. The same results showed that the mean rank score for old companies was higher at 207.36. However, as the results already have presented, the mean rank was statistically significantly different $p < 0.05$, so it would conclude that there were differences based on the company age factor towards the effects of strategic planning of human resources on project management performance.

Table 4. 4 Differences in Company Age

New companies (n=45)	Old companies (n=75)	Mann-Whitney U	Z	Sig.
Mean rank	Mean rank			
183.90	207.36	19094	3.274	0.028

In terms of analyzing the differences among the company capital, the independent variables are divided into two groups: small capital and large capital (< 1 million JOD and >1 million JOD), and no respondents were in more than one group. The mean rank is presented to show if there is a statistically significant between the respective groups $p = 0.039$ as shown in Table 4.5. The same results showed that the mean rank score for the large capital was higher at 210.55. However, as the results already have presented, the mean rank was statistically significantly different $p = < 0.05$, so it would conclude that there were differences based on the company capital factor towards the effects of strategic planning of human resources on project management performance.

Table 4. 5 Differences in Company Capital

Small capital (n=78)	Large capital (n=42)	Mann-Whitney U	Z	Sig.
Mean rank	Mean rank			
172.81	210.55	12384	2.503	0.039

In terms of analyzing differences among the company size projects, the independent variables are divided into two groups: small projects and large projects (< 1 million JOD and >1 million JOD), and no respondents were in more than one group. The mean rank is presented to show if there is a statistically significant between the respective groups $p = 0.043$ as shown in Table 4.6. The same results showed that the mean rank score for the company with large-size projects was higher at 198.72. However, as the results already have presented, the mean rank was statistically significantly different $p = < 0.05$, so it would conclude that there were differences

based on the company size projects factor towards the effects of strategic planning of human resources on project management performance.

Table 4. 6 Differences in Company Size Projects

Small projects (n=91)	Large projects (n=29)	Mann-Whitney U	Z	Sig.
Mean rank	Mean rank			
163.04	198.72	18404	2.112	0.043

4.7 Discussion

Results depend on the dimensions of the Jordanian infrastructure companies (time, cost, security, quality). However, the results show that strategic workforce planning impacts project management performance (Dabirian, 2022) in addition to its role in maintaining flexibility, so that project stakeholders can manage change if the future is different from expectations (Nurani & Maryanti, 2021). This result is consistent with the study (Hollenbeck & Jamieson, 2015)), (Papke-Shields & Boyer-Wright, 2017), and (Rajhans & Bhavsar, 2022). This result is explained because strategic planning is a systematic administrative process that reflects the awareness of the future and determines its dimensions, through long-term goals that reflect the comprehensive vision of the organization in the future environment, which enables stakeholders to develop a clear vision in a large way towards the future direction. And take decisions related to the future of the organization and its development, in addition to defining the procedures to be used to achieve the goals efficiently.

This paper also found that in the field of HRP, preparation is essential for any project that aims to meet the project's needs for employment. In addition, characteristics are commensurate with the nature and volume of work activities. In a way that helps the company to achieve its goals for a future period of time and under changing conditions, which is consistent (Shojaei & Flood, 2017; Arianto, 2015).

The result explains that strategic planning for human resources lies in determining the company's needs of human resources according to the size and nature of the work in the company, and what is the nature of the cadres required for all sections of the project.

Additionally, the performance of project management in the dimension (cost) of a commissioning company's infrastructure is affected by strategic personnel planning. A good talent plan can help increase the effectiveness of a talent, which is characterized by a high level of competence, ability, and willingness to work, resulting in lower financial costs and a corresponding balance of supply and demand. Understanding project needs-based resources and talent planning are some of the latest management methods for predicting quantitative and qualitative needs; which are supported by (Popescu & Kyriakopoulos, 2022) and (Bonifaci et al., 2016). The result is explained. The interest of large companies in the dimension of cost, because of this role in increasing profits for the company and shareholders, so companies are interested in appointing talents with high efficiency and the ability to complete the work at the lowest costs.

Another finding is related to environmental variables; which indicate strategic planning for human resources helps project management officials in the early detection of expected danger areas (Lim et al., 2017); (Aungsuroch et al., 2022). The result explains that strategic planning carries out a risk assessment process, through which risks are identified and the degree of risk to the work to be implemented, whether it is a project, a goal or an executive step in a project, or any work to be implemented or achieved, is measured. The measurement of risks is through measuring the extent of the impact.

Additionally, strategic planning works to attract and retain workers who are well-equipped, and at the same time, have the appropriate skills to work efficiently and achieve quality results, which is confirmed by (Thacker et al., 2019); (Waring, 2016), and (Kobylkin & Zachko, 2020). The result is explained the importance of the infrastructure construction sector in terms of work volume and bid value, which makes companies interested in selecting workers with

competencies and skills to achieve the required project specifications, so that the company is not exposed to a fine or delay.

This paper also found that the strategic planning for human resources has an effect on the performance of project management for infrastructure companies in Jordan due to demographic variables (company age - company capital - company projects size), where companies gain more experience with the number of years they operate, and capital helps assess the value of projects that the company can use. The size of the company also affects its productivity and the size of projects that can be received as mentioned by (Ramos et al., 2022; Baporikar, 2022), and (Rauzana & Dharma, 2022).

The result explains that companies gain more experience in the number of years they work, and capital helps assess the value of projects that the company can use. The size of the company also affects its productivity and the size of the projects implemented.

4.8 Conclusion

This paper reveals the extent of the clarity of the scientific concept of strategic planning in the management of human resources in infrastructure contracting companies in Jordan. Also, identifying the reality of the proper planning process for human resource development in light of strategic planning in infrastructure contracting companies in Jordan. This paper indicated that strategic planning for human resources with its dimensions (environmental variables, needs assessment, dealing with results, human resources plan), on the performance of project management with its dimensions (time, cost, safety, quality) for infrastructure companies in Jordan. Moreover, provided an explanation of how the strategic interaction between (HRP) on the performance of project management in infrastructure contracting companies in Jordan (cost, time, safety, and quality). Explaining the obstacles that limit the achievement of strategic planning for human resources management on the performance of project management in contracting companies in Jordan. In addition, the results indicate that strategic planning for human resources works to attract and retain workers, where sufficient numbers of human resources are available and at the same time the appropriate skills that enable them to work

efficiently. Thus, the enormity of the sector discussed in this paper is in terms of size and funds, the high contributions it presents to the Jordanian GDP, and the employment of large numbers of specialized technical manpower, including engineers, technicians, and workers.

CHAPTER 5

THE ADOPTION OF HUMAN RESOURCES ANALYTICS IN CONSTRUCTION PROJECTS IN JORDAN: ANTECEDENTS AND CONSEQUENCES

Ahmad Abujraiban¹, Gabriel J. Assaf¹

¹Department of Construction Engineering, École de Technologie Supérieure
1100 Notre-Dame Ouest, Montréal, QC H3C, Canada.

Article submitted to *Journal of Management Analytics*, June 2022

5.1 Abstract

The construction industry has begun to use analytics tools for evidence-based decision-making processes in order to execute projects more efficiently. However, human resource practices show a slow adoption of human resource analytics (HRA) owing to doubts about the actual benefits compared to its cost and complexity. In addition, recent studies investigating the adoption of this innovative technology are still in their infancy and rely on conceptual models. Thus, this study empirically examined the antecedents and impacts of adoption on improving project performance. To this end, we developed a deductive conceptual framework based on technology-organisation-environment (TOE) and resource-based view (RBV) theory. The Jordanian construction industry population of interest completed 198 questionnaires. The findings showed that eight factors significantly affect HRA adoption. Furthermore, the results suggest that HRA adoption can significantly enhance the project performance. Empirical evidence supports early adopters' understanding of the barriers and potential benefits of HRA implementation.

Keywords: HR Analytics; HRM; project performance; construction industry.

5.2 Introduction

The business sector is constantly evolving because of technological advancements. These advances can drastically change how businesses operate (Hota, 2021; Torres & Statti, 2021). Among these new technologies, business analytics has significantly impacted the quality of decisions made and, consequently, the overall performance of organisations (Al-Qaralleh & Atan, 2021; Ilmudeen, 2021). Recently, most organisations worldwide have started adopting analytics in their functions such as marketing, supply chain, operations, and manufacturing (Jiang & Akdere, 2021; Sheng et al., 2017; Shet et al., 2021). The human resource function is one of those functions that started using analytics to reap the expected benefits in this pivotal strategic role (Davenport, 2019; DiClaudio, 2019; Iles et al., 2010). Human resource analytics (HRA) is an emerging technology that uses descriptive, prescriptive, and predictive analytics to inform strategic decisions regarding human resources (Shet et al., 2021; Tursunbayeva et al., 2018). Essentially, HRA aims to support decision-making related to the management and development of employees in an organisation, regardless of the business sector (Dahlbom et al., 2020).

The construction industry is one of the sectors that can use analytics capabilities because its success depends heavily on the management of its human resources (Ahmed et al., 2018; Marzouk & Enaba, 2019). In this regard, HRA can contribute the most to those in the construction industry, which is primarily based on recruiting, training, and evaluating highly skilled workers to achieve expected project success (Bilal et al., 2016; Ng et al., 2001). According to Ahmed et al. (2018), construction projects can be better managed based on evidence-based decisions rather than gut feelings and intuitive decisions.

Human resources are crucial to the success of construction projects, whereby construction labour plays a crucial role in the execution of the project (Hussain et al., 2020). The allocation of labour to a project is one of the most critical processes in managing human resources (Dabirian et al., 2019). In essence, the human resources department in project management is primarily concerned with recruiting, organising, and managing the project team (Clark &

Colling, 2005; Keegan et al., 2018). This includes identifying the competencies necessary to motivate and build a team (Demilliere, 2014; e Silva & Costa, 2013).

Construction companies are classified as multiproject companies (Geraldi, 2009). The literature on project management states that these types of projects require a careful approach to resource allocation (Ponsteen & Kusters, 2015). In this regard, it has been claimed that analytics can support an organisation in making the best decisions on allocating resources during work hours for the efficiency of the organisation and its employees (Hamilton & Sodeman, 2020; Levenson & Fink, 2017). This is important in project management, as it is challenging to coordinate resources if an organisation does not properly understand how it distributes its people and money (Ponsteen & Kusters, 2015). Analytics can see how the distribution of people and money affects the overall performance of an organisation, allowing for better and more effective decision making regarding resource allocation (Hans & Mnkandla, 2017; Ozkan-Ozen & Kazancoglu, 2021; Shah et al., 2019). Therefore, analytics tools support project managers and human resource specialists in making appropriate decisions by providing them with insightful information (Hans & Mnkandla, 2017).

The construction industry is one of Jordan's most important economic sectors (Arif et al., 2017; Bekr, 2018). It is a major source of employment and contributes significantly to its gross domestic product (GDP) (Sweis & Jaradat, 2021). Recently, the industry has increased, leading to a shortage of skilled workers (Alqirem et al., 2018). Therefore, to meet the demand for skilled workers, Jordanian construction companies must optimise their human resource management to make better decisions regarding workforce planning, recruitment, and training (Florez et al., 2013; Moussa & El Arbi, 2020).

In recent years, scholars and practitioners have begun to pay more attention to HRA because of its ability to provide innovative human resource management insights (Hota, 2021; Kryscynski et al., 2018; Margherita, 2021; Peeters et al., 2020; Shet et al., 2021). They advocated that HRA can improve firms' ability to optimise their human resource decisions by providing robust data-driven decisions (Dulebohn & Johnson, 2013; Garcia-Arroyo & Osca,

2021). However, the adoption of HRA has been a challenge for most organisations for several reasons (Ram et al., 2019; Shet et al., 2021; Vargas et al., 2018). First, human resource analytics can be expensive to implement and maintain (Huselid, 2018; Muscalu & Şerban, 2014). Second, it is often difficult to determine the measures and metrics required to achieve desired results (Armstrong & Brown, 2019; Peeters et al., 2020). Third, the process of collecting and analysing data can be tedious and time-consuming, leading to frustration among employees and managers (Giermindl et al., 2021; Kryscynski et al., 2018; Schwartz, 2018). Fourth, there is the risk that using HRA will lead companies to make decisions that are not in the best interests of their workers (Giermindl et al., 2021).

In practice, according to the research conducted by SHRM (2016), human resource data analysts make up 79% of jobs in firms with 10,000 or more employees, and the demand for people analytics is on the rise. Nevertheless, the adoption rates have not increased at the same level (Green, 2017). Furthermore, most businesses face significant roadblocks in the early stages of developing their analytical capabilities, hindering substantial development. Furthermore, project-driven companies in the construction industry may face challenges in adopting analytical tools. In contrast with manufacturers, construction firms are subject to high levels of variability. Midway through a project, progress tracking systems have changed, resulting in incompatibility and inconsistent data collection. Many variables vary considerably from project to project, including scale, materials, and subcontractors (Hovnanian et al., 2019). At the same time, HRA is itself a human resource practice that still needs to prove its own value (Minbaeva, 2018; Rasmussen & Ulrich, 2015; van den Heuvel & Bondarouk, 2017), and the business can start realising the promise of connecting human resource decisions and processes to organisational performance (Marler & Boudreau, 2017).

Academic research conducted on this line of HRA adoption is usually conceptual or qualitative in nature and does not provide a cause-and-effect relationship that contributes to developing a theory on HRA and creating HRA standards (Etukudo, 2019; Gurusinghe et al., 2021; Margherita, 2022; McAbee et al., 2017; Mohammed & Quddus, 2019; Ram et al., 2019; Shet et al., 2021). Technology and innovation adoption are industry-specific, and each industry

faces barriers and consequences (Miller et al., 2007). A recent literature review conducted by Shet et al. (2021) calls upon scholars to address the gap in HRA literature and conduct more empirical research to understand the determinants and consequences of HRA adoption. Moreover, Jiang and Messersmith (2018) asserted that research on HRA and the application of big data analytics to human resource strategies is needed to support uncertain adopters in deciding whether to adopt it.

The construction sector is an information-intensive sector that lags behind the adoption of data analytics and requires further research (Bilal et al., 2016; Munawar et al., 2022; Ram et al., 2019; Sepasgozar & Davis, 2018). To fill this gap in the literature and address practical concerns, this study addressed two major questions.

- 1- What are the technological, organisational, and technological factors that affect HRA adoption in construction companies in Jordan?
- 2- What is the impact of HRA adoption on the project performance of construction companies in Jordan?

This study addresses these two questions using two underlying theories, the TOE framework and RBV theory, to formulate a conceptual framework and related hypotheses. Based on this theoretical background, this study discusses the adoption of HRA, HRA's potential for project performance in the construction industry, and associated theories. A conceptual framework and argumentative hypotheses were presented, followed by the research design, analysis, and discussion. Finally, the implications and conclusions of the study are presented.

5.3 Theoretical Background

This section introduces the theoretical foundation for HRA adoption and the potential of HRA in project management. Finally, the foundational theories of the RBV theory and TOE framework are discussed.

5.3.1 Adoption of human resources analytics

According to the literature, HRA has emerged as a part of big data analytics (Bassi, 2011). Academics, practitioners, thought leaders, and technology suppliers in the human resources field discuss HRA, also known as workforce analytics, talent analytics, human capital analytics, and people analytics (Falletta & Combs, 2020). Everyone seems to realise the impact of big data on decision making and competitiveness (Deloitte, 2014; Dubey et al., 2018). However, the human resource's function has been slow to adopt big data analytics (Fernandez & Gallardo-Gallardo, 2020; Vargas et al., 2018; Zeidan & Itani, 2020). In Deloitte's survey, 14 per cent of human resources departments used data analytics, whereas 77 per cent of operations, 58 per cent of sales, and 56 per cent of marketing departments already used data analytics (Deloitte, 2014). There appears to be a willingness among organisations to consider using big data and new technologies, although human resource specialists are very cautious (Fernandez & Gallardo-Gallardo, 2020).

Regarding HRA, recent studies have revealed manifold fundamental reasons behind slow adoption by human resource practitioners, whether at the individual level (Marler & Boudreau, 2017; Vargas et al., 2018) or the organisational level (Shet et al., 2021). For instance, Kapoor and Kabra (2014) argued that human resource specialists are reluctant to implement advanced HRA because of a lack of required skills, top management support, analytics, culture, and available technology. Additionally, they may be hesitant to adopt big data analytics because they lack familiarity with the technology. In a study by Saxena et al. (2021), only a few human resource professionals had experience using big data analytics tools. Since HRA is the most recent innovation in human resources management, it remains unclear, for the most part, the value it can add from its strategic positioning and contribution to its operational deliverables across the organisation (Belizón & Kieran, 2021; Marler & Boudreau, 2017). The lack of familiarity with these tools, which require statistical and mathematical analyses, may also be a barrier to the adoption of human resources professionals (Shet et al., 2021; Vargas et al., 2018). Another reason they may be hesitant to adopt big data analytics is the perceived complexity.

For instance, Fernandez and Gallardo-Gallardo (2020) found that human resource professionals believe big data analytics is too complex to understand.

A popular research topic is the factors influencing HRA adoption and their impact on corporate performance (Aydiner et al., 2019; Shet et al., 2021). HRA seems to be a small part of companies' overall investments despite the fact that more companies do so. Low adoption of HRA makes quantifying its impact on organisational success difficult (Shet et al., 2021; Singh & Muduli, 2021). Consequently, there is not yet a solid scholarly paradigm for understanding HRA adoption within organisations (Dahlbom et al., 2020; Fernandez & Gallardo-Gallardo, 2020; Margherita, 2022; Rasmussen & Ulrich, 2015). However, there is a startling lack of research on HRA despite its increasing adoption in businesses (Margherita, 2022; Stone & Dulebohn, 2013). However, it is unclear how HRA can be applied to practical business processes in the existing literature (Dahlbom et al., 2020; McCartney & Fu, 2022).

Although human resources are yet to adopt data analytics, further research is needed to prove their acceptability, usage, and success in various sectors (Shet et al., 2021). In so doing, two crucial questions need to be addressed further: When there are so many examples of human resources organisations using big data to help drive their business forward, why do human resources seem to be slow to adopt? What is the influence of innovative technology adoption on project performance?

5.3.2 HRA's potential for project management

Project management is defined as the formulation of plans, allocation of resources, and monitoring of performance to achieve goals and objectives (Ghansah et al., 2020). The main aim is to complete the project work on time, within the budget, and according to specifications (Abu-Hussein et al., 2016; Gelbard et al., 2018) to meet stakeholders' expectations (Lee & Yu, 2012). Project management is a meticulous process that requires organisational skills (Bilal et al., 2019). The regular use of data analytics in project management and monitoring has become mandatory for most organisations operating in today's business world (Almazmomi et al., 2021; Mangla et al., 2020). Construction projects are no exception, as the success or failure of

such endeavours often hinges on accurate forecasting and effective decision making (Lin & Golparvar-Fard, 2018). Applying data analytics to construction projects can improve both their efficiency and accuracy (Marzouk & Enaba, 2019; Ram et al., 2019). Data analytics tools have been successfully used in other domains including operational research and finance (Holsapple et al., 2014). Organisations involved in construction projects have increasingly adopted them owing to their potential benefits (Lin & Golparvar-Fard, 2018).

According to Ikediashi and Ogwueleka (2016), technology adoption in construction projects is typically slow, because the cost savings stemming from their use are not always evident. The construction industry is plagued by various problems related to cost overruns and delays, making it particularly important to use technologies that can improve financial performance (Lin & Golparvar-Fard, 2018). Despite the benefits of data analytics for construction projects, the latter are still primarily managed using traditional project management tools (Ahuja et al., 2009b; Dixit et al., 2021; Sandhu & Ajmal, 2012). This has led some researchers to argue that there is a need for better coordination and communication between technology providers, contractors, and engineers (Ahuja et al., 2009a). Additionally, significant methodological challenges must be overcome before the full potential of data analytics can be realised (Shet et al., 2021). In addition, as part of big data analytics (Jiang & Akdere, 2021), the adoption of HRA and its effects on project success and performance are worth studying, because human resource practices play an essential role in successful project implementation (Popaitoon & Siengthai, 2014; Ul Musawir et al., 2017). This study then seeks to identify the barriers hindering HRA's adoption in construction projects, as well as how its adoption can impact project performance.

5.3.3 Underpinning Theories

Tornatzky et al. (1990) developed the first theory of innovation adoption, which explains and predicts adoption likelihood based on a wide range of characteristics. Kowath and Choon (2001) assert that technological development, business and organisational transformation, and the industry environment influence adoption (Kauffman and Walden, 2001). Since its

inception, the TOE framework has not undergone significant theoretical development. Zhu and Kraemer (2005) claimed that the lack of development of TOE is the result of the fact that it is too generic and includes a wide array of factors and measures, thus requiring little modification. Baker (2012) argues that another reason for this alignment is that the theory does not provide competitive explanations and does not align well with other technology adoption theories. Therefore, there is little pressure to change this framework.

The TOE framework is an organisational-level theory that significantly affects innovation adoption decisions (Gurusinghe et al., 2021; Troshani et al., 2010). It comprises three distinct facets of the business context: technology, organisational structure, and environmental characteristics (Baker, 2012; Maroufkhani, Ismail, et al., 2020). It is the most widely used framework for examining the impact of adoption determinants on organisational and technological innovation (Badi et al., 2021; Cruz-Jesus et al., 2019). Several studies on technology adoption have found the TOE framework appropriate (Ahmadi et al., 2015; Awa et al., 2016; Chakraborty & Mansor, 2013; Nam et al., 2019). Recent studies have used the TOE framework to investigate the factors of human resource information systems (HRIS) adoption in organisations (Chakraborty & Mansor, 2013; Troshani et al., 2010). Similarly, the TOE framework has been widely adopted in the literature to explore analytics implementation, provide knowledge of the impact of business analytics implementation on business performance, and organise the discovery of the factors that influence it (Ghaleb et al., 2021; Marler & Boudreau, 2017; Nam et al., 2019). Recently, a few studies have explored the determinants of HRA adoption in organisations (Gurusinghe et al., 2021; Shet et al., 2021). Consequently, the TOE framework proved to be useful in this study.

The TOE model is suitable for the context of our study as it provides barriers that might affect the adoption of HRA in Jordanian construction companies. Furthermore, the adoption of HRA remains problematic at the organisational level (Angrave et al., 2016; Gurusinghe et al., 2021). In contrast, other models, such as the theory of reasoned action, theory of planned behaviour, and technology acceptance model, are more appropriate for illustrating adoption barriers at the

individual level (Queiroz et al., 2021; Venkatesh et al., 2003), which is the next step to consider an initial adoption by an organisation.

By contrast, in the early 1990s, several human resource management researchers advocated the RBV theory of personnel policies and practices (Mabey & Gooderham, 2005). From an RBV viewpoint, researchers have studied the phenomenon of competitive advantage, identifying different influences on the phenomenon of competitive advantage (Paauwe, 2009). The term “resource-based view” refers to the idea that organisations should focus on acquiring, developing, and using the best possible resources to achieve goals. This perspective is based on the premise that human resources are scarce but vital resources (Kaufman, 2015). Research in applied psychology and human resource management strongly suggests that investing in human capital can yield progressive performance benefits to individuals and organisations, using RBV theory as the foundation (Delery & Roumpi, 2017; Razak et al., 2015). RBV has been suggested to measure project success, implying that resources should be managed in order to be effective (Almarri & Gardiner, 2014; Belout & Gauvreau, 2004; Mathur et al., 2013). De Carvalho et al. (2015) found that the theory of RBV was valid for use in making choices about the training and development of human capital. This study uses RBV theory to determine which training and development to offer, and it determines that it is useful for project success. Accordingly, HRA and the data, information, and insights it generates fit the RBV criteria, implying that HRA and the data, information, and insight it generates can produce a competitive advantage for firms (McCartney & Fu, 2022). According to the literature, HRA is a new way to analyse and make decisions concerning human capital concepts (Minbaeva, 2018; Qamar & Samad, 2021). The literature indicates that human resource experts and managers are increasingly turning to HRA to improve managerial decision making related to resource allocation and human capital (Zeidan & Itani, 2020). This approach aims to understand whether human resource actions may positively or negatively affect project performance depending on the desired outcome.

TOE and RBV have become increasingly common in studies examining the determinants and consequences of adopting new technologies (Ganguly, 2022; Maroufkhani, Tseng, et al., 2020;

Pillai et al., 2021; Ruivo et al., 2016). Thus, we used the TOE and RBV frameworks to build the conceptual framework for this study.

5.3.4 Conceptual Model and Hypotheses Development

Technology adoption studies use two approaches to evaluate the adoption of any novel technology: examining adoption as one stage (variable) (D. Q. Chen et al., 2015; Kumar & Krishnamoorthy, 2020; Walker & Brown, 2019) or three stages (evaluation, adoption, and routinisation) (Chiu et al., 2017; Cruz-Jesus et al., 2019; Junior et al., 2019; Puklavec et al., 2018). Since HRA adoption is defined as the intention to use HRA at an organisational level, we consider it a single variable in our study, as HRA adoption is still an emerging concept in the related literature and a new initiative in the Jordanian context. To select the factors of each construct, namely, technological, organisational, and environmental, we based our selection on the conceptual framework developed by Shet et al. (2021) and other related studies on technology adoption that considered the TOE framework as a theoretical lens for their model development. Hence, complexity, relative advantage, compatibility, and data quality were selected as related dimensions of the technology. Top management support, organisational readiness, and analytical competency were chosen to assess the organisational constructs. Two dimensions concerning the environmental construct were identified to determine their impact: external competitive pressure and external support from vendors. Eventually, project performance was identified as the final consequence of adopting HRA in construction firms in Jordan, as they are classified as multiproject businesses (see figure 5.1).

5.3.4.1 Technological impact on HRA adoption

The impact of technology on HRA adoption in construction projects is hypothesised to be determined by four factors: complexity, relative advantage, data quality, and compatibility. The degree of complexity of a technology is determined by its difficulty in use or understanding (Rogers, 2003). Big data analytics uses this variable to provide insight into the complexity of applications and usage. Using this criterion, big data analytics and deployments

can be classified according to their sophistication levels. Recent research indicates that the complexity of an innovation hinders its acceptance (Maroufkhani, Ismail, et al., 2020). Recent studies have viewed HRA as a complex technology that requires highly skilled workers to handle interdisciplinary aspects including technical, human, and business elements inherited from tools (Kapoor & Kabra, 2014; Ozkan-Ozen & Kazancoglu, 2021; Shet et al., 2021). This complexity affects firms' decisions to adopt innovative technologies (Rogers, 2003).

Relative advantage reflects how much better the technology is compared to existing alternatives and the relative potential benefits (Rogers, 2003). An empirical study by Lee (2004) showed that perceived relative advantage is an essential indicator of technology adoption, with the probability of an innovation being adopted multiplied by its perceived relative advantage. HRA-related literature has several advantages over existing technologies, such as better resource allocation, talent management, and employee retention (Gurusinghe et al., 2021; King, 2016). However, research in the field of big data has yielded mixed findings. A number of studies have found that relative advantage and big data adoption are significantly correlated (Al-Hujran et al., 2018; Ram et al., 2019), whereas others have shown no such association (Maroufkhani, Tseng, et al., 2020; Youssef et al., 2022). In the context of construction projects, the relative advantage of HRA might be considered a critical dimension of construction project performance that can be used to improve decision making, optimise resources, and identify areas for future improvement (Van den Heuvel & Bondarouk, 2017).

Compatibility refers to how well a technology integrates with other technologies and systems and how well the implemented technology complies with an organisation's needs, practices, past experience, and values (Nedev, 2014; Rogers, 2003). When the two entities are compatible, it is easier to adopt innovation. Compatibility leads to a better understanding of innovation and easier adoption (Ilmudeen, 2021). Compatibility is also a critical factor (D. Q. Chen et al., 2015; Maroufkhani, Tseng, et al., 2020). Several studies assert that compatibility is a significant antecedent to the adoption of new technologies (Alshamaila et al., 2013; Cruz-Jesus et al., 2019; Duan et al., 2010; Wu & Wang, 2006). Comparatively, big data analytics adoption has shown contrasting results (Kumar & Krishnamoorthy, 2020), with some studies

demonstrating significant correlations (Kumar & Krishnamoorthy, 2020; Marchena Sekli & De La Vega, 2021) and others showing no correlation (Youssef et al., 2022). Nevertheless, studies have shown a positive association between compatibility and adoption intention in HRIS (Alam et al., 2016; Masum, 2015; Teo et al., 2007). Consequently, the adoption of HRA in construction projects can be regarded as a natural progression.

Data quality concerns the accuracy, completeness, and reliability of data. With regard to data quality, big data management is the most challenging task when determining which data are helpful and which are not (Hu, 2020; Kim, 2014). Because of the vast amount of available data, it can be challenging to identify datasets appropriate for a specific purpose (Minbaeva, 2018; Munawar et al., 2022). In addition, the given data format is not suitable for the intended purpose or cannot be conveniently accessed (Custers & Uršič, 2016; Herden, 2020). Furthermore, many information sources, including appraisals, feedback, and surveys, are subject to subjectivity, making their accuracy challenging to determine (Shet et al., 2019).

Owing to the difficulties in obtaining, comprehending, and utilising large datasets, it is critical to design tools for extracting and analysing vital data (Nam et al., 2019). Prior studies have asserted that data quality is essential for human resource decisions and is critical for constructing credible HRA (Gurusinghe et al., 2021; Minbaeva, 2018; Pillai & Sivathanu, 2021).

As a result of the discussion above, the following hypotheses have been proposed.

H1: The perceived complexity of HRA influences its adoption.

H2: The perceived compatibility of HRA influences its adoption.

H3: The relative advantage of HRA influences its adoption.

H4: The data quality of HRA influences its adoption.

5.3.4.2 Organisational impact on HRA adoption

We hypothesise that the impact of organisational characteristics on HRA adoption is represented by three factors: top management support, organisational readiness, and analytical

competency. In innovation and technology adoption, top management support refers to the degree to which an organisation's top management supports the implementation of innovation and technology (Cruz-Jesus et al., 2019; Young & Jordan, 2008). Empirical and theoretical studies have found that it is an influential antecedent to adoption that has been found in empirical and theoretical studies alike (Gurusinghe et al., 2021; Kanwal et al., 2017; Sun et al., 2018). In the context of this study, top management support can be defined as the degree to which managers believe that HRA can improve their organisations' performance and provide sufficient support for this new technology (Gurusinghe et al., 2021; Minbaeva, 2018). Like any new technology, managers who believe that HRA can help them improve their organisation's performance are more likely to adopt it. Analytical functions are resource-intensive and require cross-departmental collaboration (Fernandez & Gallardo-Gallardo, 2020). Top management support is necessary to accelerate the adoption of IT innovations, create a welcoming climate, and provide appropriate resources (Lai et al., 2018; Shet et al., 2021). However, managers and business owners have argued about the actual benefits of HRA, with some doubts that investing in HRA can generate justificatory returns (Dahlbom et al., 2020; Zeidan & Itani, 2020). For example, Maroufkhani, Tseng, et al. (2020) suggested that in order to be effective, top managers need to be involved in the implementation process of data analytics. Previous studies have also found that top management support is essential for adopting HRA. They can either create or break projects (Gurusinghe et al., 2021; Shet et al., 2021).

A company's organisational readiness refers to its ability and willingness to adopt new technology and use information and communications technology (ICT) efficiently and effectively to meet the needs of its customers, employees, and shareholders (Gangwar, 2018; Garcia-Arroyo&Osca,2021).

The goal of organisational readiness is to ensure that firms can capitalise on new technologies by maximising their benefits (Clohessy et al., 2020; Spanos et al., 2002). This is a daunting task, as organisational readiness must be tailored to the specificity of each organisation (Aydn & Tasci, 2005; Azadegan & Teich, 2010). In HRA adoption, organisational readiness refers to the readiness of an organisation for HRA and the resources necessary to implement it (Deloitte,

2015; Shah et al., 2017). According to Deloitte (2015), poor organisational readiness hinders the adoption of HRA by most organisations. Hence, if an organisation is unprepared for HRA, it may struggle to adopt it (Marler & Boudreau, 2017; Saxena et al., 2021). In the related literature, organisational readiness, whether technically or financially, influences the early adoption of HRA (Marler & Boudreau, 2017; Maroufkhani et al., 2019; Shet et al., 2021).

The analytical ability of an individual is the ability to develop and prove causal links between critical components of an organisation's system, using appropriate analyses to test causality, demonstrating that the data are measured appropriately, and incorporating these findings into the decision-making process (Kryscynski et al., 2018). In the context of human resources, this refers to the availability of skilled employees who are knowledgeable about HRA (Shet et al., 2021). According to previous studies, if an organisation does not have skilled workers competent in data analytics, it may struggle to adopt HRA (Angrave et al., 2016; Fernandez & Gallardo-Gallardo, 2020; Gurusinghe et al., 2021; Marler & Boudreau, 2017). According to Marler and Boudreau (2017), human resource professionals who possess analytical skills are in short supply, the most frequently cited reason for the lack of widespread adoption of HRA. In contrast, it has been argued that individuals with strong analytical skills are better positioned to adopt HRA (Fernandez & Gallardo-Gallardo, 2020; Levenson, 2018; Minbaeva, 2018). Essentially, a human resource specialist is not a professional or a well-trained data scientist. However, for human resource managers to effectively use HRA in their organisations, they must at least understand the basics of research methodology and statistics to make appropriate insights and error-prone decisions (Gurusinghe et al., 2021; McAbee et al., 2017).

Based on the above discussion, the following hypotheses were proposed.

H5: Top management support of HRA influences its adoption.

H6: Organisational readiness for HRA influences its adoption.

H7: Analytical competencies of human resource people increase HRA adoption.

5.3.4.3 Environmental impact on HRA adoption

The environment in the TOE framework is viewed as a direct influence on behaviour because it is the climate in which an organisation carries out its operations (Ghaleb et al., 2021; Maduku et al., 2016). A broad definition of environmental variables includes external elements that impact an organisation's operations (Gangwar et al., 2014). In this study, we determined that external and competitive pressures, and external support from vendors are external factors that can influence HRA adoption.

Competitive/external the pressure refers to pressure exerted by competitors and other businesses in the same industry (Zhu & Kraemer, 2005). Both business partners and competitors may influence the adoption of new technologies (Shet et al., 2021). This pressure affects the organisation to adopt new technologies to enhance its performance and create a unique competitive advantage (D. Q. Chen et al., 2015; Kumar & Krishnamoorthy, 2020). Responses to competitive and external pressures can increase the tolerance associated with the adoption of new technologies such as complexity (H.-M. Chen et al., 2015; Walker & Brown, 2019). Previous studies have asserted that the more external pressure an organisation faces, the more likely it is to adopt a new technology to successfully compete in the market (Hsu et al., 2014; Lai et al., 2018; Maroufkhani, Tseng, et al., 2020; Tsai et al., 2013). For instance, Tsai et al. (2013) claim that competitive pressure is one of the most critical factors determining how companies adopt IS innovations.

Moreover, HRA can be linked to this analysis. Employees' capabilities and skills are crucial for a firm to succeed in a competitive market (Mohammed & Quddus, 2019). Human resources are critical assets that can build an organisation's value by fostering competitive growth (Gurusinghe et al., 2021). A firm's human resource assets must be exploited to their full potential through HRA insights (King, 2016; Zang & Ye, 2015; Zhang et al., 2021). Recent studies on HRA have argued that competitive pressure is necessary to utilise human resources and gain competitive advantage (Belizón & Kieran, 2021; Fernandez & Gallardo-Gallardo, 2020; Maroufkhani et al., 2019; Shet et al., 2021; Zeidan & Itani, 2020). Hence, HRA in

construction projects can help firms improve human resource management by identifying and resolving critical issues that affect employees' work.

In business, external support refers to the extension of support from a vendor or a third party to stimulate innovation and enable adoption (Al-Qirim, 2007; Biney, 2019). In the context of technology usage, we can describe activities that are knowledge-intensive and externally supported (Marchena Sekli & De La Vega, 2021; Puklavec et al., 2018; Youssef et al., 2022). According to Puklavec et al. (2018), third-party support and outsourcing can significantly influence innovation adoption because companies are more likely to install and use new technologies when they have third-party support. Lee and Larsen (2009) observed that external support plays a critical role in the adoption and utilisation of IT and innovation. In companies with insufficient IT specialists, external support is a strong predictor of big data analytics adoption because IT specialists are required to drive and promote IT and innovation adoption (Gangwar, 2018; Maroufkhani, Tseng, et al., 2020; Youssef et al., 2022).

As stated earlier, HRA is a relatively new technology that requires interdisciplinary knowledge (Andersen, 2017; Ozkan-Ozen & Kazancoglu, 2021). Therefore, vendors must support companies that intend to adopt this technology and make it a feasible option (Maroufkhani, Ismail, et al., 2020; Tursunbayeva et al., 2018). In the related literature, it was found that construction companies rely on outsourcing and vendors because they lack the technical skills to implement innovations such as big data analytics (Bilal et al., 2016; Lu & Zhang, 2021). Thus, it can be argued that in Jordan, construction companies need external support from specialist vendors to aid them in training and comprehending HRA technology.

Based on the above discussion, the following hypotheses were proposed.

H8: Competitive/ external pressure is positively influencing HRA adoption.

H9: External support from vendors is positively influencing HRA adoption.

5.3.4.4 HRA impact on project performance

In general, the concept of Human Resource Management (HRM) practices can be categorised as either “hard” or “soft” (Konzelmann et al., 2006). Hard HRM practices include predetermined approaches to human resource management, such as policies and procedures, selection and hiring processes, training, performance evaluation, and compensation. In comparison, soft HRM practices also include employment relationships (Parayitam et al., 2021). HRM is generally perceived as a crucial component of a firm’s success (Al-Dmour et al., 2017). An organisation benefits from it in two ways: it contributes to its success (Huselid, 1995), and it provides a competitive advantage (Amit & Belcourt, 1999). Work experience and employment relationships are affected by how HRM strategies and policies are implemented (Bodla & Ningyu, 2017; Guest, 2002). According to the project management literature, HRM practices serve as inputs for project performance (Huemann et al., 2007; Jiang et al., 2012; Wickramasinghe & Liyanage, 2013). Thus, HRM practices can be considered indirect contributors to project performance (Keegan et al., 2018; Popaitoon & Siengthai, 2014).

Correspondingly, in the human resources domain, related studies suggest that HRA plays a critical role in attracting and retaining talent. HR professionals can use HRA to provide employees with various benefits including healthcare, retirement plans, and other supplemental expenses (Belizón & Kieran, 2021; Giermindl et al., 2021). In essence, HRA is an emerging practice that focuses on quantitatively analysing employee data to identify potential and current performance issues (Larsson & Edwards, 2021; Qamar & Samad, 2021). Several studies have found that HRA provides data-driven insights that can improve HR practices such as talent management outcomes (Gurusinghe et al., 2021), better employee productivity (Gaur et al., 2019; Vivekananth, 2016), lower attrition and turnover rates (Gobble, 2017) and employee satisfaction and engagement (Qamar & Samad, 2021). These data-driven insights can be used to improve a firm’s HRM practices (King, 2016). Furthermore, HRA can serve as a tool to measure the value of human capital and HRM practices to ensure that they support and align with strategic goals (Angrave et al., 2016; Huselid, 2018; Larsson & Edwards, 2021).

Additionally, construction studies have concluded that the availability of skilled workers influences the overall performance of construction projects (Hussain et al., 2020; Jarkas, 2015). The literature suggests that HRA enhance workers' skills and improve their talent (Cherry, 2016; Gurusinghe et al., 2021; Zang & Ye, 2015). Thus, by implementing HRA in HR practices, it can be argued that the project will perform better by enhancing HR practices and boosting worker skills. Considering that HRA is part of big data analytics, this argument is also supported by studies that examine the impact of big data analytics on project performance (Gunasekaran et al., 2017; Mangla et al., 2020). As per Mangla et al. (2020), the use of big data analytics in the decision-making process enhances numerous aspects of project performance.

This leads us to suggest the following hypothesis.

H10: Adoption of HRA can positively influence project performance.

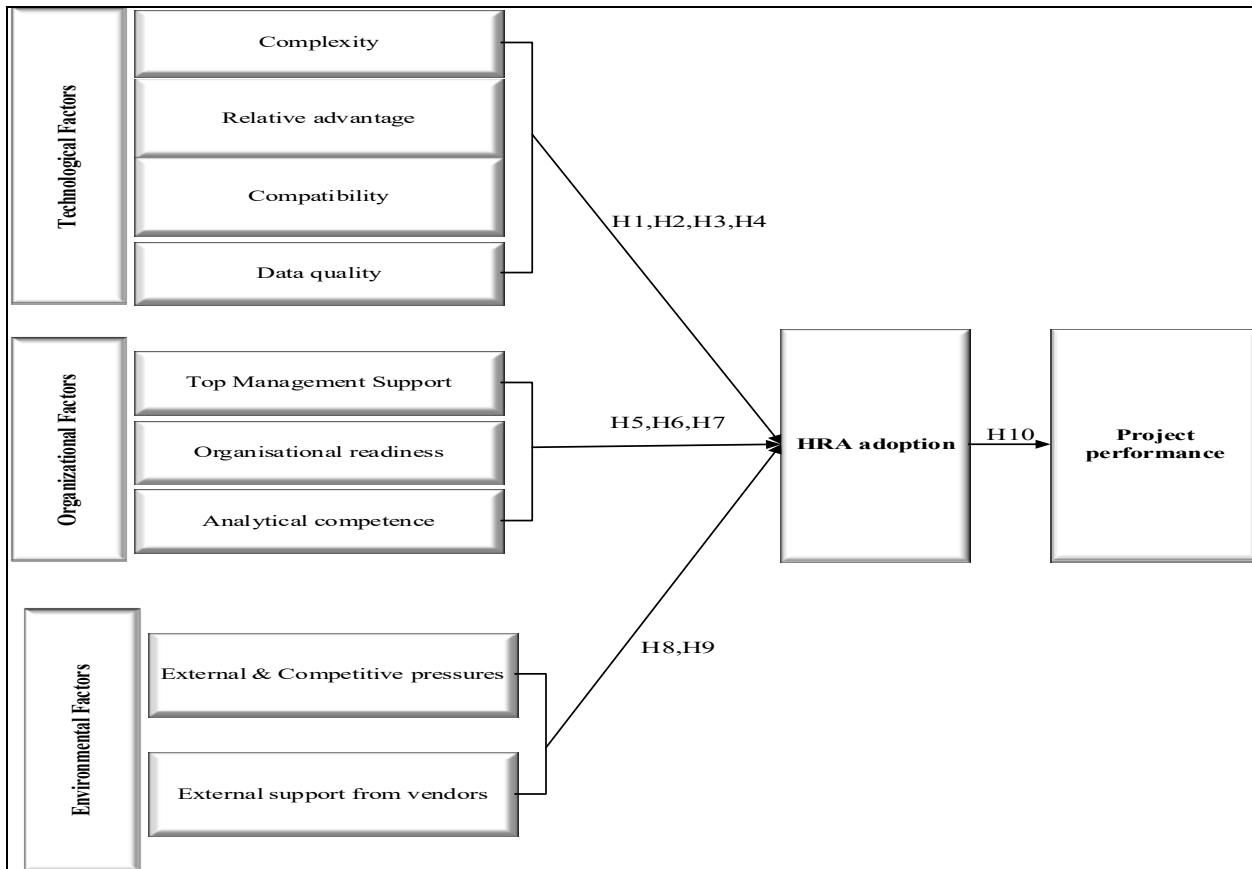


Figure 5. 1 Conceptual Framework

5.4 Research Method

Research has focused on a positivistic paradigm that holds that phenomena have an objective reality that can be articulated and quantified in causal relationships (Straub et al., 2004). Objective and social reality were captured in this study using survey responses as part of the positivist approach in order to identify HRA antecedents. As part of this approach, we study the literature on technology, big data, and HRA adoption to determine the antecedents of HRA adoption and their impact on project performance. A structural equation model was developed based on partial least squares to validate the hypothesised relationships based on the TOE framework and RBV theory, a structural equation model was developed based on partial least squares (PLS).

5.4.1 Data collection, measurement scales, and sampling

The data collection included a survey to identify the antecedents of HRA adoption in a Jordanian project and the effect of HRA adoption on the outcome of the project. Survey data were collected using an online questionnaire. The questionnaire was administered to all construction stakeholders, including firms, technical partners, organisational representatives, and professionals within the Jordanian construction industry, including subcontractors and equipment suppliers.

This study used a survey questionnaire comprising previously published multi-item measures with good psychometric properties except for relative advantage, human resource analytical competence, and data quality. Several stages of theoretical modelling, statistical testing, and refinement are involved in developing the measurement model (Straub, 1989). Based on existing measures and expert opinions, measurement items were created. First, the relative advantage is operationalised based on prominent HRA studies that suggest the advantages of HRA deployment. Regarding the analytical competence of human resources, the items were derived from a qualitative study by McCartney et al. (2020) and the data quality scale was drawn from the items developed by Minbaeva (2018). Other scales were adopted from the current literature on big data analytics and revised to fit the context of the current study, as shown in the Appendix. The questionnaire was presented to seven experts who were part of the digital transformation initiative in Jordan and two academicians who specialised in business analytics to review the items of all the constructs. The items were revised and some were deleted based on their recommendations. Subsequently, a pilot study was conducted by disseminating the questionnaire to human resources and business analysts in the construction industry using LinkedIn. Thirty-eight complete questionnaires were returned. Based on the validity and reliability measures from the pilot study, three additional items were deleted (that is, In our company, our human capital data are difficult to integrate, and HRA can improve business decisions related to acquiring, motivating, and retaining talented employees). The final questionnaire was then developed. For this assessment, the constructs were measured using a 5-point Likert scale (strongly disagree or strongly agree).

Cross-sectional surveys were used to collect data and to test the conceptual framework of the study. For this study, the authors used a convenience sampling technique for project managers, human resources, and big data specialists who participated in their companies' construction projects in Jordan to access data collection. This method is suitable when it is difficult to identify the target population. Paper and online surveys were used to collect data. A consulting company in Jordan distributed the paper-based questionnaire physically, whereas an online questionnaire was distributed to respondents via e-mail by the authors in collaboration with a consulting company in Jordan. The total number of responses received within two months was 288. After reviewing the returned questionnaires thoroughly for missing values, incomplete responses, and excluding responses from respondents without sufficient background in data and human resources analytics, out of 288 respondents who received the questionnaire, 198 usable responses were analysed. Confirmatory factor analysis and model tests were conducted on the obtained data. In sum, 80.3% of the respondents were male and 19.7% were female. Of the respondents, 42.9% had a master's degree, 36.9% had a bachelor's degree, and 20.2% held a PhD. Regarding experience, 2.5% had less than one year of work experience, 21.2% spent between 1 and 5 years with their companies, 14.6% spent between 5 and 10 years with their company, and the majority (61.6%) had more than 10 years of experience. The breakdown of age was 33.3% over 51 years, 19.2% between 41 and 50, 27.8% between 31 and 40, and 19.7% between 21 and 30 years. The demographic characteristics of respondents are shown in table 5.1.

Table 5. 1 Summary of the demographic profile

	Description	Frequency	Percentage
Gender	Male	159	80.3
	Female	39	19.7
Level of education	Bachelor's Degree	73	36.9
	Master's Degree	85	42.9
	Doctorate Degree	40	20.2
Years of experience	<1 year	5	2.5
	1–5 years	42	21.2
	5–10 years	29	14.6

	>10 years	122	61.6
Age	20–30 years old	39	19.7
	31–40 years old	55	27.8
	41–50 years old	38	19.2
	51 and above	66	33.3

5.5 Results

The model is reflective, because its structure is linked to its items. In particular, the study used measures that are expressions of constructs, that is, changes in the constructs resulted in changes in the measures. This study applied structural equation modelling (PLS-SEM) based on partial least squares to test the higher-order adoption model because its flexible assumptions allow it to estimate hierarchical models by removing the uncertainty of inadmissible solutions (Hair et al., 2011). PLS-SEM was used to estimate the hierarchical model because of its theoretical parsimony and reduced complexity (Hulland et al., 2010). Additionally, PLS-SEM is effective in providing valid results in a relatively small sample (Hair et al., 2011).

PLS-SEM includes two main phases of evaluation: 1- assessment of the measurement model and 2- assessment of the structural model (Hair et al., 2011). A structural equation model can be obtained by combining the structural and measurement models (Sarlis et al., 2009). As part of the first stage, a measurement model was examined to see how indicators relate to their items, whereas the second stage involved evaluating the structural model of hypothesis testing (Henseler et al., 2009).

5.5.1 Measurement Model

This study was guided by a roadmap for PLS-SEM assessment (Hair Jr et al., 2014). To ensure reliable and valid results, methods such as indicator reliability, internal consistency reliability, convergent validity, and discriminant validity assessment should be applied.

Regarding indicator reliability, reliability is defined as the measurement of consistency or the degree to which an instrument measures similarly under identical conditions each time (Fink & Litwin, 1995). Testing the indicator for reliability includes assessing the outer loading. A reliability assessment was conducted based on indicator loadings. Indicators with outer loading values greater than .07 demonstrate high reliability (Hair et al., 2011). According to Hair Jr et al. (2014), values greater than .40 are acceptable, pending further investigation. Table 5.2 shows the loadings for each of the lower and higher-order constructs. The seven loadings are lower than .70. Nonetheless, they exceeded the .40 value reported by Hair et al. (2014), which was used for the validation testing.

Related to internal consistency reliability, composite reliability was used to test internal consistency reliability. If items are consistent across constructs, there should be a composite reliability of 0.7 or greater (Hair Jr et al., 2014). The construct items were subjected to a composite reliability test to ensure their internal consistency, indicating that they were grouped with sufficient consistency (i.e., over 0.7).

In comparison, convergent validity examines the closeness of two measures of a concept. It is possible to identify another measure of a concept and associate it with a summed scale (Hair et al., 2014). Hair et al. (2014) established three methods to estimate relative convergent validity: factor loading (outer loading), construct reliability (as discussed previously), and variance extraction. (Hair et al., 2014 b). The average variance extracted (AVE) value is derived by averaging the mean and variance of the items loaded into a construct and is a distilled version of the convergence indicator. Convergence is considered adequate when the AVE is 0.5 or above (Hair et al., 2017). Table 2 shows that all constructs have an AVE ranging

from 0.504 to 0.690, confirming convergent validity, and indicating that no variables need to be removed.

Table 5. 2 Factor Loading

Factor	Item	Outer Loading	Composite Reliability	AVE
Complexity (CMX)	CMX1	0.757	0.772	0.531
	CMX2	0.732		
	CMX3	0.696		
Relative advantage (RLA)	RLA1	0.617	0.832	0.556
	RLA2	0.820		
	RLA3	0.800		
	RLA4	0.728		
Compatibility (CMP)	CMP1	0.654	0.810	0.592
	CMP2	0.738		
	CMP3	0.896		
Data Quality (DQ)	DQ1	0.735	0.839	0.511
	DQ2	0.652		
	DQ3	0.738		
	DQ4	0.762		
	DQ5	0.684		
Top management support (TMS)	TMS1	0.886	0.821	0.558
	TMS2	0.429		
	TMS3	0.791		
	TMS4	0.844		
Organizational readiness (OGR)	OGR1	0.886	0.870	0.690
	OGR2	0.769		
	OGR3	0.833		
Analytical competency (ANC)	ANC1	0.792	0.830	0.504
	ANC2	0.772		
	ANC3	0.749		
	ANC4	0.750		
	ANC5	0.415		
Competitive and external pressure (COP)	COP1	0.727	0.794	0.563
	COP2	0.724		
	COP3	0.797		

External support from vendors (ESV)	ESV1	0.718	0.782	0.545
	ESV2	0.716		
	ESV3	0.779		
HRA Adoptions	HRA1	0.713	0.890	0.619
	HRA2	0.837		
	HRA3	0.871		
	HRA4	0.756		
	HRA5	0.746		
Project performance (PRP)	PRP2	0.836	0.883	0.603
	PRP3	0.784		
	PRP4	0.694		
	PRP5	0.708		

Discriminant validity is the degree to which a test or other measure is free from influences that have nothing to do with the construct being measured (Fornell & Larcker, 1981). To conduct the test, also known as the Fornell and Larcker criterion, a researcher chooses a group of participants, measures the construct on which they are being tested, and then allows this measure to determine whether the variables are being used as score predictors (Henseler et al., 2015). If the construct is not related to other variables, the test is considered valid (Qandah et al., 2020). To this end, we constructed a matrix of latent variables, whose diagonals were replaced by the square root of the variable's average value (Fornell & Larcker, 1981; Hair et al., 2013). Generally, the diagonal cell value must be greater than the combined value of the columns and rows. Table 5.3 summarises the Fornell and Larcker criterion matrices based on the ten variables described in the research. The results show that diagonal cells always have higher values than their corresponding rows and columns.

Table 5. 3 Discriminant Validity

	ANC	CMP	CMX	COP	DQ	ESV	HRA	OGR	PRP	RLA	TMS
ANC	0.710										
CMP	0.554	0.769									
CMX	0.452	0.746	0.798								
COP	0.420	0.623	0.780	0.784							
DQ	0.427	0.458	0.572	0.622	0.715						
ESV	0.755	0.634	0.618	0.547	0.554	0.738					
HRA	0.491	0.835	0.668	0.639	0.434	0.632	0.887				
OGR	0.574	0.904	0.737	0.618	0.430	0.666	0.827	0.831			
PRP	0.197	0.361	0.146	0.217	0.240	0.259	0.265	0.206	0.776		
RLA	0.462	0.603	0.660	0.681	0.771	0.578	0.596	0.566	0.208	0.746	
TMS	0.599	0.912	0.750	0.626	0.508	0.692	0.836	0.979	0.215	0.587	0.747

5.5.2 Assessment of Structure Model

The second phase of the modelling process involved checking the structural model after ensuring that the constructs' measurements were consistent and accurate. At this stage, the researchers examined the relationship between construct hypotheses and predictive ability measures. The structural model contains a dependency relationship that connects the model constructs (Figure 5.2). As part of this study, 5000 re-samples were used to estimate the statistical significance of the hypothesised model (Hair et al., 2017).

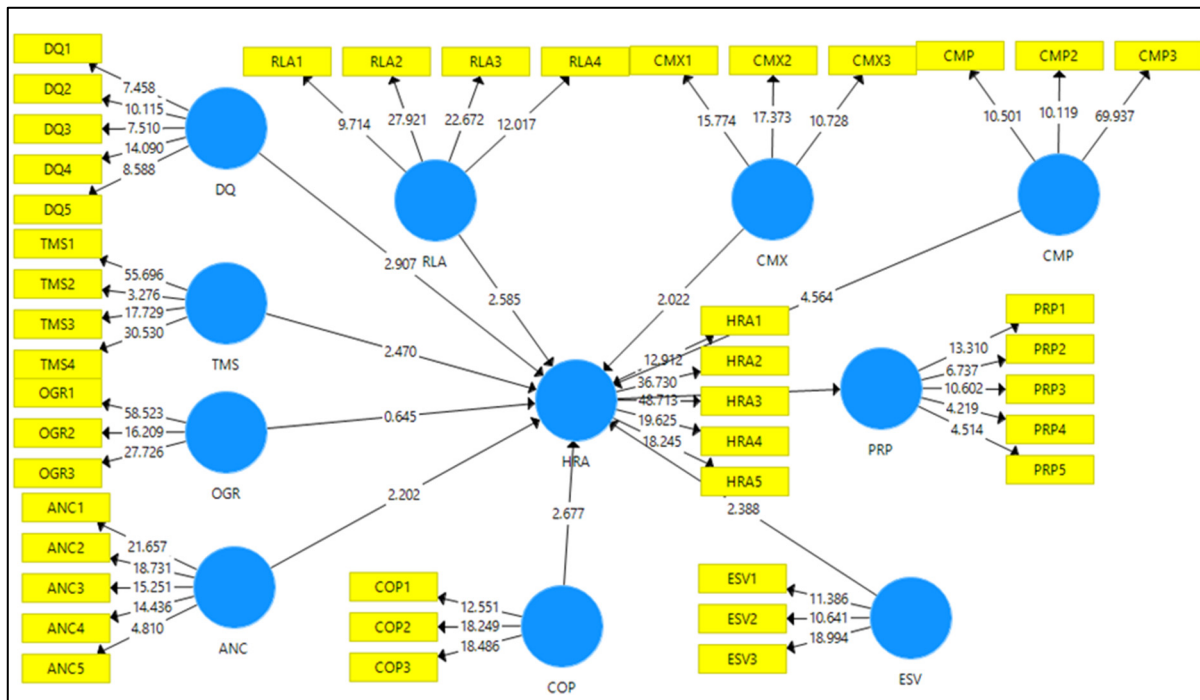


Figure 5. 2 A structural model to evaluate the direct effects of variables

Table 5.4 presents the hypothesised correlations and path coefficients of the constructs. When the path coefficient is close to +1, there is a clear positive relationship between the constructs, while the standardised value ranges from -1 to +1 (Hair Jr et al., 2016). To this end, 5,000 bootstrap subsamples and a critical t-value greater than ± 1.65 (one-tailed test) were used to determine the significance of the direct relationships. In addition to the t-value, a p-value was also provided, representing the likelihood of incorrectly rejecting the null hypothesis.

Based on Table 5.4, all hypotheses were accepted, except H6, which showed no significant relationship. Table 5.4 provides an overview of the results obtained from the bootstrapping analysis. The results demonstrate that technological constructs through their dimensions, namely, complexity ($\beta = -0.161$, $t = 2.022$, $p < 0.05$), relative advantage ($\beta = 0.186$, $t = 2.585$, $p < 0.05$), compatibility ($\beta = 0.356$, $t = 4.564$, $p < 0.05$), and data quality ($\beta = -0.194$, $t = 2.907$, $p < 0.05$) are antecedents that affect HRA adoption by construction companies in Jordan. Thus, H1, H2, H3, and H4 are supported.

Furthermore, this study examined the effects of organizational constructs on HRA adoption, including top management support ($\beta= 0.581, t=2.470, p<0.05$), organizational readiness ($\beta=-0.148, t=0.645, p>0.05$), and analytical competency ($\beta= -0.124, t=2.202, p<0.05$). The results show that top management support and analytical competency influence HRA adoption, whereas organizational readiness has no significant influence. Thus, H5 and H7 were supported, whereas H6 was rejected. Moreover, there is strong evidence that environmental factors affect HRA adoption. With the corresponding values of competitive and external pressure ($\beta= 0.222, t=2.677, p<0.05$) and external support from vendors ($\beta= 0.175, t=2.388, p<0.05$), Hypotheses H8 and H9 were supported.

Ultimately, this study aims to determine the effects of HRA adoption on project performance ($\beta= 0.515, t=6.413, p<0.05$). However, HRA adoption constructs positively contribute to project performance. Thus, H10 is supported.

Table 5. 4 Hypothesized Direct Effects of the Variables

Hypotheses		Path Coefficient	t Statistics	p-Value	
H1	CMX -> HRA	-0.161	2.022	0.044	Supported
H2	RLA -> HRA	0.186	2.585	0.010	Supported
H3	CMP -> HRA	0.356	4.564	0.000	Supported
H4	DQ -> HRA	-0.194	2.907	0.004	Supported
H5	TMS -> HRA	0.581	2.470	0.014	Supported
H6	OGR -> HRA	-0.148	0.645	0.519	Unsupported
H7	ANC -> HRA	-0.124	2.202	0.028	Supported
H8	COP -> HRA	0.222	2.677	0.008	Supported
H9	ESV -> HRA	0.175	2.388	0.017	Supported
H10	HRA -> PRP	0.265	4.171	0.000	Supported

Hair Jr et al. (2014) argued that researchers should also present the coefficient of determination (R^2) and predictive relevance (Q^2) in addition to stating the significance of the relationships in order to shed light on the variance of the endogenous variables. The determination coefficient,

also known as the R^2 value, is the most commonly used metric for evaluating structural models. The R^2 value is a measure of the model's predictive accuracy, indicating how much variance is explained by all exogenous (independent) variables in the endogenous (dependent) variable (Hair Jr et al., 2016). The R^2 value ranged from 0 to 1, with a significant value greater than 0.75 and a moderate value between 0.50 and 0.25 (Hair et al., 2014). The R^2 is a commonly used metric for evaluating a structural model's ability to explain both independent and dependent constructs (Kline, 2015). In contrast, The Stone-Geisser Q-test is a model fit predictor. It determines how well the model can predict the parameter estimation. The blindfolding method was used in the PLS program to measure the Q-test values. Consequently, the omission gap was set to seven during the blindfolding process. Values of $Q > 0$ indicate a positive correlation between the exogenous and endogenous constructs. Conversely, values below zero indicate a negative correlation (Hair et al., 2012).

Table 5.5 shows the structural model of the proposed research model along with the R^2 and Q^2 values. The first latent construct for HRA adoption was the R^2 value, which was 0.770 with a Q^2 value of 0.458. Exogenous (independent) constructs have significant predictive power, with a large proportion of HRA adoption having a predictive relevance. Furthermore, project performance was the second endogenous latent variable, with an R^2 value of 0.070 and a Q^2 value of 0.036, indicating that the model's exogenous variables had acceptable predictive power and small predictive relevance.

Table 5. 5 Predictive power and predictive relevance of the model

Endogenous latent Construct	Predictive Power		Predictive Relevance	
	R^2	Status	Q^2	Status
HRA	0.770	Strong	0.458	Large
PRP	0.070	small	0.036	Small

5.6 Discussion

This study investigated how HRA adoption occurs in the Jordanian construction industry. We used the TOE framework to test the most relevant barriers for construction companies to successfully adopt HRA, while RBV theory was applied to formulate the causal relationship between HRA adoption and project performance. This study has yielded several key findings.

5.6.1 Key findings

In this study, we identified the technological, organisational, and environmental factors influencing HRA adoption in construction companies and tested the potential impact of adoption on project performance. In this study, the four dimensions of technological characteristics are complexity, relative advantage, compatibility, and data quality. Organisational factors, such as top management support, organisational readiness, and analytical competency, were identified as the main drivers. Two environmental factors are the determinants: external/competitive pressure and external support from vendors. This study also predicted that the intention to adopt HRA would influence the relationship between successful implementation and project performance. The measurement model is reliable and valid for the constructs investigated in this study. Based on the measurement model, top management support, as an organisational characteristic, is the most influential factor in adopting HRA. This could be explained by the top management's focus on transactional activities that directly impact profitability rather than long-term strategic benefits (Fernandez & Gallardo-Gallardo, 2020; Gurusinghe et al., 2021; Sun et al., 2018). Managers can facilitate the successful adoption of HRA by recognising strategic concerns.

The second critical factor for adopting an HRA is its compatibility with the technology. Existing systems and organisational values must be compatible with HRA (Kapoor & Kabra, 2014; Shet et al., 2021). HRA will be challenged by employees who want to preserve their current values and authority if the organisation is not ready for change (Ozkan-Ozen &

Kazancoglu, 2021). Similarly, it is vital to easily integrate the HRA with BIM and other ERPs (Ram et al., 2019).

These findings suggest that data quality is a predictor of adoption of HRA. Organisations with high data quality rates are more likely to adopt HRA than those with low rates. Data must be available and consistent to avoid misleading decisions (Angrave et al., 2016; Levenson & Fink, 2017).

The third technical factor is the relative advantage of adopting the HRA. It has been proven that the proposed antecedent is vital to HRA adoption. Many organisations believe that an HRA can provide them with advantages such as recruiting and retaining talent and supporting their strategic objectives, but others doubt its benefits (Marler & Boudreau, 2017; Sivathanu & Pillai, 2019). Thus, it is crucial to prove the real advantages that HRA provides to a company compared to existing technologies such as HRIS and BIM.

The fourth technological factor is the perceived complexity. This arguably stems from the interdisciplinary nature of this emerging technology (Ozkan-Ozen & Kazancoglu, 2021). In addition, as a function, human resources are subjective, and decisions are made in different contexts depending on the context, whereas HRA is objective. Thus, it is challenging to quantify the essential variables of human resources (Lai et al., 2018; Shet et al., 2021).

In the context of organisational characteristics, while top management was the most prominent factor in HRA adoption, organisational readiness was found to be insignificant as the only factor. This finding aligns with prior studies on big data adoption (Gangwar, 2018; Marchena Sekli & De La Vega, 2021). The nature of respondents may explain this result. As most of the questionnaires were completed by IT managers or IT-related employees, we believe that they had sufficient IT infrastructure and skills and underestimated the financial aspect of HRA adoption. In contrast to organisational readiness, analytical competency significantly affects HRA adoption. This finding is consistent with Gurusinghe et al. (2021), who argued that the availability of people with high analytical competency positively affects adoption. The

perception is that HRA is designed for and targeted at people with analytical skills, not HR professionals seeking to conduct predictive and prescriptive HRA. In addition, HRA involves advanced statistical skills as well as knowledge of AI and machine learning (Angrave et al., 2016; Levenson & Fink, 2017; Marler & Boudreau, 2017).

In the environmental context, two proposed factors (external/competitive pressure and external support from vendors) have been proven to significantly impact HRA adoption. External pressures could drive construction companies to adopt HRA as a new technology to keep up with the rivalry and demands of business partners (Fernandez & Gallardo-Gallardo, 2020; Musawa & Wahab, 2012). Shet et al. (2021) argue that a company that excels in managing people will deliver better results. In other words, if a competitor is able to better manage their people by using analytics to hire, develop, reward, and retain employees, it becomes imperative that human resources leverage analytics to better manage their employees.

Likewise, our hypothesis is that external support from vendors and providers is vital for increasing the likelihood of HRA adoption. Premkumar and Roberts (1999) argue that adopting IS innovations can also be positively affected by external support or outsourcing from external providers. Most companies are more likely to implement new systems without outsourcing or third-party support (Maroufkhani, Tseng, et al., 2020). Similar findings have been noted in previous studies on big data adoption (Gangwar, 2018; Youssef et al., 2022). These findings suggest that firms can rapidly build innovative capabilities by learning from vendors and platforms available for free (Alam et al., 2016).

The results show that HRA adoption significantly predicted improved project performance. In other words, HRA would improve performance related to human resources, employee skills, motivation, and talent management and allocate resources more effectively within projects, the human resources department, and the overall company strategy (Giacumo & Bremen, 2016; Jiang & Akdere, 2021). In this regard, Dabirian et al. (2019) noted that human resource allocation can drastically influence the cost and time of a project, especially if used as an effective strategy for enhancing the performance of a project, which can be achieved by better

estimating employees' needs before the project begins. The current study is consistent with the prior literature on the influence of IT innovation adoption on project performance (Hewage et al., 2008; Ikediashi & Ogwueleka, 2016; Yang & Huang, 2016a, 2016b).

5.6.2 Implications for research

From a theoretical standpoint, this study contributes to the literature in several ways. First, they demonstrated how a TOE framework can be empirically explored in the context of HRA adoption. Despite the existing literature applying this framework and others, such as the TAM model, the HRA adoption literature is based on anecdotal claims and conceptual frameworks (Fernandez & Gallardo-Gallardo, 2020; Gurusinghe et al., 2021; Shet et al., 2021) or qualitative investigations (Margherita, 2021). However, this study empirically demonstrates the feasibility and benefits of adopting HRA in a real-world context. The adoption of analytics within organisations is affected by technological, organizational, and environmental factors. Several subfactors within each of these factors are critical for the successful implementation of analytics. Several factors that affect HRA adoption have been discussed in the literature (Minbaeva, 2018; Shet et al., 2021; Van den Heuvel & Bondarouk, 2017). However, the measurement scales could not be tested empirically. This study contributes to the literature by developing and validating scales for future research.

By analysing all the challenges in an organisation and linking them to broader themes defined as factors, we contribute to understanding HRA adoption in an organisation. To emphasise how the variables within each factor impact the adoption process, we discuss them in detail. In this study, we contextualise the TOE framework and RBV to contribute to the emerging field of HRA in the construction sector. We expect HRA adoption to improve project performance, as the technology increases performance. Studying the project performance implications of HRA using the proposed framework will be of great help.

Regarding how resources can drive competitive advantage, RBV has been promising, especially in terms of project management capabilities tailored to a specific organizational

environment over time. Although RBV has many advantages for practitioners and scholars alike, opponents have accused it of overemphasising its potential, especially regarding the lack of generalisability criteria and definitions of ailments (Almarri & Gardiner, 2014). This study contributes to research that utilises RBV in the project management domain and stresses its potential. This extended Wamba et al. (2017) claim that the RBV allows scholars to examine all the business values created by big data adoption.

Ultimately, research on big data adoption and implementation in general and on HRA technology is still rudimentary and limited in developing countries (Lutfi et al., 2022). Although there is an increasing body of literature in the developed world, generalising its findings to a developing country is not possible owing to differences in characteristics (Reyes-Veras et al., 2021). In that sense, this study contributes to the current body of knowledge in developing countries in general, and the Middle East in particular, which scholars can expand in the future.

5.6.3 Implications for practice

Several stakeholders must be involved for HRA to be successfully adopted in an organisation. The findings of this study have several implications for human resource managers, IT managers, human resource leaders, consulting practitioners, CEOs, academics, and policymakers. This study examined the managerial characteristics that enable HRA adoption. Both HRM practitioners and HRA managers must consider technological, organizational, and environmental factors. To reap the benefits of HRA, organisations struggling to implement it must assess their positions on these factors. To reap the benefits of HRA, organisations struggling to implement them must evaluate their positions on these factors. They must also determine their focus areas to help build more substantial practices.

In addition, this study provides project managers in the construction industry with valuable information about the essentials of deploying analytics in general in their project management. As such, the current study can be used for future enhancements to analytics in its application

or in a study that focuses on deployment. The findings of this study have several positive implications, indicating that HRAs can be an adoption of HRA in construction companies. It is not easy to assess the factors which enter a company's decision-making process; it requires due consideration and an analysis of HRM practices. This study has several negative implications, indicating that HRA adoption can be problematic. The findings of this study should be considered a starting point for further research on the factors influencing HRM practices within project management.

Furthermore, it outlines how HRA capability should be built by creating an organisational culture. Third, we demonstrate the importance of an HRA's ability to make effective decisions regarding talent management and strategy improvement. Additionally, HRA software suppliers can provide valuable insights into how companies decide whether to implement an HRA. This insight can help firms formulate effective marketing strategies for their products. To increase HRA adoption, software manufacturers can focus on persuading the top management of the benefits of HRA software (Gurusinghe et al., 2021).

5.7 Limitations and future research

This study has some limitations. First, we examine the key factors associated with HRA using the TOE framework. Previous studies have identified other factors relevant to the TOE framework, such as training, development, and access to skilled workers, in addition to individual and data governance factors (Shet et al., 2021). Therefore, future studies should incorporate these factors in their research.

Moreover, HRA adoption and its impact on project performance are studied using a direct causal relationship effect. This proposed relationship can be mediated by other variables, such as HRM practices and talent management outcomes (Gurusinghe et al., 2021) or moderated by human resources, such as strategic business alignment (Akter et al., 2016), firm size, and data-driven culture (Gurusinghe et al., 2021; Van den Heuvel & Bondarouk, 2017).

This study is an empirical exploration of HRA adoption. As such, some variables have been measured using newly developed scales that require further validation in different contexts. Therefore, this study serves as a model for future research to validate these scales.

5.8 Conclusion

HRA is becoming increasingly indispensable for every business today due to its ability to make evidence-based and effective decisions to ensure a sustainable future. In this study, we developed a conceptual model that evaluates the antecedents of HRA adoption and its implications for project performance. This study was designed based on the impact of technological, organizational, and environmental factors on HRA adoption. In addition, we examine how HRA adoption influences project performance in Jordan's construction industry. The integrated conceptual model draws upon both theoretical foundations based on the RBV theory and the TOE framework. According to the results, TOE contexts are associated with significantly positive effects on HRA adoption, which leads to improved project performance for construction companies. This study has implications for scholars and paves the way for further empirical studies of HRA adoption and implementation. Additionally, this study supports managers and policymakers in making appropriate decisions related to HRA adoption.

CONCLUSION

This study investigated the effect of strategic components of training and career development on increasing employee performance. In addition, it explored the impact of strategic planning for human resources with its dimensions (environmental variables, needs assessment, dealing with results, human resources plan) on the performance of project management with its dimensions (time, cost, safety, quality) for infrastructure companies in Jordan. Lastly, it examines the antecedents of adopting HRA on Jordanian construction companies and its role in enhancing overall project performance. The findings of this study suggest that strategic planning for human resources is a vital tool for companies in improving their overall project performance. This is because it helps companies to align their human resources with their strategic plans, thus enabling them to develop their people, better understand their workforce needs, and deliver better services to their clients. The HRA technology and strategic planning for human resources dimensions can be adopted by Jordanian construction companies to enhance their overall project performance. This is because it helps companies to align their human resources with their strategic plans, thus enabling them to develop their people, better understand their workforce needs, and deliver better services to their clients.

The empirical results have shown the following:

- 1- Results indicate that the human resources strategy helps to retain and attract workers, providing they have the appropriate skills and sufficient numbers of human resources.
- 2- According to this paper, demographic variables (company age - company capital - company project size) have an effect on the performance of project management for infrastructure companies in Jordan with regard to strategic planning for human resources. The longer the company has been in business, the more experience it will acquire, and the larger its capital base, the better it will be able to assess the value of the projects it can implement. Also, the size of the company affects its productivity and the size of the projects it can accept.

- 3- In the field of HRP, preparation is also essential for any project that seeks to meet its employment needs. Moreover, characteristics are based on the type and volume of work activities to achieve the company's goals in the future and under changing conditions.
- 4- Furthermore, strategic personnel planning affects project management performance in the dimension (cost) of a commissioning company's infrastructure. A well-designed talent plan can result in lower financial costs and a corresponding balance between supply and demand when talent is characterized by competence, ability, and willingness to work.
- 5- Employee performance was positively related to training policy implementation (0.186), training process stages (0.355), and training program quality (0.266).
- 6- Training and development also influence performance quality positively, according to the results.
- 7- Employee performance is marginally affected by career development. Employee performance can be improved by having a career development program in place, and some employees will be able to progress up the career ladder as a result.
- 8- The findings showed that eight factors, namely, complexity, relative advantage, compatibility, data quality, top management support, analytical competency, competitive and external pressures, and external support from vendors, significantly affect HRA adoption, whereas organisational readiness shows an insignificant relationship.
- 9- The results suggest that HRA adoption can significantly enhance project performance.

RECOMMENDATIONS

This study investigated how training and career development components can enhance employee performance. Moreover, it examined the impact of strategic human resource management on the performance of infrastructure companies in Jordan in terms of project management (time, cost, safety, quality) using its dimensions (environmental variables, needs assessment, handling results, human resources plan). Finally, it examines how HRA has influenced and enhanced the performance of Jordanian construction companies. The following recommendations can be drawn from this study:

- 1- Implementing a well-designed human resource management system can help improve the performance of infrastructure companies in Jordan. The system should be designed to address environmental, needs assessment, and handling results dimensions.
 - 2- Ensuring employees have the necessary training and development opportunities can enhance their performance. Training programs should be tailored to meet each company's employees' specific needs and should be provided on an ongoing basis.
 - 3- Strategic human resource management is essential for the success of infrastructure companies in Jordan. Proper planning and management of employee selection, training, development, and motivation can help improve the performance of these companies.
 - 4- HR policies and procedures need to be reviewed regularly and updated if needed so they are compatible with changes in the internal or external environment of the organizations; this will create a favourable work environment for employees.
 - 5- The impact of HRA on the performance of Jordanian construction companies has been positive overall. In particular, HRA has helped to increase the efficiency and quality of project management activities carried out by these companies. These benefits have contributed significantly to their overall success in the market.
- Checklist for HRM Systems

- Does the company have a human resource management system in place?
 - What is the system's design focus?
 - How frequently is the system updated?
 - What are the systems' environmental dimensions? (e.g., staffing requirements, diversity considerations, work-life balance policies and programs, etc.)
 - What are the systems' needs assessment dimensions? (e.g., organizational analysis, job analysis, workplace surveys, interviews)
- 6- The construction industry should rely more on making decisions based on information gathered and analyzed by modern analytics tools rather than depending on personal intuitive and gut feelings.
- 7- Different stakeholders in the infrastructure and construction industry should be informed about the barriers and benefits of adopting HRA technology to overcome any resistance to adopting it.

LIST OF BIBLIOGRAPHICAL REFERENCES

- Abdel-Wahab, M. (2012). Rethinking apprenticeship training in the British construction industry. *Journal of Vocational Education & Training*, 64(2), 145-154.
- AbdElaal, A. A., Al Shobaki, M. J., Abu-Naser, S. S., & El Talla, S. A. (2022). The Impact of Strategic Planning for Increasing the Level of Performance in Egyptian Ceramic Companies. *International Journal of Academic Accounting, Finance & Management Research(IJAAFMR)*, 12(5), 23-45.
- Abu-Hussein, R., Hyassat, M., Sweis, R., Alawneh, A., & Al-Debei, M. (2016). Project management factors affecting the enterprise resource planning projects' performance in Jordan. *Journal of Systems and Information Technology*.
- Adam Jr, E. E. (1994). Alternative quality improvement practices and organization performance. *Journal of Operations management*, 12(1), 27-44.
- Adshead, D., Thacker, S., Fuldauer, L. I., & Hall, J. W. (2019). Delivering on the Sustainable Development Goals through long-term infrastructure planning. *Global Environmental Change*, 59, 101975.
- Agarwal, V., Mathiyazhagan, K., Malhotra, S., & Saikouk, T. (2021). Analysis of challenges in sustainable human resource management due to disruptions by Industry 4.0: an emerging economy perspective. *International Journal of Manpower*.
- Ahmad, H., Bazlamit, I., & Ayoush, M. (2017) Investigation of Document Management Systems in Small Size Construction Companies in Jordan. *Procedia Engineering*, 182, 3 – 9.
- Ahmadi, H., Nilashi, M., & Ibrahim, O. (2015). Organizational decision to adopt hospital information system: an empirical investigation in the case of Malaysian public hospitals. *Int J Med Inform*, 84(3), 166-188.
<https://doi.org/10.1016/j.ijmedinf.2014.12.004>
- Ahmed, V., Aziz, Z., Tezel, A., & Riaz, Z. (2018). Challenges and drivers for data mining in the AEC sector. *Engineering, Construction and Architectural Management*.
- Ahuja, V., Yang, J., & Shankar, R. (2009a). Benefits of collaborative ICT adoption for building project management. *Construction Innovation*.
- Ahuja, V., Yang, J., & Shankar, R. (2009b). Study of ICT adoption for building project management in the Indian construction industry. *Automation in construction*, 18(4), 415-423.

- Aiyetan, A. O., & Das, D. K. (2022). Factors and Strategies for Improving Construction Management on Sites in Mega-Projects in South Africa: An Explorative Survey. *Infrastructures*, 7(2), 19. doi.org/10.3390/infrastructures7020019.
- Akadiri, P. O., Chinyio, E. A., & Olomolaiye, P. O. (2012). Design of a sustainable building: A conceptual framework for implementing sustainability in the building sector. *Buildings*, 2(2), 126-152.
- Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., & Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics*, 182, 113-131.
- Al Balkhy, W., Sweis, R., & Lafhaj, Z. (2021). Barriers to adopting lean construction in the construction industry—The case of Jordan. *Buildings*, 11(6), 222.
- Al-Dmour, R. H., Masa'deh, R. e., & Obeidat, B. Y. (2017). Factors influencing the adoption and implementation of HRIS applications: are they similar? *International Journal of Business Innovation and Research*, 14(2), 139-167.
- Al-Hujran, O., Al-Lozi, E. M., Al-Debei, M. M., & Maqableh, M. (2018). Challenges of cloud computing adoption from the TOE framework perspective. *International Journal of E-Business Research (IJEER)*, 14(3), 77-94.
- Al-Qaralleh, R. E., & Atan, T. (2021). Impact of knowledge-based HRM, business analytics and agility on innovative performance: linear and FsQCA findings from the hotel industry. *Kybernetes*.
- Al-Qirim, N. (2007). The adoption of eCommerce communications and applications technologies in small businesses in New Zealand. *Electronic Commerce Research and Applications*, 6(4), 462-473.
- Al-Qudah, S., Obeidat, A. M., & Shrouf, H. (2020). The impact of strategic human resources planning on the organizational performance of public shareholding companies in Jordan. *Problems and Perspectives in Management*, 18(1), 219.
- ALagah, A. (2021). Strategic Human Resource outsourcing enterprise resource Planning and Performance: A systematic Review. *World Bulletin of Management and Law*, 5, 15-22.
- Alam, M. G., Masum, A. K., Beh, L. S., & Hong, C. S. (2016). Critical Factors Influencing Decision to Adopt Human Resource Information System (HRIS) in Hospitals. *PloS one*, 11(8), e0160366. <https://doi.org/10.1371/journal.pone.0160366>

- Albalkhy, W., & Sweis, R. (2022). Assessing lean construction conformance amongst the second-grade Jordanian construction contractors. *International Journal of Construction Management*, 22(5), 900-912.
- Albrecht, S. L., & Marty, A. (2020). Personality, self-efficacy and job resources and their associations with employee engagement, affective commitment, and turnover intentions. *International Journal of Human Resource Management*, 31(5), 657– 681. <https://doi.org/10.1080/09585192.2017.1362660>
- Almarri, K., & Gardiner, P. (2014). Application of resource-based view to project management research: supporters and opponents. *Procedia Social and Behavioral Sciences*, 119, 437-445.
- Almazzomi, N., Ilmudeen, A., & Qaffas, A. A. (2021). The impact of business analytics capability on data-driven culture and exploration: achieving a competitive advantage. *Benchmarking: An International Journal*.
- Alnasseri, N. (2015). *Managing and controlling airport construction projects: a strategic management framework for operators*. University of Northumbria at Newcastle (United Kingdom).
- Alqirem, R., Kasasbeh, H., & Alghusin, N. (2018). The effect of construction sector on the economic growth of Jordan. *CEA Journal of Economics*, 13(2).
- Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. *Journal of Enterprise Information Management*.
- Amit, R., & Belcourt, M. (1999). Human resources management processes: a value-creating source of competitive advantage. *European Management Journal*, 17(2), 174-181.
- Anam Amin, R. S., & Lodhi, M. R. N. (2013). The impact of employees training on the job performance in education sector of Pakistan. *Middle-East Journal of scientific research*, 17(9), 1273-1278.
- Andersen, M. K. (2017). Human capital analytics: the winding road. *Journal of Organizational Effectiveness: People and Performance*.
- Anderson, J. C., & Gerbing, D. W. (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. *Psychometrika*, 49(2), 155-173.
- Angrave, D., Charlwood, A., Kirkpatrick, I., Lawrence, M., & Stuart, M. (2016). HR and analytics: why HR is set to fail the big data challenge. *Human Resource Management Journal*, 26(1), 1-11.

- Anitha, J. (2014). Determinants of Employee Engagement and their Impact on Employee Performance. *International Journal of Productivity and Performance Management*, 63(3), 308-323.
- Arianto, B. (2015). Kampanye kreatif dalam kontestasi presidensial 2014. *Jurnal Ilmu Sosial dan Ilmu Politik*, 19(1), 16-39.
- Arif, M., Al Zubi, M., Gupta, A. D., Egbu, C., Walton, R. O., & Islam, R. (2017). Knowledge sharing maturity model for Jordanian construction sector. *Engineering, Construction and Architectural Management*.
- Armstrong, M., & Brown, D. (2019). Strategic Human Resource Management: back to the future. *Institute for Employment Studies reports*, 1-36.
- Aryanto, R., Fontana, A., & Afiff, A. Z. (2015). Strategic human resource management, innovation capability and performance: An empirical study in Indonesia software industry. *Procedia-Social and Behavioral Sciences*, 211, 874-879.
doi.org/10.1016/j.sbspro.2015.11.115
- Asfaw, A. M., Argaw, M. D., & Bayissa, L. (2015). The impact of training and development on employee performance and effectiveness: A case study of District Five Administration Office, Bole Sub-City, Addis Ababa, Ethiopia. *Journal of Human Resource and Sustainability Studies*, 3(04), 188.
- Aunguroch, Y., Gunawan, J., & Fisher, M. L. (2022). Introduction: The Evolution of Human Resource Management. In *Redesigning the Nursing and Human Resource Partnership* (pp. 1-13). Springer. doi:[10.1007/978-981-16-5990-4_1](https://doi.org/10.1007/978-981-16-5990-4_1).
- Avunduk, Y. (2021). The relationship between the performance and the perceived stress of employees. *Research in Social Sciences and Technology*, 6(1), 102-112.
- Awa, H. O., Ukoha, O., & Emecheta, B. C. (2016). Using TOE theoretical framework to study the adoption of ERP solution. *Cogent Business & Management*, 3(1), 1196571.
- Awang, P. (2015). *SEM made simple: A gentle approach to learning Structural Equation Modeling*. MPWS Rich Publication, Bangi.
- Aydiner, A. S., Tatoglu, E., Bayraktar, E., Zaim, S., & Delen, D. (2019). Business analytics and firm performance: The mediating role of business process performance. *Journal of Business Research*, 96, 228-237.
- Aydın, C. H., & Tasci, D. (2005). Measuring readiness for e-learning: Reflections from an emerging country. *Journal of Educational Technology & Society*, 8(4), 244-257.

- Ayoub, H., Sweis, G., Abu-Khader, W., & Sweis, R. (2022). A framework to evaluate sustainable construction principles in government building projects: the case of Jordan. *Engineering, Construction and Architectural Management*(ahead-of-print).
- Azadegan, A., & Teich, J. (2010). Effective benchmarking of innovation adoptions: A theoretical framework for e-procurement technologies. *Benchmarking: An International Journal*.
- Baccarini, D. (1999). The logical framework method for defining project success. *Project management journal*, 30(4), 25-32.
- Badi, S., Ochieng, E., Nasaj, M., & Papadaki, M. (2021). Technological, organisational, and environmental determinants of smart contracts adoption: UK construction sector viewpoint. *Construction Management and Economics*, 39(1), 36-54.
- Bagheri, J. (2016). Overlaps between human resources' strategic planning and strategic management tools in public organizations. *Procedia-Social and Behavioral Sciences*, 230, 430-438.
- Bahr, M., & Laszig, L. (2021). Productivity development in the construction industry and human capital: a literature review. *arXiv preprint arXiv:2104.00129*.
- Baker, J. (2012). The technology–organization–environment framework. *Information systems theory*, 231-245.
- Baporikar, N. (2022). International Human Resource Management Strategies for Multicultural Organizations. In *Research Anthology on Human Resource Practices for the Modern Workforce* (pp. 1666-1687). IGI Global. doi: 10.4018/978-1-6684-3873-2.ch084.
- Barbosa, F., Woetzel, J., & Mischke, J. (2017). *Reinventing construction: A route of higher productivity*.
- Barker, H., & Ingram, H. (2011). Addressing scarce construction skills for competitive advantage: a case study. *Training & Management Development Methods*, 25(4), 549.
- Barney, J. B., & Arikan, A. M. (2005). The resource-based view: origins and implications. *The Blackwell handbook of strategic management*, 123-182.
- Bartlett, K. R., Johnson, K. R., & Schneider, I. E. (2016). Comparing strategic human resource development approaches for tourism and hospitality workforce planning. *Journal of Human Resources in Hospitality & Tourism*, 15(4), 440-461.

- Bashir, N. A., & Jehanzeb, K. (2013). Training and Development Program and Its Benefits to Employee and Organization: A Conceptual Study. *European Journal of Business and Management*, 5(2), 243–252. www.iiste.org
- Bassi, L. (2011). Raging debates in HR analytics. *People and Strategy*, 34(2), 14.
- Bassi, L. J., & McMurrer, D. P. (2008). Toward a human capital measurement methodology. *Advances in Developing Human Resources*, 10(6), 863–881.
- Bayindir, L., & Şahin, E. (2007). A review of studies in swarm robotics. *Turkish Journal of Electrical Engineering & Computer Sciences*, 15(2), 115-147.
- Becker, B. E., & Huselid, M. A. (1998). Human resources strategies, complementarities, and firm performance. *SUNY Buffalo: Unpublished manuscript*.
- Bekr, G. A. (2018). Study and assessment of causes and effects of delay in large public construction projects in Jordan. *International Journal of Applied Engineering Research*, 13(8), 6204-6210.
- Belizón, M. J., & Kieran, S. (2022). Human resources analytics: A legitimacy process. *Human Resource Management Journal*, 32(3), 603-630.
- Belout, A., & Gauvreau, C. (2004). Factors influencing project success: the impact of human resource management. *International Journal of Project Management*, 22(1), 1-11.
- Berkley, B., & Saylor, J. (1994). 'Customer-Driver Project Management. In: New York: McGraw-Hill.
- Bid, S., & Siddique, G. (2020). Water-Level Fluctuation (WLF) Of Panchet Dam in India and Assessment of Its Human Risk Using AHP Method. *Geojournal*, 1-26.
- Bilal, M., Oyedele, L. O., Kusimo, H. O., Owolabi, H. A., Akanbi, L. A., Ajayi, A. O., Akinade, O. O., & Delgado, J. M. D. (2019). Investigating profitability performance of construction projects using big data: A project analytics approach. *Journal of Building Engineering*, 26, 100850.
- Bilal, M., Oyedele, L. O., Qadir, J., Munir, K., Ajayi, S. O., Akinade, O. O., Owolabi, H. A., Alaka, H. A., & Pasha, M. (2016). Big Data in the construction industry: A review of present status, opportunities, and future trends. *Advanced engineering informatics*, 30(3), 500-521.
- Biney, I. K. (2019). Unearthing entrepreneurial opportunities among youth vendors and hawkers: challenges and strategies. *Journal of Innovation and Entrepreneurship*, 8(1), 1-14.

- Biondi, L. & Russo, S. (2022). Integrating Strategic Planning of Performance Management in Universities: A Multiple Case-Study Anaysis, *Journal of Management*.
- Blanco, J. L., Fuchs, S., Parsons, M., & Ribeirinho, M. J. (2018). Artificial intelligence: Construction technology's next frontier. *Building Economist, The*, (Sep 2018), 7-13.
- Boachie-Mensah, F. O., & Seidu, P. A. (2012). Employees' Perception of Performance Appraisal System: A Case Study. *International Journal of Business and Management*, 7(2), 73.
- Bodla, A. A., & Ningyu, T. (2017). Transformative HR practices and employee task performance in high-tech firms: The role of employee adaptivity. *Journal of Organizational Change Management*.
- Bonifaci, P., Copiello, S., & Stanghellini, S. (2016). The methodological framework of feasibility study to support strategic planning. *Procedia-Social and Behavioral Sciences*, 223, 45-50. doi.org/10.1016/j.sbspro.2016.05.287.
- Boon, C., Eckardt, R., Lepak, D. P., & Boselie, P. (2018). Integrating strategic human capital and strategic human resource management. *The International Journal of Human Resource Management*, 29(1), 34-67.
- Bradburn, N. M., Sudman, S., & Wansink, B. (2004). *Asking questions: the definitive guide to questionnaire design--for market research, political polls, and social and health questionnaires*. John Wiley & Sons.
- Bratton, J., Gold, J., Bratton, A., & Steele, L. (2021). *Human resource management*. Bloomsbury Publishing.
- Bryman, A., & Cramer, D. (1992). Quantitative data analysis for social scientists. *Estudios Geográficos*, 53(207), 347.
- Burns, N., & Groves, S. (2001). The practice of nursing research, conduct, critique, & utilization (4th ed.). Toronto, Ontario: W. B. Saunders Company. by organizations: cross-country evidence from the retail industry. *Information systems research*, 16(1), 61-84.
- Chakraborty, A. R., & Mansor, N. N. A. (2013). Adoption of human resource information system: A theoretical analysis. *Procedia-Social and Behavioral Sciences*, 75, 473-478.
- Chen, D. Q., Preston, D. S., & Swink, M. (2015). How the use of big data analytics affects value creation in supply chain management. *Journal of management information systems*, 32(4), 4-39.

- Chen, H.-M., Kazman, R., & Matthes, F. (2015). Demystifying big data adoption: Beyond IT fashion and relative advantage.
- Chen, X., & Siau, K. (2011). Impact of business intelligence and IT infrastructure flexibility on competitive performance: an organizational agility perspective.
- Cherry, M. A. (2016). People analytics and invisible labor. *Louis ULJ*, 61, 1.
- Chiu, C.-Y., Chen, S., & Chen, C.-L. (2017). An integrated perspective of TOE framework and innovation diffusion in broadband mobile applications adoption by enterprises. *International Journal of Management, Economics and Social Sciences (IJMESS)*, 6(1), 14-39.
- Clark, I., & Colling, T. (2005). The management of human resources in project management-led organizations. *Personnel Review*.
- Clohessy, T., Treiblmaier, H., Acton, T., & Rogers, N. (2020). Antecedents of blockchain adoption: An integrative framework. *Strategic Change*, 29(5), 501-515.
- Coates, T. T., & McDermott, C. M. (2002). An exploratory analysis of new competencies: a resource based view perspective. *Journal of Operations management*, 20(5), 435-450.
- Collis, J., & Hussey, R. (2003). Business research: A practical guide for undergraduate and postgraduate students.
- Cooke, F. L., Schuler, R., & Varma, A. (2020). Human resource management research and practice in Asia: Past, present and future. *Human Resource Management Review*, 30(4). <https://doi.org/10.1016/j.hrmr.2020.100778>.
- Crossan, F. (2003). Research philosophy: towards an understanding. *Nurse Researcher (through 2013)*, 11(1), 46.
- Cruz-Jesus, F., Pinheiro, A., & Oliveira, T. (2019). Understanding CRM adoption stages: empirical analysis building on the TOE framework. *Computers in Industry*, 109, 1-13.
- Custers, B., & Uršič, H. (2016). Big data and data reuse: a taxonomy of data reuse for balancing big data benefits and personal data protection. *International data privacy law*, 6(1), 4-15.
- Dabirian, S. (2022). Estimating the Effects of Human Resource Motivation on Construction Projects Performance using System Dynamics. *Journal of Structural and Construction Engineering*, 8(11), 193-210. doi. [10.22065/JSCE.2021.236632.2179](https://doi.org/10.22065/JSCE.2021.236632.2179)

- Dabirian, S., Abbaspour, S., Khanzadi, M., & Ahmadi, M. (2019). Dynamic modelling of human resource allocation in construction projects. *International Journal of Construction Management*, 1-10.
- Dahlbom, P., Siikanen, N., Sajasalo, P., & Jarvenpää, M. (2020). Big data and HR analytics in the digital era. *Baltic Journal of Management*.
- Dani, N.; Dadan, D. & Kusnadi (2022). Strategic Planing Organizational Culture, Anlysis of Oganizational Performance in Strategic Change Management Mediation in State Intelligence Agency, *International Journal of Reseach- GRANTHAALYAH*, 104), 1-4. doi:10.29121/granthaalayah.v10;4.2022.4568.
- Dash, M., Anand, V., & Gangadharan, A. (2012). Perceptions of Work-Life Balance Among IT Professionals. *IUP Journal of Organizational Behavior*, 11(1).
- Davenport, T. H. (2019). Is HR the most-analytics driven function. *Harvard Business Review (Digital Article, April 2019)*. Retrieved on 19 April 2019.
- de Carvalho, M. M., Patah, L. A., & de Souza Bido, D. (2015). Project management and its effects on project success: Cross-country and cross-industry comparisons. *International Journal of Project Management*, 33(7), 1509-1522.
- Delery, J. E., & Roumpi, D. (2017). Strategic human resource management, human capital and competitive advantage: is the field going in circles? *Human Resource Management Journal*, 27(1), 1-21.
- Deloitte, B. (2015). Global human capital trends 2015. Leading in the new world of work. In: Deloitte University Press London.
- Deloitte. (2014). *Engaging the 21st-century workforce*.
- Demilliere, A.-S. (2014). The role of human resources in project management. *Romanian Distribution Committee Magazine*, 5(1), 36-40.
- Detsimas, N., Coffey, V., Sadiqi, Z., & Li, M. (2016). Workplace training and generic and technical skill development in the Australian construction industry. *Journal of management development*.
- DeVellis, R. F., & Thorpe, C. T. (2021). *Scale development: Theory and applications*. Sage publications.
- Dhamdhere, S. N. (2015). Importance of knowledge management in the higher educational institutes. *Turkish Online Journal of Distance Education*, 16(1), 162-183. doi: 10.17718/TOJDE.34392.

- Dhlewayo, N. P., Bello, P. O., & Mofokeng, J. T. (2021). Missing in action: Perspectives on employee absenteeism in the South African Police Service. *Cogent Social Sciences*, 7(1), 1964200.
- DiClaudio, M. (2019). People analytics and the rise of HR: how data, analytics and emerging technology can transform human resources (HR) into a profit center. *Strategic HR Review*.
- Dixit, S., Stefańska, A., Musiuk, A., & Singh, P. (2021). Study of enabling factors affecting the adoption of ICT in the Indian built environment sector. *Ain Shams Engineering Journal*, 12(2), 2313-2319.
- Dos Santos, R., Bueno, E. V., Kato, H. T., & Corrêa, R. O. (2018). Design management as dynamic capabilities: a historiographical analysis. *European Business Review*.
- Duan, Y., He, Q., Feng, W., Li, D., & Fu, Z. (2010). A study on e-learning take-up intention from an innovation adoption perspective: A case in China. *Computers & Education*, 55(1), 237-246.
- Dubey, R., Gunasekaran, A., & Childe, S. J. (2018). Big data analytics capability in supply chain agility: The moderating effect of organizational flexibility. *Management Decision*.
- Dulebohn, J. H., & Johnson, R. D. (2013). Human resource metrics and decision support: A classification framework. *Human Resource Management Review*, 23(1), 71-83.
- Silva, L. C., & Costa, A. P. C. S. (2013). Decision model for allocating human resources in information system projects. *International Journal of Project Management*, 31(1), 100-108.
- Ehie, I. C., & Madsen, M. (2005). Identifying critical issues in enterprise resource planning (ERP) implementation. *Computers in industry*, 56(6), 545-557. doi:[10.1016/j.compind.2005.02.006](https://doi.org/10.1016/j.compind.2005.02.006)
- Enshassi, A., & Burgess, R. (1990). Training for construction site managers involved with multicultural work teams. *International journal of project management*, 8(2), 95-101.
- Enyioko, V.U. & Ikoro, E.I. (2017). Effect of Employees Training on Organizational Performance: A Study of Seven-Up Bottling Company, Enugu State Nigeria. *IIARD International Journal of Economics and Business Management*, 3(10), 48-63.
- Erari, N. (2021) The Effects of Organizational Commitment, Competency, and Reward on Employee Performance: Lessons from Indonesia Local Government., *International Journal of Business Marketing and Management (IJBMM)* Volume 6 Issue 2 , P.P. 20-31

- Etukudo, R. (2019). *Strategies for using analytics to improve Human Resource Management* Walden University.
- Etzioni, A. (1960). Two approaches to organizational analysis: A critique and a suggestion. *Administrative science quarterly*, 257-278.
- Falletta, S. V., & Combs, W. L. (2020). The HR analytics cycle: a seven-step process for building evidence-based and ethical HR analytics capabilities. *Journal of Work-Applied Management*.
- Farooq, M., & Khan, M. A. (2011). Impact of training and feedback on employee performance. *Far east journal of psychology and business*, 5(1), 23-33.
- Fasoranti, M. M. (2012). The effect of government expenditure on infrastructure on the growth of the Nigerian economy, 1977-2009. *International Journal of Economics and Financial Issues*, 2(4), 513-518.
- Fay, M., Toman, M., Benitez, D., & Csordas, S. (2011). Infrastructure and sustainable development. *Postcrisis Growth and Development: A Development Agenda for the G*, 20(22), 329-382.
- Fayyad, J. A., Farah, L., Cassir, Y., Salamoun, M. M., & Karam, E. G. (2010). Dissemination of an evidence-based intervention to parents of children with behavioral problems in a developing country. *European child & adolescent psychiatry*, 19(8), 629-636.
- Fernandez, V., & Gallardo Gallardo, E. (2020). HR analytics conceptualization and adoption: key issues. *Academy of Management Proceedings*,
- Fernandez, V., & Gallardo-Gallardo, E. (2020). Tackling the HR digitalization challenge: key factors and barriers to HR analytics adoption. *Competitiveness Review: An International Business Journal*.
- Fink, A., & Litwin, M. S. (1995). *How to measure survey reliability and validity* (Vol. 7). Sage.
- Florez, L., Castro-Lacouture, D., & Medaglia, A. L. (2013). Sustainable workforce scheduling in construction program management. *Journal of the Operational Research Society*, 64(8), 1169-1181.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Franklin, D. K., Cowden, R., & Karodia, A. M. (2014). The Impact of Training and Development on Job Performance. *Singapore Journal of Business Economics, And Management Studies*, 3(3), 1-34.

- Ganguly, K. K. (2022). Understanding the challenges of the adoption of blockchain technology in the logistics sector: the TOE framework. *Technology Analysis & Strategic Management*, 1-15.
- Gangwar, H. (2018). Understanding the determinants of big data adoption in India: An analysis of the manufacturing and services sectors. *Information Resources Management Journal (IRMJ)*, 31(4), 1-22.
- Gangwar, H., Date, H., & Raoot, A. (2014). Review on IT adoption: insights from recent technologies. *Journal of Enterprise Information Management*.
- Garcia-Arroyo, J., & Osca, A. (2021). Big data contributions to human resource management: a systematic review. *The International Journal of Human Resource Management*, 32(20), 4337-4362.
- Garengo, P.; Sardi, P. & Nudurupati, S (2021). Hman Resource Mangement (HRM) in the Performance Measurement and Management (PMM) Domain: a Bibliometric Review, International Journal of Productivity and Performance Management Emerald Publishing Limited.
- Garson, G. D. (2012). Testing statistical assumptions. *Asheboro, NC: Statistical Associates Publishing*.
- Gaur, B., Shukla, V. K., & Verma, A. (2019). Strengthening people analytics through wearable IOT device for real-time data collection. 2019 international conference on automation, computational and technology management (ICACTM).
- Gelbard, R., Ramon-Gonen, R., Carmeli, A., Bittmann, R. M., & Talyansky, R. (2018). Sentiment analysis in organizational work: Towards an ontology of people analytics. *Expert Systems*, 35(5), e12289.
- Geraldi, J. G. (2009). Reconciling order and chaos in multi-project firms. *International Journal of Managing Projects in Business*.
- Ghaleb, E. A., Dominic, P., Fati, S. M., Muneer, A., & Ali, R. F. (2021). The Assessment of Big Data Adoption Readiness with a Technology–Organization–Environment Framework: A Perspective towards Healthcare Employees. *Sustainability*, 13(15), 8379.
- Ghansah, F. A., Owusu-Manu, D.-G., & Ayarkwa, J. (2020). Project management processes in the adoption of smart building technologies: a systematic review of constraints. *Smart and Sustainable Built Environment*.

- Ghodrati, N., Yiu, T. W., Wilkinson, S., Poshdar, M., Talebi, S., Elghaish, F., & Sepasgozar, S. M. (2022). Unintended consequences of productivity improvement strategies on safety behaviour of construction labourers; a step toward the integration of safety and productivity. *Buildings*, 12(3), 317.
- Giacumo, L. A., & Bremen, J. (2016). Emerging evidence on the use of big data and analytics in workplace learning: a systematic literature review. *Quarterly Review of Distance Education*, 17(4), 21.
- Giermindl, L. M., Strich, F., Christ, O., Leicht-Deobald, U., & Redzepi, A. (2021). The dark sides of people analytics: reviewing the perils for organisations and employees. *European Journal of Information Systems*, 1-26.
- Gobble, M. M. (2017). The datification of human resources. *Research-Technology Management*, 60(5), 59-63.
- Goswami, S. & Saha, R.C. (2021). Impact of training on organisational productivity, Asia-Pacific Journal of Management and Technology (AJMT), 1(3), 22-28.
- Green, D. (2017). The best practices to excel at people analytics. *Journal of Organizational Effectiveness: People and Performance*.
- Guest, D. (2002). Human resource management, corporate performance and employee wellbeing: Building the worker into HRM. *The journal of industrial relations*, 44(3), 335-358.
- Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S. F., Childe, S. J., Hazen, B., & Akter, S. (2017). Big data and predictive analytics for supply chain and organizational performance. *Journal of Business Research*, 70, 308-317.
- Gurusinghe, R. N., Arachchige, B. J., & Dayarathna, D. (2021). Predictive HR analytics and talent management: a conceptual framework. *Journal of Management Analytics*, 8(2), 195-221.
- Hadden, K., Gardner, S., & Patterson, C. (2022). From Strategic Planning to Strategy Impact. *NEJM Catalyst Innovations in Care Delivery*, 3(1). doi.org/10.1056/CAT.21.0323.
- Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage publications.
- Hair Jr, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European business review*.

- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis: Pearson new international edition. Essex: Pearson Education Limited, 1, 2.*
- Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods. *Journal of the academy of marketing science, 45(5)*, 616-632.
- Hair, J. F., Money, A. H., Samouel, P., & Page, M. (2007). *Research methods for business. Education+ Training.*
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice, 19(2)*, 139-152.
- Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science, 40(3)*, 414-433.
- Hamilton, R., & Sodeman, W. A. (2020). The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources. *Business Horizons, 63(1)*, 85-95.
- Hamouche, S. (2021). Human resource management and the COVID-19 crisis: Implications, challenges, opportunities, and future organizational directions. *Journal of Management & Organization, 1*, 1-16.
- Hanaysha, J. (2016). Examining the effects of employee empowerment, teamwork, and employee training on organizational commitment. *Procedia-Social and Behavioral Sciences, 229*, 298-306.
- Hans, R. T., & Mnkandla, E. (2017). A descriptive analytics tool for improving project human resource management: The importance of discerning a project team member's sentiments. 2017 IEEE AFRICON,
- Haryono, S., Supardi, S., & Udin, U. (2020). The effect of training and job promotion on work motivation and its implications on job performance: Evidence from Indonesia. *Management Science Letters, 10(9)*, 2107-2112.
- Hassan, W., Razi, A., Qamar, R., Jaffir, R., & Suhail, S. (2013). The effect of training on employee retention. *Global Journal of Management And Business Research.*
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science, 43(1)*, 115-135.

- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In *New challenges to international marketing*. Emerald Group Publishing Limited.
- Herden, T. T. (2020). Explaining the competitive advantage generated from Analytics with the knowledge-based view: the example of Logistics and Supply Chain Management. *Business Research, 13*(1), 163-214.
- Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in nursing & health, 31*(2), 180-191.
- Hewage, K. N., Ruwanpura, J. Y., & Jergeas, G. F. (2008). IT usage in Alberta's building construction projects: Current status and challenges. *Automation in construction, 17*(8), 940-947.
- Ho, P. H. (2016). Labour and skill shortages in Hong Kong's construction industry. *Engineering, Construction and Architectural Management*.
- Hollenbeck, J. R., & Jamieson, B. B. (2015). Human capital, social capital, and social network analysis: Implications for strategic human resource management. *Academy of management perspectives, 29*(3), 370-385. doi: 10.5465/AMP.2014.0140.
- Holsapple, C., Lee-Post, A., & Pakath, R. (2014). A unified foundation for business analytics. *Decision support systems, 64*, 130-141.
- Hoopes, D. G., Madsen, T. L., & Walker, G. (2003). Guest editors' introduction to the special issue: why is there a resource-based view? Toward a theory of competitive heterogeneity. *Strategic management journal, 24*(10), 889-902.
- Hota, J. (2021). Framework of Challenges Affecting Adoption of People Analytics in India Using ISM and MICMAC Analysis. *Vision, 09722629211029007*.
- Hovnanian, G., Kroll, K., & Sjödin, E. (2019). How analytics can drive smarter engineering and construction decisions. *McKinsey & Company Capital Projects & Infrastructure*.
- Hsu, P.-F., Ray, S., & Li-Hsieh, Y.-Y. (2014). Examining cloud computing adoption intention, pricing mechanism, and deployment model. *International Journal of Information Management, 34*(4), 474-488.
<https://doi.org/10.1088/1742-6596/1477/5/052052>
- Hu, X. (2020). Sorting big data by revealed preference with application to college ranking. *Journal of Big Data, 7*(1), 1-26.

- Huemann, M., Keegan, A., & Turner, J. R. (2007). Human resource management in the project-oriented company: A review. *International journal of project management*, 25(3), 315-323.
- Hulland, J., Ryan, M. J., & Rayner, R. K. (2010). Modeling customer satisfaction: A comparative performance evaluation of covariance structure analysis versus partial least squares. In *Handbook of partial least squares* (pp. 307-325). Springer.
- Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of management journal*, 38(3), 635-672.
- Huselid, M. A. (2018). The science and practice of workforce analytics: Introduction to the HRM special issue. In (Vol. 57, pp. 679-684): Wiley Online Library.
- Hussain, S., Xueting, W., & Hussain, T. (2020). Impact of skilled and unskilled labor on project performance using structural equation modeling approach. *Sage Open*, 10(1), 2158244020914590.
- Ikediashi, D. I., & Ogwueleka, A. C. (2016). Assessing the use of ICT systems and their impact on construction project performance in the Nigerian construction industry. *Journal of Engineering, Design and Technology*.
- Iles, P., Chuai, X., & Preece, D. (2010). Talent management and HRM in multinational companies in Beijing: Definitions, differences and drivers. *Journal of world Business*, 45(2), 179-189.
- Ilmudeen, A. (2021). Big data analytics capability and organizational performance measures: The mediating role of business intelligence infrastructure. *Business Information Review*, 38(4), 183-192.
- Irfan, M., Hassan, M., Hassan, N., Habib, M., Khan, S., & Nasruddin, A. M. (2020). Project management maturity and organizational reputation: A case study of public sector organizations. *IEEE Access*, 8, 73828-73842.
- Islam, R., & Rasad, S. (2005). Employee performance evaluation by AHP: A case study. *DISAHP 2005. Honolulu, Hawaii, July*, 8-10.
- Ismail, H. N., & Rishani, M. (2018). The relationships among performance appraisal satisfaction, career development and creative behavior. *The Journal of Developing Areas*, 52(3), 109-124.

- James, A. T., Kumar, G., Tayal, P., Chauhan, A., Wadhawa, C., & Panchal, J. (2022). Analysis of human resource management challenges in implementation of industry 4.0 in Indian automobile industry. *Technological Forecasting and Social Change*, *176*, 121483.
- Jarkas, A. M. (2015). Factors influencing labour productivity in Bahrain's construction industry. *International Journal of Construction Management*, *15*(1), 94-108.
- Jatarona, N. A. B. (2018). Poor Performance Of Public Construction Project In Malaysia (Doctoral Dissertation, Universiti Teknologi Malaysia).
- Jehanzeb, K. & Bashir, N.A. (2013). Training and development programme and its benefits to employee and organisation: A conceptual study. *European Journal of business and management*, *5*(2), 243-252.
- Jenatabadi, H. S. (2015). An overview of organizational performance index: Definitions and measurements. *Available at SSRN 2599439*.
- Jeschke, K. C., Kines, P., Rasmussen, L., Andersen, L. P. S., Dyreborg, J., Ajslev, J., Kabel, A., Jensen, E., & Andersen, L. L. (2017). Process evaluation of a Toolbox-training program for construction foremen in Denmark. *Safety Science*, *94*, 152-160.
- Jha, V. (2016). Training and development program and its benefits to employee and organization: A conceptual study. *International Journal of Scientific Research in Science and Technology*, *2*(5), 80-86.
- Jiang, K., & Messersmith, J. (2018). On the shoulders of giants: A meta-review of strategic human resource management. *The International Journal of Human Resource Management*, *29*(1), 6-33.
- Jiang, K., Lepak, D. P., Hu, J., & Baer, J. C. (2012). How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. *Academy of management Journal*, *55*(6), 1264-1294.
- Jiang, K., Lepak, D. P., Hu, J., & Baer, J. C. (2012). How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. *Academy of management journal*, *55*(6), 1264-1294.
- Jiang, Y., & Akdere, M. (2021). An operational conceptualization of human resource analytics: implications for in human resource development. *Industrial and commercial training*.
- Johnson, K. R., Park, S., & Bartlett, K. R. (2018). Perceptions of customer service orientation, training, and employee en-gagement in Jamaica's hospitality sector. *European Journal of Training and Development*, *42*(3-4), 191-209. <https://doi.org/10.1108/EJTD-11-2017-0094>

- Junior, C. H., Oliveira, T., & Yanaze, M. (2019). The adoption stages (Evaluation, Adoption, and Routinisation) of ERP systems with business analytics functionality in the context of farms. *Computers and electronics in agriculture*, 156, 334-348.
- Jyoti, J., & Sharma, P. (2015). Impact of mentoring functions on career development: moderating role of mentoring culture and mentoring structure. *Global Business Review*, 16(4), 700-718.
- Kanwal, N., Zafar, M. S., & Bashir, S. (2017). The combined effects of managerial control, resource commitment, and top management support on the successful delivery of information systems projects. *International Journal of Project Management*, 35(8), 1459-1465.
- Kapoor, B., & Kabra, Y. (2014). Current and future trends in human resources analytics adoption. *Journal of Cases on Information Technology (JCIT)*, 16(1), 50-59.
- Kaufman, B. E. (2015). The RBV theory foundation of strategic HRM: Critical flaws, problems for research and practice, and an alternative economics paradigm. *Human Resource Management Journal*, 25(4), 516-540.
- Kaur, D., & Batra, R. (2018). Effectiveness of training and soft skills for enhancing the performance of banking employees. *Prabandhan: Indian Journal of Management*, 11(9), 38-49.
- Keegan, A., Ringhofer, C., & Huemann, M. (2018). Human resource management and project based organizing: Fertile ground, missed opportunities and prospects for closer connections. *International journal of project management*, 36(1), 121-133.
- Khan, R. A. G., Khan, F. A., & Khan, M. A. (2011). Impact of training and development on organizational performance. *Global Journal of Management And Business Research*, 11(7).
- Kim, K. Y. (2014). Business intelligence and marketing insights in an era of big data: The q-sorting approach. *KSII Transactions on Internet and Information Systems (TIIS)*, 8(2), 567-582.
- King, K. G. (2016). Data analytics in human resources: A case study and critical review. *Human Resource Development Review*, 15(4), 487-495.
- Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.

- Kobylkin, D., & Zachko, O. (2020). Structural models of safety-oriented management of infrastructure projects decomposition. 2020 IEEE 15th International Conference on Computer Sciences and Information Technologies (CSIT). DOI:[10.1109/CSIT49958.2020.9321877](https://doi.org/10.1109/CSIT49958.2020.9321877).
- Konzelmann, S., Conway, N., Trenberth, L., & Wilkinson, F. (2006). Corporate governance and human resource management. *British Journal of Industrial Relations*, 44(3), 541-567.
- Kryscynski, D., Reeves, C., Stice-Lusvardi, R., Ulrich, M., & Russell, G. (2018). Analytical abilities and the performance of HR professionals. *Human Resource Management*, 57(3), 715-738.
- Kulkarni, P. P. (2013). A literature review on training & development and quality of work life. *Researchers World*, 4(2), 136.
- Kumar, A., & Krishnamoorthy, B. (2020). Business analytics adoption in firms: A qualitative study elaborating TOE framework in India. *International Journal of Global Business and Competitiveness*, 15(2), 80-93.
- Kumar, B. R. (2022). Trends in Infrastructure Industry. In *Project Finance* (pp. 1-29). Springer.
- Kumari, G., Joshi, G., & Pandey, K. (2014). Analysis of Factors Affecting Job Satisfaction of The Employees In Public And Private Sector. *International Journal of Trends in Economics Management*, 3(1), 11-19.
- Kuruppu, C., Kavirathne, C., & Karunarathna, N. (2021). The impact of training on employee performance in a selected apparel sector organization in Sri Lanka. *Global Journal of Management And Business Research*.
- Lai, Y., Sun, H., & Ren, J. (2018). Understanding the determinants of big data analytics (BDA) adoption in logistics and supply chain management: An empirical investigation. *The International Journal of Logistics Management*.
- Lalli, S. (2009). Quantitative study determining the purpose of career planning in US based international organizations (Doctoral Dissertation). Retrieved from the Dissertations & Theses@ University of Phoenix database. (Publication No. AAT 3350855).
- Larsson, A.-S., & Edwards, M. R. (2022). Insider econometrics meets people analytics and strategic human resource management. *The International Journal of Human Resource Management*, 33(12), 2373-2419.

- Latham, G. P. (2011). Human resource training and development. In M. F. R. Kets de Vries & K. Korotov (Eds.), *The international library of critical writings on business and management. Leadership development* (p. 3–40). Edward Elgar Publishing.
- Lee, J. (2004). Discriminant analysis of technology adoption behavior: a case of internet technologies in small businesses. *Journal of computer information systems*, 44(4), 57-66.
- Lee, S.-K., & Yu, J.-H. (2012). Success model of project management information system in construction. *Automation in construction*, 25, 82-93.
- Lee, W., Migliaccio, G. C., Lin, K.-Y., & Seto, E. Y. (2020). Workforce development: understanding task-level job demands-resources, burnout, and performance in unskilled construction workers. *Safety Science*, 123, 104577.
- Lee, Y., & Larsen, K. R. (2009). Threat or coping appraisal: determinants of SMB executives' decision to adopt anti-malware software. *European Journal of Information Systems*, 18(2), 177-187.
- Lengnick-Hall, C. A., & Lengnick-Hall, M. L. (2006). HR, ERP, and knowledge for competitive advantage. *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in Alliance with the Society of Human Resources Management*, 45(2), 179-194. doi.org/10.1002/hrm.20103.
- Lennick, D., & Kiel, F. (2007). *Moral intelligence: Enhancing business performance and leadership success*. Pearson Prentice Hall.
- Levenson, A. (2018). Using workforce analytics to improve strategy execution. *Human Resource Management*, 57(3), 685-700.
- Levenson, A., & Fink, A. (2017). Human capital analytics: too much data and analysis, not enough models and business insights. *Journal of Organizational Effectiveness: People and Performance*.
- Li, C., Naz, S., Khan, S.M.A., Kusi, B. Murad, M. (2019). An empirical investigation on the relationship between a high-performance work system and employee performance: measuring a mediation model through partial least squares–structural equation modeling. *Psychology Research and Behavior Management*, 12, 397-416.
- Lim, S., Wang, T. K., & Lee, S.-Y. (2017). Shedding new light on strategic human resource management: The impact of human resource management practices and human resources on the perception of federal agency mission accomplishment. *Public Personnel Management*, 46(2), 91-117. [doi:10.1177/0091026017704440](https://doi.org/10.1177/0091026017704440).

- Lin, J. J., & Golparvar-Fard, M. (2018). Visual data and predictive analytics for proactive project controls on construction sites. Workshop of the European Group for Intelligent Computing in Engineering,
- Lippert, S. K., & Govindarajulu, C. (2006). Technological, organizational, and environmental antecedents to web services adoption. *Communications of the IIMA*, 6(1), 14.
- Loehlin, J. C. (1992). *Genes and environment in personality development*. Sage Publications, Inc.
- Loo, R. (1996). Training in project management: a powerful tool for improving individual and team performance. *Team performance management: An international journal*.
- Lorsch, J. W. (1970). Introduction to the structural design of organizations. *Organizational structure and design*, 1, 16.
- Lu, Y., & Zhang, J. (2021). Bibliometric analysis and critical review of the research on big data in the construction industry. *Engineering, Construction and Architectural Management*.
- Lutfi, A., Alsyouf, A., Almaiah, M. A., Alrawad, M., Abdo, A. A. K., Al-Khasawneh, A. L., Ibrahim, N., & Saad, M. (2022). Factors Influencing the Adoption of Big Data Analytics in the Digital Transformation Era: Case Study of Jordanian SMEs. *Sustainability*, 14(3), 1802.
- Mabey, C., & Gooderham, P. N. (2005). The impact of management development on perceptions of organizational performance in European firms. *European Management Review*, 2(2), 131-142.
- Maduku, D. K., Mpinganjira, M., & Duh, H. (2016). Understanding mobile marketing adoption intention by South African SMEs: A multi-perspective framework. *International Journal of Information Management*, 36(5), 711-723.
- Majumder, S., Majumder, S., & Biswas, D. (2021). Impact of effective construction planning in project performance improvement. *Quality & Quantity*, 1-12. doi:[10.1007/s11135-021-01224-5](https://doi.org/10.1007/s11135-021-01224-5).
- Manggis, I. W., Yuesti, A., & Sapta, I. K. S. (2018). The Effect of Career Development and Organizational Culture to Employee Performance with Motivation of Work as Intervening Variable in Cooperation in Denpasar Village. *International Journal of Contemporary Research and Review*, 9(07), 20901–20916. <https://doi.org/10.15520/Ijcr/2018/9/07/553>

- Mangla, S. K., Raut, R., Narwane, V. S., & Zhang, Z. J. (2020). Mediating effect of big data analytics on project performance of small and medium enterprises. *Journal of Enterprise Information Management*.
- Manzoor, Q.-A. (2012). Impact of employees motivation on organizational effectiveness. *Business management and strategy*, 3(1), 1-12.
- Mapes, J., New, C., & Szwejczeniowski, M. (1997). Performance trade-offs in manufacturing plants. *International Journal of Operations & Production Management*.
- Marchena Sekli, G. F., & De La Vega, I. (2021). Adoption of big data Analytics and its impact on organizational performance in higher education mediated by knowledge management. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(4), 221.
- Margherita, A. (2022). Human resources analytics: A systematization of research topics and directions for future research. *Human Resource Management Review*, 32(2), 100795.
- Markos, S., & Sridevi, M. S. (2010). Employee engagement: The key to improving performance. *International journal of business and management*, 5(12), 89.
- Marler, J. H., & Boudreau, J. W. (2017). An evidence-based review of HR Analytics. *The International Journal of Human Resource Management*, 28(1), 3-26.
- Maroufkhani, P., Ismail, W. K. W., & Ghobakhloo, M. (2020). Big data analytics adoption model for small and medium enterprises. *Journal of Science and Technology Policy Management*.
- Maroufkhani, P., Tseng, M.-L., Iranmanesh, M., Ismail, W. K. W., & Khalid, H. (2020). Big data analytics adoption: Determinants and performances among small to medium-sized enterprises. *International Journal of Information Management*, 54, 102190.
- Maroufkhani, P., Wagner, R., Wan Ismail, W. K., Baroto, M. B., & Nourani, M. (2019). Big data analytics and firm performance: A systematic review. *Information*, 10(7), 226.
- Marzouk, M., & Enaba, M. (2019). Analyzing project data in BIM with descriptive analytics to improve project performance. *Built environment project and asset management*, 9(4), 476-488.
- Masum, A. K. M. (2015). Adoption Factors of Electronic Human Resource Management (e-HRM) in Banking Industry of Bangladesh. *Journal of Social Sciences/Sosyal Bilimler Dergisi*, 11(1).
- Matarneh, R., & Hamed, S. (2017). Barriers to the adoption of building information modeling in the Jordanian building industry. *Open journal of civil engineering*, 7(3), 325-335.

- Mathur, G., Jugdev, K., & Fung, T. S. (2013). Project management assets and project management performance outcomes: Exploratory factor analysis. *Management Research Review*.
- Matuska, K., Bass, J., & Schmitt, J. S. (2013). Life balance and perceived stress: Predictors and demographic profile. *OTJR: occupation, participation and health*, 33(3), 146-158.
- McAbee, S. T., Landis, R. S., & Burke, M. I. (2017). Inductive reasoning: The promise of big data. *Human Resource Management Review*, 27(2), 277-290.
- McCartney, S., & Fu, N. (2022). Bridging the gap: why, how and when HR analytics can impact organizational performance. *Management Decision*.
- McCartney, S., & Fu, N. (2022). Promise versus reality: a systematic review of the ongoing debates in people analytics. *Journal of Organizational Effectiveness: People and Performance*.
- McCartney, S., Murphy, C., & McCarthy, J. (2020). 21st century HR: a competency model for the emerging role of HR Analysts. *Personnel review*.
- Mcdowall, A., & Saunders, M. N. K. (2010). UK managers' conceptions of employee training and development, 34(7), 609– 630. <https://doi.org/10.1108/03090591011070752>.
- Mertler, C. A., Vannatta, R. A., & LaVenía, K. N. (2021). *Advanced and multivariate statistical methods: Practical application and interpretation*. Routledge.
- Metto, J. & Kimutai, K. (2017). The Effect of Training and Development on Employee Performance at Moi University, Kenya. *International Journal of Human Resources Development and Management*, 18(1)77-90
- Milhem, W., Abushamsieh, K., & Pérez Aróstegui, M. N. (2014). Training Strategies, Theories, and, Types. *Journal of Accounting, Business & Management*, 21(1).
- Miller, D. J., Fern, M. J., & Cardinal, L. B. (2007). The use of knowledge for technological innovation within diversified firms. *Academy of management journal*, 50(2), 307-325.
- Minbaeva, D. B. (2018). Building credible human capital analytics for organizational competitive advantage. *Human Resource Management*, 57(3), 701-713.
- Mitki, Y., & Herstein, R. (2007). Innovative training in designing corporate identity. *Industrial and commercial training*.

- Mohammed, D., & Quddus, A. (2019). HR analytics: A modern tool in HR for predictive decision making. *Journal of Management*, 6(3).
- Mohd, A. I. D., Ahmad, Z. E. M., & Zulhabri, I. (2019). Factors influencing the implementation of technologies behind industry 4.0 in the Malaysian construction industry.
- Monday, J. U., Akinola, G. O., Ologbenla, P., & Aladeraji, O. K. (2015). Strategic management and firm performance: A study of selected manufacturing companies in Nigeria. *European Journal of business and management*, 7(2), 161-171.
- Moussa, N. B., & El Arbi, R. (2020). The impact of Human Resources Information Systems on individual innovation capability in Tunisian companies: The moderating role of affective commitment. *European Research on Management and Business Economics*, 26(1), 18-25.
- Mozael, B. M. (2015). Impact of training and development programs on employee performance. *International Journal of Scientific and Research Publications*, 5(11), 37-42.
- Munawar, H. S., Ullah, F., Qayyum, S., & Shahzad, D. (2022). Big Data in Construction: Current Applications and Future Opportunities. *Big Data and Cognitive Computing*, 6(1), 18.
- Munns, A. K., & Bjeirmi, B. F. (1996). The role of project management in achieving project success. *International journal of project management*, 14(2), 81-87.
- Musawa, M. S., & Wahab, E. (2012). The adoption of electronic data interchange (EDI) technology by Nigerian SMEs: A conceptual framework. *Journal of Business Management and Economics*, 3(2), 55-68.
- Muscalu, E., & Şerban, A. (2014). HR analytics for strategic human resource management. *Proceedings of the International Management Conference*.
- Mustafa, M., Nordin, M., & Razzaq, A. (2020). Structural equation modelling using AMOS: Confirmatory factor analysis for taskload of special education integration program teachers. *Univers. J. Educ. Res*, 8(1), 127-133.
- Nam, D., Lee, J., & Lee, H. (2019). Business analytics adoption process: An innovation diffusion perspective. *International Journal of Information Management*, 49, 411-423.
- Napitupulu, S., Haryono, T., Laksmi Riani, A., Sawitri, H. S. R., & Harsono, M. (2017). The Impact of Career Development On Employee Performance: An Empirical Study of the Public Sector in Indonesia. *International Review of Public Administration*, 22(3), 276–299. <https://doi.org/10.1080/12294659.2017.1368003>

- Nasution, M. I., Fahmi, M., Jufrizen, Muslih, & Prayogi, M. A. (2020). The Quality of Small and Medium Enterprises Performance Using the Structural Equation Model-Part Least Square (SEM-PLS). *Journal of Physics: Conference Series*, 1477(5), 0–7.
- Nedev, S. (2014). Exploring the factors influencing the adoption of Cloud computing and the challenges faced by the business. *Enquiry*.
- Ng, S. T., Skitmore, R. M., & Sharma, T. (2001). Towards a human resource information system for Australian construction companies. *Engineering, Construction and Architectural Management*.
- Nikulsheeva, V., Khokhlova, G., Kretova, N., & Borisova, A. (2021). Human capital as a factor of development of innovative activity of construction industry enterprises. *IOP Conference Series: Earth and Environmental Science*.
- Noe, R. A., & Kodwani, A. D. (2018). Employee training and development, 7e. McGraw-Hill Education. *Science, Engineering & Technology*, 3(1), 387-399.
- North, D., Gal, I., & Zewotir, T. (2014). Building capacity for developing statistical literacy in a developing country: Lessons learned from an intervention. *Statistics Education Research Journal*, 13(2).
- Nurani, E. V., & Maryanti, E. (2021). The Effect of Company Size, Profitability and Financial Lverage on Income Smoothing Practices with Good Corporate Governance as Moderating Variables in Manufacturing Companies in the Consumer Goods Industry Sector Listed on the Indonesia Stock Exchange. *Indonesian Journal of Innovation Studies*, 16, 10.21070/ijins.v21016i.21564-21010.21070/ijins.v21016i.21564.
- Nurudeen, S. (2022). Appraisal of the Effect of Strategic Management on The Performance of Small and Medium Enterprises: A Case Study of Some Selected SMEs in Lagos State, *Iconic Research and Engineering Journals*, 5. 8, 162-171.
- Obisi, C., & Ph, D. (2011). Employee Training and Development in Nigerian Organizations : Some Observations and Agenda for Research. 1(9), 82–91.
- Ogbu, J., & Osanaiye, J. (2017). Impact of employee training on organizational performance: A study of selected insurance firms in Abuja–Nigeria. *European Journal of business and management*, 9(14), 64-72.
- Oke, A., Aigbavboa, C., & Khangale, T. (2017). Effect of skills shortage on sustainable construction. *International Conference on Applied Human Factors and Ergonomics*,

- Oludele, A. E. (2021) Impact of Strategic Planning on Organizational Performance of Health Care Services in Nigeria, *Science Journal of Business and Management*, 9(3), 209-214. doi:10.11648/j.sibm.20210903.18.
- Ozkan-Ozen, Y. D., & Kazancoglu, Y. (2021). Analysing workforce development challenges in the Industry. *International Journal of Manpower*, 43(2), 310-333.
- Ozkeser, B. (2019). Impact of training on employee motivation in human resources management. *Procedia Computer Science*, 158, 802-810.
- Paais, M., & Pattiruhu, J. R. (2020). Effect of Motivation, Leadership, and Organizational Culture on Satisfaction and Employee Performance. *Journal of Asian Finance, Economics, and Business*, 7(8), 577–588. <https://doi.org/10.13106/JAFEB.2020.VOL7.NO8.577>
- Pauwe, J. (2009). HRM and performance: Achievements, methodological issues and prospects. *Journal of Management studies*.
- Pai-Po, L., Baboucarr, S., & Chih-Chien, S.L. (2014). Training and Development Impact on Employees' Performance in the Administrative Cadre of the Personnel Management Office in the Gambia, *Journal of International Cooperation*, 8(1), 51-86.
- Panuniar, D. M., Bacolod, M. M., Abadiano, M. N., & Deocares, M. S. (2020). Emerging School Leadership amidst Covid - 19 Pandemic. 57, 5935–5963.
- Papke-Shields, K. E., & Boyer-Wright, K. M. (2017). Strategic planning characteristics are applied to project management. *International Journal of Project Management*, 35(2), 169-179.
- Parayitam, S., Naina, S. M., Shea, T., Syed Mohideen, A. H., & Aruldoss, A. (2021). The Relationship Between Human Resource Management Practices, Knowledge Management Practices, and Performance: Evidence from the Healthcare Industry in India. *Global Business Review*, 09721509211037209.
- Paul, P., Roy, A., & Mukhopadhyay, K. (2006). The impact of cultural values on marketing ethical norms: A study in India and the United States. *Journal of International Marketing*, 14(4), 28-56.
- Paynes, E. J., & Schrader, A. (2008). Human Resource Management for Public and Non-profit Organization.
- Peeters, T., Pauwe, J., & Van De Voorde, K. (2020). People analytics effectiveness: developing a framework. *Journal of Organizational Effectiveness: People and Performance*.

- Peters, M. E., Neumann, M., Iyyer, M., Gardner, M., Clark, C., Lee, K., & Zettlemoyer, L. (2018). Improving Language Understanding by. Openai, 1–10.
- Pillai, R., & Sivathanu, B. (2021). Measure what matters: descriptive and predictive metrics of HRM-pathway toward organizational performance. *International Journal of Productivity and Performance Management*.
- Pillai, R., Sivathanu, B., Mariani, M., Rana, N. P., Yang, B., & Dwivedi, Y. K. (2021). Adoption of AI-empowered industrial robots in auto component manufacturing companies. *Production Planning & Control*, 1-17.
- Ponsteen, A., & Kusters, R. J. (2015). Classification of human-and automated resource allocation approaches in multi-project management. *Procedia-Social and Behavioral Sciences*, 194, 165-173.
- Popaitoon, S., & Siengthai, S. (2014). The moderating effect of human resource management practices on the relationship between knowledge absorptive capacity and project performance in project-oriented companies. *International Journal of Project Management*, 32(6), 908-920.
- Popescu, C. R. G., & Kyriakopoulos, G. L. (2022). Strategic Human Resource Management in the 21st-Century Organizational Landscape: Human and Intellectual Capital as Drivers for Performance Management. *COVID-19 Pandemic Impact on New Economy Development and Societal Change*, 296-323. doi: 10.4018/978-1-6684-3374-4.ch015.
- Potnuru, R. K. G., & Sahoo, C. K. (2016). HRD interventions, employee competencies and organizational effectiveness: an empirical study. *European Journal of Training and Development*, 40(5), 345-365.
- Premkumar, G., & Roberts, M. (1999). Adoption of new information technologies in rural small businesses. *Omega*, 27(4), 467-484.
- Prodi, R., & Sautter, C. (2018). *Boosting investment in social infrastructure in Europe*.
- Puklavec, B., Oliveira, T., & Popovič, A. (2018). Understanding the determinants of business intelligence system adoption stages: An empirical study of SMEs. *Industrial Management & Data Systems*.
- Qamar, Y., & Samad, T. A. (2021). Human resource analytics: a review and bibliometric analysis. *Personnel Review*.
- Qandah, R., Suifan, T. S., & Obeidat, B. Y. (2020). The impact of knowledge management capabilities on innovation in entrepreneurial companies in Jordan. *International Journal of Organizational Analysis*.

- Qi, F., & Wang, W. (2018). Employee Involvement, Public Service Motivation, and Perceived Organizational Performance: Testing a New Model. *International Review of Administrative Sciences*, 84(4), 746-764.
- Queiroz, M. M., Fosso Wamba, S., De Bourmont, M., & Telles, R. (2021). Blockchain adoption in operations and supply chain management: empirical evidence from an emerging economy. *International Journal of Production Research*, 59(20), 6087-6103.
- Rahim, F. A. M., Yusoff, N. S. M., Chen, W., Zainon, N., Yusoff, S., & Deraman, R. (2016). The challenge of labour shortage for sustainable construction. *Planning Malaysia*(5).
- Rajhans, K., & Bhavsar, V. (2022). Impending need of sustainable human resource management practices in construction industry: evidence from India. *International Journal of Construction Management*, 1-11. doi:[10.1080/15623599.2022.2050569](https://doi.org/10.1080/15623599.2022.2050569).
- Ram, J., Afridi, N. K., & Khan, K. A. (2019). Adoption of Big Data analytics in construction: development of a conceptual model. *Built environment project and asset management*.
- Ramazani, J., & Jergeas, G. (2015). Project managers and the journey from good to great: The benefits of investment in project management training and education. *International journal of project management*, 33(1), 41-52.
- Ramos, L. R., Tissue, M. M., Johnson, A., Kavanagh, L., & Warren, M. (2022). Building the MCH Public Health Workforce of the Future: A Call to Action from the MCHB Strategic Plan. *Maternal and Child Health Journal*, 1-7. doi:[10.1007/s10995-022-03377-7](https://doi.org/10.1007/s10995-022-03377-7).
- Rasmussen, T., & Ulrich, D. (2015). Learning from practice: how HR analytics avoids being a management fad. *Organizational Dynamics*, 44(3), 236-242.
- Rauzana, A., & Dharma, W. (2022). Causes of delays in construction projects in the Province of Aceh, Indonesia. *Plos one*, 17(1). <https://doi.org/10.1371/journal.pone.0263337>.
- Razak, A. R. A., Othman, A. A., & Sundram, V. P. K. (2015). The relationships of human success factor, information technology, and procurement process coordination on operational performance in building construction industry—a proposed conceptual framework. *Procedia economics and finance*, 31, 354-360.
- Razkenari, M., Fenner, A., Shojaei, A., Hakim, H., & Kibert, C. (2020). Perceptions of offsite construction in the United States: An investigation of current practices. *Journal of Building Engineering*, 29, 101138.
- Reyes-Veras, P. F., Renukappa, S., & Suresh, S. (2021). Challenges faced by the adoption of big data in the Dominican Republic construction industry: an empirical study.

- Reyes, M. Z. (2004). *Social research: A deductive approach*. Rex Bookstore, Inc.
- Ringle, C. M., & Sarstedt, M. (2016). Gain more insight from your PLS-SEM results: The importance-performance map analysis. *Industrial management & data systems*.
- Rogers, E. (2003). *Diffusion of Innovations* fifth Ed Free Press. New York. Rezvani, Z., Jansson, J. & Bodin.
- Rui, L. M., Ismail, S., & Hussaini, M. (2015). Professional development of project management for contractor in the construction project: a review. *Procedia-Social and Behavioral Sciences*, 174, 2940-2945.
- Ruivo, P., Rodrigues, J., Johansson, B., Oliveira, T., & Rebelo, J. (2016). Using TOE and RBV theories to define a theoretical model to assess ERP value across Iberian Manufacturing and Services SMEs. *Procedia Computer Science*, 100, 474-479.
- Sacks, R., Girolami, M., & Brilakis, I. (2020). Building information modelling, artificial intelligence and construction tech. *Developments in the Built Environment*, 4, 100011.
- Sadiq, Usman, Ahmad Fareed Khan, Khurram Ikhtlaq, Superior University Bahaudin G. Mujtaba, Nova Southeastern University: The Impact of Information Systems on the Performance of Human Resources Department, *Journal of Business Studies Quarterly*, 2012, Vol. 3, No. 4, p. 77-91.
- Saira, S., Mansoor, S., Ishaque, S., Ehtisham, S., & Ali, M. (2020). Training effectiveness and employee outcomes: a study of an Australian manufacturing organization. *European Journal of Training and Development*.
- Sandhu, M., & Ajmal, M. (2012). The adoption of ICT in project-based and traditional organizations: Evidence from Finnish and Swedish companies. *Journal of Enterprise Information Management*.
- Saris, W. E., Satorra, A., & Van der Veld, W. M. (2009). Testing structural equation models or detection of misspecifications? *Structural equation modeling*, 16(4), 561-582.
- Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research methods. Business Students 4th edition Pearson Education Limited, England*.
- Saxena, M., Bagga, T., & Gupta, S. (2021). Fearless path for human resource personnel's through analytics: a study of recent tools and techniques of human resource analytics and its implication. *International Journal of Information Technology*, 13(4), 1649-1657.

- Saz-Gil, M. I., Cosenza, J. P., Zardoya-Alegría, A., & Gil-Lacruz, A. I. (2020). Exploring Corporate Social Responsibility under the Background of Sustainable Development Goals: A Proposal to Corporate Volunteering. *Sustainability (Switzerland)*, 12(12). <https://doi.org/10.3390/SU12124811>
- Schuler, R. S., & Jackson, S. E. (1987). Linking competitive strategies with human resource management practices. *Academy of Management Perspectives*, 1(3), 207-219.
- Schulz, D. J., & Enslin, C. (2014). The female executive's perspective on career planning and advancement in organizations: Experiences with cascading gender bias, the double-bind, and unwritten rules to advancement. *Sage Open*, 4(4), 2158244014558040.
- Schwartz, D. (2018). Embedded in the crowd: Creative freelancers, crowdsourced work, and occupational community. *Work and Occupations*, 45(3), 247-282.
- Semerari, A., Carcione, A., Dimaggio, G., Falcone, M., Nicolò, G., Procacci, M., & Alleva, G. (2003). How to Evaluate Metacognitive Functioning in Psychotherapy? The Metacognition Assessment Scale and Its Applications. *Clinical Psychology & Psychotherapy*, 10(4), 238-261.
- Senders, J. W., & Moray, N. P. (2020). *Human Error: Cause, Prediction, and Reduction*. CRC Press.
- Sepasgozar, S. M., & Davis, S. (2018). Construction technology adoption cube: An investigation on process, factors, barriers, drivers and decision makers using NVivo and AHP analysis. *Buildings*, 8(6), 74.
- Shah, N., Irani, Z., & Sharif, A. M. (2017). Big data in an HR context: Exploring organizational change readiness, employee attitudes and behaviors. *Journal of Business Research*, 70, 366-378.
- Shah, S., Gochtovtt, A., & Baldini, G. (2019). Importance of project management in business analytics: academia and real world. In *Aligning business strategies and analytics* (pp. 81-94). Springer.
- Sheng, J., Amankwah-Amoah, J., & Wang, X. (2017). A multidisciplinary perspective of big data in management research. *International Journal of Production Economics*, 191, 97-112.
- Shet, S. V., Patil, S., & Chandawarkar, M. R. (2019). Competency based superior performance and organizational effectiveness. *International Journal of Productivity and Performance Management*.

- Shet, S. V., Poddar, T., Samuel, F. W., & Dwivedi, Y. K. (2021). Examining the determinants of successful adoption of data analytics in human resource management—A framework for implications. *Journal of Business Research*, *131*, 311-326.
- Shojaei, A., & Flood, I. (2017). Extending the Portfolio and Strategic Planning Horizon by Stochastic Forecasting of Unknown Future Projects. The Seventh International Conference on Advanced Communications and Computation, INFOCOMP.
- SHRM. (2016). *Jobs of the future: Data analysis skills*. <https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/pages/data-analysis-skills.aspx>
- Shurrab, M., Abbasi, G., & Al Khazaleh, R. (2018). Evaluating the effect of motivational dimensions on the construction project managers in Jordan. *Engineering, Construction and Architectural Management*.
- Siddiqui, D. A., & Sahar, N. (2019). The impact of training & development and communication on employee engagement—A study of banking sector. Sahar, N. and Siddiqui, DA (2019). The Impact of Training & Development and Communication on Employee Engagement—A Study of Banking Sector. *Business Management and Strategy*, *10*(1), 23-40.
- Silva, G., Warnakulasuriya, B., & Arachchige, B. (2018). A review of the skill shortage challenge in construction industry in Sri Lanka. *Int J Econ Bus Manage Res*, *2*(1), 75-89.
- Singh, S., & Muduli, A. (2021). Factors influencing information sharing intention for human resource analytics. *Economic Studies*, *30*(3).
- Sivathanu, B., & Pillai, R. (2019). Technology and talent analytics for talent management—a game changer for organizational performance. *International Journal of Organizational Analysis*.
- Somasundaram, U. V., & Egan, T. M. (2004). Training and Development: An Examination of Definitions and Dependent Variables. *Online Submission*.
- Spanos, Y. E., Prastacos, G. P., & Poulymenakou, A. (2002). The relationship between information and communication technologies adoption and management. *Information & management*, *39*(8), 659-675.
- Stavrou, E. T., & Brewster, C. (2005). The configurational approach to linking strategic human resource management bundles with business performance: myth or reality? *Management Revue*, 186-201.
- Stavrou, E. T., Brewster, C., & Charalambous, C. (2010). Human resource management and firm performance in Europe through the lens of business systems: best fit, best practice or both? *The International Journal of Human Resource Management*, *21*(7), 933-962.

- Stevens, J. (1996). *Applied multivariate statistics for social sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Stone, D. L., & Dulebohn, J. H. (2013). Emerging issues in theory and research on electronic human resource management (eHRM). In (Vol. 23, pp. 1-5): Elsevier.
- Straub, D. W. (1989). Validating instruments in MIS research. *MIS quarterly*, 147-169.
- Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information systems*, 13(1), 24.
- Sugianingrat, I. A. P. W., Widyawati, S. R., da Costa, C. A. D. J., Ximenes, M., Piedade, S.D. R., & Sarmawa, W. G. (2019). The employee engagement and OCB as mediating on employee performance. *International Journal of Productivity and Performance Management*, 68(2), 319-339.
- Sun, S., Cegielski, C. G., Jia, L., & Hall, D. J. (2018). Understanding the factors affecting the organizational adoption of big data. *Journal of computer information systems*, 58(3), 193-203.
- Susomrith, P., Coetzer, A., & Ampofo, E. (2019). Training and development in small professional services firms. *European Journal of Training and Development*, 43(5-6), 517-535. <https://doi.org/10.1108/EJTD-11-2018-0113>
- Swanson, R. A., Holton, E., & Holton, E. F. (2001). *Foundations of human resource development*. Berrett-Koehler Publishers.
- Sweis, G. J., Sweis, R. J., Al-Shboul, M. A., & Al-Dweik, G. A. (2015). The Impact of Information Technology (IT) adoption on the quality of construction projects: The case of Jordan. *International Journal of Information Technology Project Management (IJITPM)*, 6(3), 26-40.
- Sweis, R. J., & Jaradat, M. (2021). Project management performance of construction projects in Jordan: a comparative study of ISO 9001-certified and non-certified companies. *The TQM Journal*.
- Sweis, R. J., Ghalion, R., El-Mashaleh, M., Amayreh, I., Niveen, A. S., & Al Balkhi, W. (2019). The effects of training and motivating employees on improving performance of construction companies: The case of Jordan. *International Journal of Information, Business and Management*, 11(2), 179-211.
- Tabassi, A. A., Ramli, M., & Bakar, A. H. A. (2012). Effects of training and motivation practices on teamwork improvement and task efficiency: The case of construction firms. *International journal of project management*, 30(2), 213-224.

- Tahir, N., Yousafzai, I. K., Jan, S., & Hashim, M. (2014). The impact of training and development on employees performance and productivity a case study of United Bank Limited Peshawar City, KPK, Pakistan. *International Journal of Academic Research in Business and Social Sciences*, 4(4), 86.
- Tai, W. T. (2006). Effects of training framing, general self-efficacy and training motivation on trainees' training effectiveness. *Personnel review*.
- Tasgin, M., & Bingol, H. O. (2019). Community Detection Using Boundary Nodes in Complex Networks. *Physica A: Statistical Mechanics and Its Applications*, 513, 315-324.
- Teo, T. S., Lim, G. S., & Fedric, S. A. (2007). The adoption and diffusion of human resources information systems in Singapore. *Asia Pacific Journal of Human Resources*, 45(1), 44-62.
- Thacker, S., Adshead, D., Fay, M., Hallegatte, S., Harvey, M., Meller, H., O'Regan, N., Rozenberg, J., Watkins, G., & Hall, J. W. (2019). Infrastructure for sustainable development. *Nature Sustainability*, 2(4), 324-331. doi [10.1038/s41893-019-0256-8](https://doi.org/10.1038/s41893-019-0256-8).
- Thang, N. N., Quang, T., & Buyens, D. (2010). The relationship between training and firm performance: A literature review. *Research and practice in human resource management*, 18(1), 28-45.
- Thang, N. N., Thu, N. V., & Buyens, D. (2008). *The impact of training on firm performance: Case of Vietnam*. Faculteit Economie en Bedrijfskunde, Univ. Gent.
- Tharenou, P., Donohue, R., & Cooper, B. (2007). *Management research methods*. Cambridge University Press.
- Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). *Processes of technological innovation*. Lexington books.
- Torres, K. M., & Statti, A. (2021). Utilizing Technology to Enhance Human Resource Practices. In *Designing and Implementing HR Management Systems in Family Businesses* (pp. 83-100). IGI Global.
- Troshani, I., Jerram, C., & Gerrard, M. (2010). Exploring the organizational adoption of Human Resources Information Systems (HRIS) in the Australian public sector.
- Tsai, M.-C., Lai, K.-H., & Hsu, W.-C. (2013). A study of the institutional forces influencing the adoption intention of RFID by suppliers. *Information & management*, 50(1), 59-65.

- Tu, Y.- T., Lin, S. -Y., & Chang, Y.-Y. (2011). A cross-cultural comparison by individualism/collectivism among Brazil, Rus-sia, India and China. *International Business Research*, 4(2), 175-182
- Tursunbayeva, A., Di Lauro, S., & Pagliari, C. (2018). People analytics—A scoping review of conceptual boundaries and value propositions. *International Journal of Information Management*, 43, 224-247.
- Uddin, M. J., Luva, R. H., & Hossian, S. M. M. (2013). Impact of organizational culture on employee performance and productivity: A case study of telecommunication sector in Bangladesh. *International Journal of Business and Management*, 8(2), 63.
- Ul Musawir, A., Serra, C. E. M., Zwikael, O., & Ali, I. (2017). Project governance, benefit management, and project success: Towards a framework for supporting organizational strategy implementation. *International Journal of Project Management*, 35(8), 1658-1672.
- Uzoamaka, E. V., & Innocent, I. E. (2017). Effect of Employees Training on Organizational Performance: A Study of Seven-Up Botling Company, Enugu State Nigeria. *IIARD International Journal of Economics and Business Management*, 3(10), 48-63.
- Van de Ven, F. (2007). Fulfilling the promise of career development: Getting to the " heart" of the matter. *Organization Development Journal*, 25(3), P45.
- Van den Heuvel, S., & Bondarouk, T. (2017). The rise (and fall?) of HR analytics: A study into the future application, value, structure, and system support. *Journal of Organizational Effectiveness: People and Performance*.
- Vardarlier, P., & Ozsahin, M. (2021). Digital transformation of human resource management: Social media's performance effect. *International Journal of Innovation and Technology Management*, 18(03), 2150005. doi:[10.1142/S021987702150005X](https://doi.org/10.1142/S021987702150005X).
- Vargas, R., Yurova, Y. V., Ruppel, C. P., Tworoger, L. C., & Greenwood, R. (2018). Individual adoption of HR analytics: a fine grained view of the early stages leading to adoption. *The International Journal of Human Resource Management*, 29(22), 3046-3067.
- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision sciences*, 39(2), 273-315.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
- Veysel, A., & MENTEŞE, A. (2013). BİR KURUMSAL KAYNAK PLANLAMA MODÜLÜ OLARAK İNSAN KAYNAKLARI BİLGİ SİSTEMİNİNİKY VE İŞLETME

- PERFORMANSI ÜZERİNDEKİ ETKİSİ: BİR UYGULAMA. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*(37).
- Vinita, J. (2016). Training and Development Program and its Benefits to Employee and Organization : A Conceptual Study. *International Journal of Scientific Research in Science and Technology (IJSRST)*, 2(5), 80-86.
- Vivekananth, P. (2016). The impact of Internet of Things (IoT) in human resource management. *IPASJ International Journal of Management (IJM)*, 4(9).
- Walker, A. J. (1982). *HRIS development: A project team guide to building an effective personnel information system*. Van Nostrand Reinhold Company.
- Walker, R. S., & Brown, I. (2019). Big data analytics adoption: A case study in a large South African telecommunications organisation. *South African Journal of Information Management*, 21(1), 1-10.
- Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J.-f., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, 356-365.
- Waring, S. P. (2016). *Taylorism transformed: Scientific management theory since 1945*. UNC Press Books.
- Washington, K., Feinstein, A. H. and Busser, J. A. (2003). Evaluating the effect of training on perceptions of internal occupational status. *International Journal of Hospitality Management*, 22, 3, 243–65.
- Wenzel, R., & Van Quaquebeke, N. (2018). The double-edged sword of big data in organizational and management research: A review of opportunities and risks. *Organizational Research Methods*, 21(3), 548-591.
- Wesolowski, B. C., Wind, S. A., & Engelhard Jr, G. (2016). Examining Rater Precision in Music Performance Assessment: An Analysis of Rating Scale Structure Using the Multifaceted Rasch Partial Credit Model. *Music Perception: An Interdisciplinary Journal*, 33(5), 662-678.
- Wickramasinghe, V., & Liyanage, S. (2013). Effects of high performance work practices on job performance in project-based organizations. *Project management journal*, 44(3), 64-77.
- Wiggins, G. (2011). A True Test: Toward More Authentic and Equitable Assessment. *Phi Delta Kappan*, 92(7), 81-93.

- Witte, L. (2016). *We have HR analytics! So what?: an exploratory study into the impact of HR analytics on strategic HRM* University of Twente.
- Woods, J. G. (2012). An analysis of apprentices in the US construction trades: an overview of their training and development with recommendations for policy makers. *Education+ Training*.
- Wright, P. M., & McMahan, G. C. (1992). Theoretical perspectives for strategic human resource management. *Journal of management*, 18(2), 295-320.
- Wu, J.-H., & Wang, Y.-M. (2006). Measuring KMS success: A respecification of the DeLone and McLean's model. *Information & management*, 43(6), 728-739.
- Yang, L.-R., & Huang, C.-F. (2016a). Information platform to improve technological innovation capabilities: Role of cloud platform. *Journal of Civil Engineering and Management*, 22(7), 936-943.
- Yang, L.-R., & Huang, C.-F. (2016b). Information technology utilization to improve project team-owner relationship and project performance. *KSCE Journal of Civil Engineering*, 20(1), 48-57.
- Yong, J. Y., Yusliza, M. Y., Ramayah, T., Chiappetta Jabbour, C. J., Sehnem, S., & Mani, V. (2020). Pathways towards sustainability in manufacturing organizations: Empirical evidence on the role of green human resource management. *Business Strategy and the Environment*, 29(1), 212-228.
- Young, R., & Jordan, E. (2008). Top management support: Mantra or necessity? *International Journal of Project Management*, 26(7), 713-725.
- Youssef, M. A. E.-A., Eid, R., & Agag, G. (2022). Cross-national differences in big data analytics adoption in the retail industry. *Journal of Retailing and Consumer Services*, 64, 102827.
- Zaid Alkilani, S., Jupp, J., & Sawhney, A. (2013). Issues of construction health and safety in developing countries: a case of Jordan. *Australasian Journal of Construction Economics and Building*, 13(3), 141-156.
- Zaid, A. A., Jaaron, A. A., & Bon, A. T. (2018). The impact of green human resource management and green supply chain management practices on sustainable performance: An empirical study. *Journal of cleaner production*, 204, 965-979. <https://doi.org/10.1016/j.jclepro.2018.09.062>
- Zang, S., & Ye, M. (2015). Human resource management in the era of big data.

- Zangiacomi, A., Pessot, E., Fornasiero, R., Bertetti, M., & Sacco, M. (2020). Moving towards digitalization: a multiple case study in manufacturing. *Production Planning & Control*, 31(2-3), 143-157.
- Zeidan, S., & Itani, N. (2020). HR analytics and organizational effectiveness. *International Journal on Emerging Technologies*, 11(2), 683-688.
- Zhang, Y., Xu, S., Zhang, L., & Yang, M. (2021). Big data and human resource management research: An integrative review and new directions for future research. *Journal of Business Research*, 133, 34-50.
- Zheng, J., & Ma, R. (2021). Analysis of Enterprise Human Resources Demand Forecast Model Based on SOM Neural Network. *Computational Intelligence and Neuroscience*, 2021. <https://doi.org/10.1155/2021/6596548>.
- Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business.
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods*. Cengage Learning.

