

# Interrelationships Between Lean HRM Practices and Their Impacts on Firm Performance: Comparing Jordanian and German Models

## Abstract

**Purpose** – Lean management is a contemporary management system that firms adopt to boost their performance. Lean management can be integrated with human resources management to develop the new concept of lean human resources management (LHRM). This entails the implementation of several practices. However, the LHRM-performance paradigm remains under-explored in the literature. Hence, this study aims to examine the interrelationships between LHRM practices and the impacts of those practices on firm performance (FP).

**Design/methodology/approach** – Using two equal-sized samples ( $n = 250$  each) of manufacturing firms in Jordan and Germany, the current study proposes two structural equation models (i.e., a Jordanian and a German model) depicting the interrelationships between LHRM practices and the impacts of those practices on FP. After testing these models, a comparison between them is conducted, producing findings with theoretical and practical implications.

**Findings** – The main findings indicate that the average implementation of LHRM practices among German manufacturing firms is at a higher level than the average implementation among Jordanian firms. The findings also support the proposed interrelationships between LHRM practices and the impact of those practices on FP for both the Jordanian and German models.

**Originality/value** – This study is among the first to highlight the proposed relationships, both in general and in the context of comparing developed and developing countries. Its findings have important implications that can enable manufacturing managers to benefit from the implementation of LHRM practices to enhance firm performance in different contexts. These findings provide valuable insights for human resource managers and decision makers and open several avenues for future research.

**Paper type** Research paper

**Keywords:** Lean management, Human resource management, Firm performance, Structural equation modelling, Jordan, Germany.

## 1. Introduction

Lean management (LM) is a set of practices that focus on achieving cost reduction by eliminating non-value-added activities from a firm's operations (Bwaliez and Abushaikha, 2019). LM is an integrated system requiring the implementation of a diverse set of management concepts that can be applied to various impact areas. This implementation has long been a part of the ambitions of firms wanting to improve their performance (Saini and Singh, 2020), and human resources management (HRM) is among the relevant impact areas (Bonavia and Marin-Garcia, 2011; Al-Tahat and Bwaliez, 2015). However, most LM research has focused on LM

practices from an engineering, quality, or operations management perspective instead of from a HRM or personnel-related perspective. Nonetheless, both Bonavia and Marin-Garcia (2011) and Ekanayake and Preena (2021) have integrated the concepts of LM and HRM to develop the new concept of lean human resources management (LHRM) (also known as lean workforce management). Elsewhere, Al-Tahat and Bwaliez (2015) identified the main LHRM practices as multifunctional and flexible employees (MFE), employee training and development (ETD), employee involvement and empowerment (EIE), employee appraisal and performance-related pay systems (EAPPS) and safety improvement programs (SIP).

For many researchers, LM practices, are generally necessary for firms wanting to improve their performance (Belekoukias *et al.*, 2014; Wickramasinghe and Wickramasinghe, 2017; Saini and Singh, 2020). Despite the critical role that LM plays in enhancing firm performance (FP) (Alkhalidi and Abdallah, 2019; Abdallah *et al.*, 2021), the impact of this specific type of personnel-related LM practice on FP remains under-explored in the literature (Shah and Ward, 2003; Bonavia and Marin-Garcia, 2011). In addition, researchers often study LHRM practices in a vacuum, ignoring consideration of the ways that different LHRM practices mutually reinforce each another. Therefore, this study aims to examine not only the interrelationships between LHRM practices but also how these practices impact FP.

Furthermore, the literature includes no studies comparing the impacts of LHRM practices on FP in developing and developed countries, with existing research generally indicating the effects of LM practices – and, to a lesser extent, LHRM practices – on the performance of firms operating in either developed or, to a lesser extent, developing countries (Saini and Singh, 2020). Therefore, this study aims to compare implementations of LHRM-FP models in developing and developed countries to ultimately respond to the following research questions:

RQ1: What are the interrelationships between LHRM practices and what are the impacts of those practices on FP?

RQ2: What is the difference between the Jordanian and German LHRM-FP models?

This study comparatively explores the contexts of a developing country (Jordan) and a developed country (Germany) to examine the interrelationships between LHRM practices and the impacts of those practices on FP. It also compares a Jordanian LHRM-FP model with a German model to identify the strengths and weaknesses of each. This approach enables the study to contribute substantially to the literature by synthesizing LM and HRM paradigms and bridging the gap between academic and applied studies in the fields of operations management and HRM. It can also act as a managerial guide for implementing LHRM practices within manufacturing firms.

The rest of this study is organized as follows. Section 2 presents the previous literature. Section 3 details the hypotheses development process and explains the theoretical model. Section 4 describes the research methodology. Section 5 presents and discusses the results. Section 6 outlines the conclusions, indicating theoretical and practical implications and addressing the research's limitations and possible directions for future research.

## **2. Literature Review**

### **2.1. Human resources management**

Although the term “human resources” can be used interchangeably with the term “workforce”, the first is used more frequently in the management literature (Al-Tahat and Bwaliez, 2015; Anwar and Abdullah, 2021). DeNisi and Griffin (2007) defined human resources as the people an organization employs to conduct jobs, tasks and functions in exchange for remuneration and other rewards. Thus, HRM corresponds to the part of management that deals directly with people and aims to optimize the productive contribution of people to their organizations. According to Dessler (2017), HRM is a set of practices that includes recruiting, selecting, training, compensating, evaluating, developing employees, and attending to their labour relations, health and safety, and equity concerns. More specifically, HRM practices include complex selection procedures, substantial investments in training, teamwork, extensive communication, motivating job design (e.g., flexible work, employee participation, autonomy and empowerment), developmental performance appraisals, performance-related pay, performance-related promotion, harmonization and employment security (Combs *et al.*, 2006; Bwaliez, 2012; Ho and Kuvaas, 2019). Most researchers define HRM systems as “an integrated set or cluster of HRM practices that have the potential to achieve substantially enhanced economic performance” (Ho and Kuvaas, 2019, p. 2). HRM vitally contributes to shaping organizational performance (Liu *et al.*, 2007; Anwar and Abdullah, 2021) by improving the knowledge and skills of employees and providing employees with the chance to utilize those characteristics for organizational benefit (Boselie *et al.*, 2005; Combs *et al.*, 2006). Hence, effective HRM calls for managers and human resources professionals to determine the best way of utilizing employees to accomplish goals, improve performance and increase the efficiency and effectiveness of the organization (Al-Tahat and Bwaliez, 2015; Rifai *et al.*, 2021; Ta’Amnha *et al.*, 2021a, 2021b, 2021c, 2022).

### **2.2. Lean management**

LM is essentially the idea of optimum resource utilization to achieve more outputs from fewer inputs (Bwaliez and Abushaikha, 2019). LM evolved in Japan in the 1940s, and it is commonly attributed to Taiichi Ohno of the Toyota Motor Corporation (Al-Tahat and Bwaliez, 2015). Ohno based his work on eliminating what he considered the seven sources of waste: overproduction, inappropriate processing, waiting, transportation, motion, inventory and defects (Ohno, 1988). However, the landmark book *Every Employee is a Manager* (1991) makes the case for an eighth type of waste: the underutilization of employee talent. For its author, this represents the most damaging and egregious form of waste because if all the talents of all employees were brought to bear on the problems and issues of production, the other forms of waste would be greatly minimized.

LM can be applied to every business and every process because it is not only a tactic or a cost reduction program but also a way of thinking and acting across entire organizations (Goetsch and Davis, 2016). To achieve this, beyond establishing what LM is, it is essential to establish a process for becoming lean. This can be achieved by implementing a set of synergistic practices, known as LM practices, that includes continuous improvement, just-in-time, total

quality management, cellular manufacturing, total productive maintenance, supplier relationship management and workforce management. Many studies have presented the most frequently identified lean practices in the extant literature (e.g., Shah and Ward, 2003; Browning and Heath, 2009; Belekoukias *et al.*, 2014; Wickramasinghe and Wickramasinghe, 2017; Sahoo and Yadav, 2018; Bwaliez and Abushaikha, 2019).

### **2.3. Lean human resource management**

This builds on the integration of the foundations of LM and the principles of HRM in the form of the LHRM concept (Bonavia and Marin-Garcia, 2011). Because the core principle of implementing LM is reducing waste by optimally utilizing a firm's resources (Dave and Sohani, 2019), and human resources are fundamentally important firm resources (i.e., human capital), HRM is among the areas in which LM can be effectively applied (Bonavia and Marin-Garcia, 2011; Al-Tahat and Bwaliez, 2015; Ekanayake and Preena, 2021; Solgi *et al.*, 2021). Gaiardelli *et al.* (2019) defined "lean human resources" as the right number of employees with the right skillsets for the job at hand working safely and productively without errors. Many researchers have identified HRM as a significant dimension of LM implementation (e.g., Bonavia and Marin-Garcia, 2011; Agarwal *et al.*, 2013; Arezes *et al.*, 2015). Thus, LHRM is a systematic approach based on lean practice standards that eliminate inefficiencies from the organization (Bonavia and Marin-Garcia, 2011; Ekanayake and Preena, 2021). To date, human aspects of LM implementation have often been neglected or only partially considered (Gaiardelli *et al.*, 2019), with many HRM practitioners seeing LM as a special province of operations management and many operations management specialists having little in-depth knowledge of the theory and practice of HRM (Bamber *et al.*, 2014; Anwar and Abdullah, 2021). The current study adopts the HRM practices most commonly adopted in LM settings (Al-Tahat and Bwaliez, 2015), namely, MFE, ETD, EIE, EAPPS and SIP.

### **2.4. Firm performance (FP)**

There is no consensus among scholars and practitioners concerning a definition of FP and its elements (Sezhiyan and Nambirajan, 2010; Miller *et al.*, 2013; Anwar and Abdullah, 2021), with several definitions in existence alongside various indicators (Richard *et al.*, 2009; Sezhiyan and Nambirajan, 2010; Silvestro, 2014). The definition adopted in this study derives from Sezhiyan and Nambirajan (2010), who understand FP as a set of managerial and critical methodologies that enables firm managers to attain one or more pre-selected goals.

The most commonly used measures of FP are quality, cost, accuracy and efficiency (Loh and Yusof, 2020). Other researchers have also suggested quality, effective cost, on-time delivery, efficiency and customer satisfaction (Nawanir *et al.*, 2013; Sabry, 2014; Sureeratta *et al.*, 2014). Meanwhile, Bhasin (2013) grouped the measures into the following four quadrants based on the balanced scorecard framework (Kaplan, 2009): financial, customer, internal process and innovation, learning and growth. This study adopts that approach, as **Table 1** shows.

**Table 1:** List of measurement items for firm performance

Balanced scorecard measure	Measurement item	References
Financial	Profitability Revenue growth Market share Competitive position	Alkunsol <i>et al.</i> (2018), Bwaliez and Abushaikha (2019), Kafetzopoulos <i>et al.</i> (2019)
Customer	Delivery lead-time	Nawanir <i>et al.</i> (2013), Sabry (2014) Sureeratta <i>et al.</i> (2014), Bwaliez and Abushaikha (2019)
Internal process	Quality Productivity Employee satisfaction	Bhasin (2013), Alkunsol <i>et al.</i> (2018), Bwaliez and Abushaikha (2019), Loh and Yusof (2020)
Innovation, learning and growth	Overall growth	Alkunsol <i>et al.</i> (2018), Bwaliez and Abushaikha (2019)

### 3. Hypotheses Development and Theoretical Model

#### 3.1. The role of multifunctional and flexible employees

The knowledge and skills embodied in human resources are critical elements of LM. However, skills in one field or one function of lean work are not enough, and multifunctional and flexible employees are vital in lean organizations (Power and Sohal, 2000; Cappelli and Neumark, 2001; Thun *et al.*, 2010). To have multifunctional and flexible employees, organizations must introduce formal cross-functional training programs, job-rotation programs and cross-functional teams (Pérez and Sánchez, 2000; Shah and Ward, 2003; de Treville and Antonakis, 2006; Schonberger, 2007; Sahoo and Yadav, 2018).

Employee involvement can be nurtured via an efficient organizational structure with decentralized authority, multifunctional training programs and collaboration and communication across the entire employee body (Womack *et al.*, 1990; Rinehart *et al.*, 2018). According to de Menezes and Wood (2006), teamwork is vital for substantial employee involvement. Notably, cross-training and job rotation also contribute to preventing repetitive strain injuries (Conti *et al.*, 2006; Askin and Goldberg, 2007). In addition, cross-training operators allows teams of workers to reduce the variation in output caused by injuries to team members (Rinehart *et al.*, 2018). According to Sánchez and Pérez (2001), LM is based on a set of principles that includes multi-disciplinary teams, elimination of non-value-added activities and continuous improvement practices designed to enhance FP. Based on this overview of the existing literature, the following hypotheses are proposed:

*H1:* MFE practices positively affect EIE practices.

*H2:* MFE practices positively affect SIP practices.

*H3:* MFE practices positively affect FP.

### **3.2. The role of employee training and development**

Employees only knowing the routine functions of job roles does not produce significant contributions to organizations beyond enabling the accomplishment of assigned tasks (Liu *et al.*, 2007). This explains the importance of continuous employee training and development. Many studies have highlighted the importance of employee training in the success of LM (e.g., Womack *et al.*, 1990; Forza, 1996; Wickramasinghe and Wickramasinghe, 2017; Sahoo and Yadav, 2018), and it has long been acknowledged that training programs are an essential LHRM practice (Osterman, 1994; MacDuffie, 1995).

Several researchers have identified the effect of training and development on other human resources practices. For example, Magnan *et al.* (1995) reported that employee training is significantly related to flexibility performance, and Muller (1999) recognized that employee training can contribute to functional flexibility if it leads to multiskilling. According to Pérez and Sánchez (2000), training is positively correlated with job rotation and team working. Elsewhere, Power and Sohal (2000) found that firms need to actively promote the development of multiskilled and flexible employees via training and effective employee development programs, and Liu *et al.* (2007) indicated that bundling training with flexible job descriptions and greater employee autonomy could provide scope to leverage new skills and capabilities.

To promote employee contributions and increase employee empowerment and responsibility, firms have adopted innovative practices including employee education and training (Yang *et al.*, 2011), with Voegtlin *et al.* (2015) confirming a positive relationship between training individual employees and sharing empowerment across work units. Meanwhile, Silva *et al.* (2004) and Dessler (2017) both recognized the importance of training and awareness-raising for employees for anticipating and uncovering safety problems. Delivering safety training to employees is a significant variable that can increase safety performance (Cameron *et al.*, 2013), with Hare and Cameron (2011) extending this insight by recognizing that increased duration of training is associated with lower accident rates. Furthermore, training and development enrich employee skills, adding value to an organization by maximizing its overall effectiveness and productivity (Ibrahim *et al.*, 2017). More generally, training is a key factor for business growth and competitiveness (Brinia and Pefanis, 2013), with people practices such as training teamwork enhancing the quality of products because well-trained and skilled employees contribute to the betterment of operations across production systems (Chauhan and Chauhan, 2019; Saini and Singh, 2020). Specifically, Ismael *et al.* (2021) detailed a direct relationship between development programs and organizational effectiveness. Consequently, training can be used as a catalyst for improving FP in general (Beckwith, 2003; Pool, 2011; Rana and Malik, 2017). Accordingly, this paper tests the following hypotheses:

*H4*: ETD practices positively affect MFE practices.

*H5*: ETD practices positively affect EIE practices.

*H6*: ETD practices positively affect SIP practices.

*H7*: ETD practices positively affect FP.

### **3.3. The role of employee involvement and empowerment**

Even knowledgeable, skilled and motivated employees will not employ their optimal talent if organizational structures and job design block their efforts and prevent them from participating in decision-making (Liu *et al.*, 2007). The participation of employees in the formulation of important work decisions or in the supervision of all or part of employee work activities is called employee involvement (Dessler, 2017). According to Liu *et al.* (2007), employee involvement describes the degree to which employees can influence decisions and is a critical component of LM implementation (Shah and Ward, 2007; Angelis *et al.*, 2011; Herzog and Tonchia, 2014). As de Treville and Antonakis (2006) have noted, LHRM relies on the commitment and involvement of employees. However, employee participation should be coupled with some type of incentive to avoid participation being viewed as the onerous addition of new work tasks (Liu *et al.*, 2007). To achieve excellence in the prevention of safety and health hazards, firms must foster the commitment and participation of all relevant employees (Fernández-Muñiz *et al.*, 2007).

Another key element of successful LM is employee empowerment (Elnadi and Shehab, 2014; Sahoo and Yadav, 2018). Employee empowerment describes giving employees more responsibility, autonomy and control in the execution of their roles within organizational processes, as well as increasing levels of training to build the skills employees need to effectively exercise responsibility (Dessler, 2017). Magnan *et al.* (1995) found that employee autonomy and impact are related to flexibility performance, and Kathuria and Partovi (1999) recognized that delegation practices are more effective at managing workload when there is considerable emphasis on flexibility. Elsewhere, Born and Molleman (1996) supported the notion that employee empowerment has implications for reward systems, with Horwitz and Horwitz (2017) positively correlating both affective commitment and structural empowerment with patient safety culture in healthcare organizations. Notably, employee participation and involvement also maximize productivity (Cua *et al.*, 2006), with Rana and Malik (2017) observing that employee participation is significantly and positively related to organizational performance, García-Juan *et al.* (2019) demonstrating that employee empowerment is positively associated with organizational performance, and Saini and Singh (2020) revealing that people practices (i.e., employee involvement) enhance the quality of an organization's products. Accordingly, the following hypotheses can be proposed:

*H8*: EIE practices positively affect MFE practices.

*H9*: EIE practices positively affect EAPPS practices.

*H10*: EIE practices positively affect SIP practices.

*H11*: EIE practices positively affect FP.

### **3.4. The role of employee appraisal and performance-related pay systems**

After employees have been hired and trained and worked in a position for some time, firms must appraise their performance. Dessler (2017) defined employee appraisal as assessing an employee's current or past performance relative to that person's performance standards. That is, performance appraisal concerns determining how well employees are doing their jobs, communicating work-related information to employees, and establishing a plan for performance improvement (Stone, 2017). Performance appraisal vitally contributes to the

training and development of employees, particularly by enabling the identification of training needs (DeNisi and Griffin, 2007). Appraisal involves establishing work standards, evaluating an employee's actual performance relative to these standards and providing feedback to the employee with the aim of motivating that person to eliminate deficiencies or continue to perform above average, which, in turn, contributes to the involvement and empowerment of the employee (Dessler, 2017).

Even when employees possess knowledge, skills and abilities that allow them to move beyond routine tasks, they are unlikely to do so unless properly motivated. Performance-related pay systems are used to boost motivation via strengthening the link between employee effort and the received rewards (Liu *et al.*, 2007). According to Olivella *et al.* (2008), performance-related pay systems are common in lean environments, with Hiltrop (1992) advocating for lean firms to adapt reward systems. Salary structures and reward systems certainly influence employee loyalty and commitment, which are absolutely necessary in LM (Forza, 1996). In lean environments, compensation systems tie wages to either skills or performance (Olivella *et al.*, 2008).

Interestingly, for Osterman (1994), when employees are given more power, commitment and effort to determine outcomes, they should have a financial stake in organizational success. Skills-based compensation rewards practices are associated with multifunctional and flexible human resource practices including learning, multiskilling and teamwork, while performance-related compensation increases commitment (Olivella *et al.*, 2008). Organizational incentives relate directly to training outcomes (Dermol and Čater, 2013). According to Black (2008), firms must be willing to compensate workers for increasing their skills. It may also be helpful to promote employees who learn new skills to a new grade in a graded pay system or pay for the time they spend in cross-training. Born and Molleman (1996) identified ways that reward systems can support empowerment, and Bessant and Francis (1999) indicated that offering rewards to workers for their ideas boosts worker participation and continuous improvement. Incentives and rewards for employee participation in safety activities are critical for a good occupational safety management system (Vredenburg, 2002). Notably, health and safety professionals use awards as a means of assessing and acknowledging their own contributions to firm health and safety standards (Tait and Walker, 2000).

Broadly speaking, for many organizations, the primary goal of an employee evaluation system is to improve individual and organizational performance (Ahmed *et al.*, 2013). A firm that adopts a performance-related pay system will have workers that are more likely to be engaged and motivated to participate in activities that improve the organization's overall performance (Pil and MacDuffie, 1996). Organizational incentives relate indirectly to FP via encouraging cognitive and behavioural changes (Dermol and Čater, 2013). According to Rana and Malik (2017), employee performance appraisal and compensation significantly and positively relate to organizational performance. In addition, Ho and Kuvaas (2020) found that performance-related pay is positively correlated with FP. Accordingly, the following hypotheses are proposed:



H12: EAPPS practices positively affect MFE practices.

H13: EAPPS practices positively affect ETD practices.

H14: EAPPS practices positively affect EIE practices.

H15: EAPPS practices positively affect SIP practices.

H16: EAPPS practices positively affect FP.

### **3.5. The role of safety improvement programs**

Another important HRM practice is addressing health and safety hazards that employees may be exposed to at the workplace. Health and safety hazards are factors in the workplace that have the potential to cause harm to employees or others (DeNisi and Griffin, 2007). To reduce these hazards and conform with legal regulations, safety improvement programs have become an issue of increasing concern for operations managers (Brown *et al.*, 2000; Kabir *et al.*, 2018), with many authors advocating the role of safety improvement programs in LM systems (Shah and Ward, 2003; Browning and Heath, 2009; Wickramasinghe and Wickramasinghe, 2017; Sahoo and Yadav, 2018). Accordingly, employee development programs should concentrate on problem-solving skills, safety and first-aid issues (Power and Sohal, 2000).

Based on a study of US hospitals, Stock and McFadden (2017) concluded that hospital managers should focus on building a stronger employee safety culture due to its positive relationship with hospital performance. However, safety represents an essential dimension for all organizations, not only those intrinsically concerned with health and safety risks, such as the healthcare sector. An organization may increase employee commitment by addressing safety first, thereby demonstrating care and concern, which causes employees to feel valued (Brown, 1996; Ta'Amnha *et al.*, 2021b). In addition, Kongtip *et al.* (2008) recognized that safety improvement programs enhance the involvement of employees via safety committees, which might, for example, arrange regular monthly meetings. Notably, lean firms are characterized by more substantial employee participation, something that can be achieved by a high percentage of workers participating in safety programs (Olivella *et al.*, 2008). Empirical studies have demonstrated that workplace safety has significant impacts on cost, delivery and quality (e.g., Brown *et al.*, 2000). Thus, the safety of people, environment and assets are substantial prerequisites for the success of any firm (Narayan, 2012). Accordingly, the following hypotheses are proposed:

H17: SIP practices positively affect ETD practices.

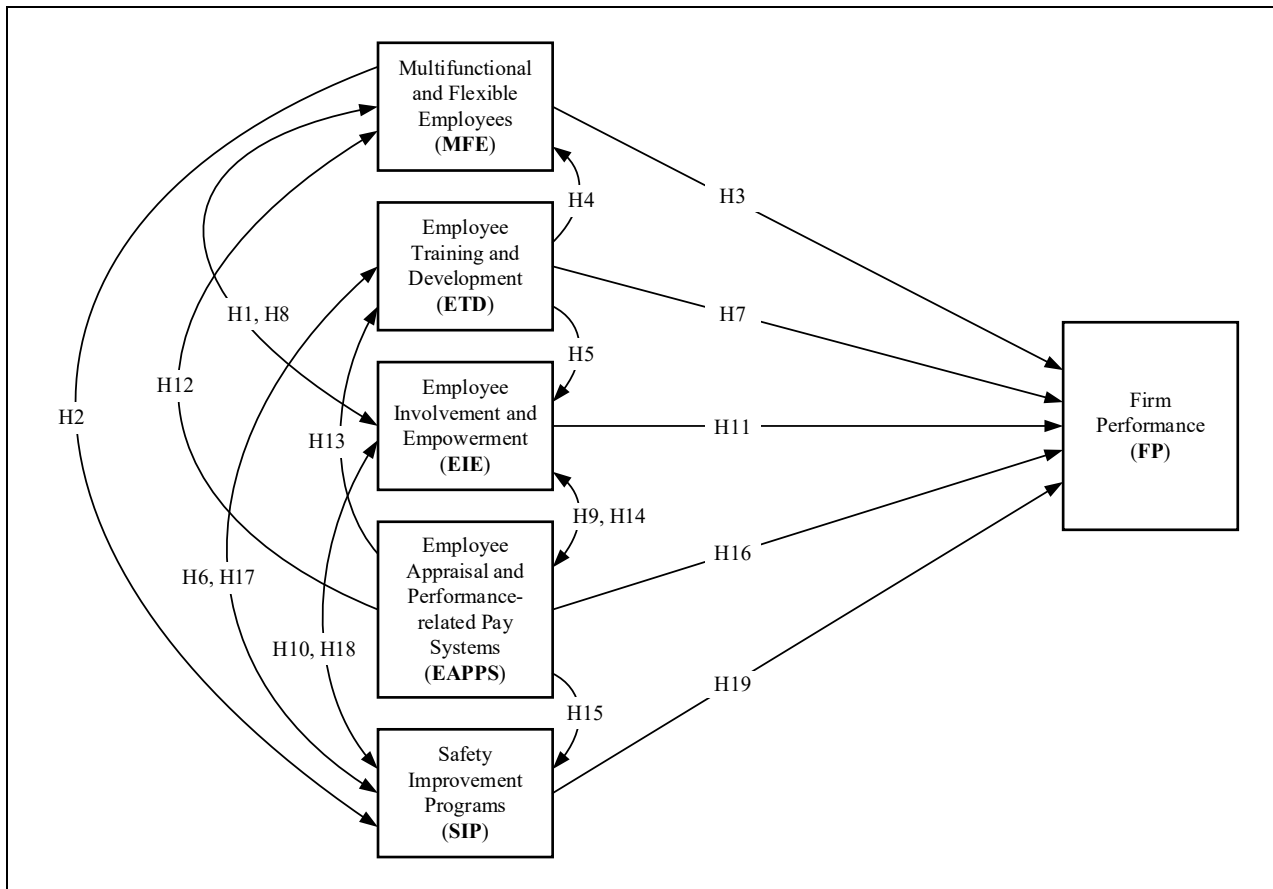
H18: SIP practices positively affect EIE practices.

H19: SIP practices positively affect FP.

### **3.6. Theoretical model**

This study's theoretical model combines all the proposed hypotheses. It appears in **Figure 1**, which makes apparent that it includes the six main constructs: the five LHRM practices (i.e., MFE, ETD, EIE, EAPPS and SIP) and FP. The arrows in the model represent the interactions between these six constructs. Arrows with two points indicate that the relationship between the two constructs is in both directions. Each arrow is also labelled with the associated hypothesis.

In short, the model investigates the interrelationships between LHRM practices and the impacts of those practices on FP.



**Figure 1:** Theoretical model

## 4. Methodology

### 4.1. Questionnaire design

A structured questionnaire was used to collect primary data from two samples of manufacturing firms: one from Jordan and the other from Germany. The questionnaire included 10 measurement items for each identified construct. The LHRM practices were measured using items adapted from Bwaliez (2012), and FP was measured using items adapted from Bwaliez and Abushaikha (2019). These items were adapted because they are comprehensive and cover different aspects of the constructs and were originally developed to be distributed to managers from manufacturing firms. These items also achieved high Cronbach’s alpha ( $\alpha$ ) coefficient values in their original studies, indicating a high level of reliability in terms of internal consistency (Ta’Amnha *et al.*, 2021c, 2021d). Consequently, as **Table 2** shows, the questionnaire contained 10 specific follow-on items about the implementation of each LHRM practice and FP. Respondents were asked to give their opinions about the degree of implementation and applicability of each item on a five-point Likert scale: (1) “not applicable at all”, (2) “applicable to some extent”, (3) “applicable to a moderate extent”, (4) “applicable to a large extent” and (5) “applicable to a full extent”.

**Table 2: Construct validity and reliability analysis of the Jordanian and German models**

Construct (source) / item description	Jordanian model		German model	
	Factor loading	Validity and reliability	Factor loading	Validity and reliability
<i>Multifunctional and flexible employees (Bwaliez, 2012)</i>				
Employees at this firm have a minimum number of tasks (at least more than one task) that they are able to do.	0.63	CFI = 0.94, IFI = 0.92, TLI = 0.95, SRMR = 0.05, AVE = 0.884, Cronbach's $\alpha$ = 0.876, CR = 0.891	0.54	CFI = 0.92, IFI = 0.93, TLI = 0.93, SRMR = 0.02, AVE = 0.872, Cronbach's $\alpha$ = 0.961, CR = 0.974
This firm prioritizes flexibility in job descriptions.	0.68		0.71	
Employees at this firm learn how to perform a variety of tasks/jobs.	0.91		0.87	
The longer an employee has been at this firm, the more tasks or jobs that he/she learns to perform.	0.64		0.67	
Employees are cross-trained at this firm so that they can fill in for others if necessary.	0.87		0.92	
The firm has a job rotation system in which employees are often moving from one job to another at planned intervals.	0.90		0.89	
Supervisors encourage employees to cooperate with each other and participate in work teams.	0.55		0.57	
Activities are organized to improve team unity.	0.59		0.51	
When employees are recruited, interpersonal skills are highly valued.	0.59		0.68	
Teams of multiskilled employees and job rotation programs cover all employees at all levels of this firm.	0.88		0.85	
<i>Employee training and development (Bwaliez, 2012)</i>				
This firm provides new employees with the basic background information needed to perform their job satisfactorily.	0.71	CFI = 0.97, IFI = 0.98, TLI = 0.98, SRMR = 0.04, AVE = 0.878, Cronbach's $\alpha$ = 0.912, CR = 0.932	0.64	CFI = 0.98, IFI = 0.95, TLI = 0.96, SRMR = 0.02, AVE = 0.917, Cronbach's $\alpha$ = 0.946, CR = 0.957
In this firm, there is an emphasis on training new and existing employees.	0.84		0.93	
When employees are recruited, willingness to learn new skills is highly valued.	0.67		0.71	
Before implementing training, this firm conducts a complete skill assessment to pinpoint the aspects that have skill shortages.	0.89		0.91	
Employees at this firm are rewarded for learning new skills.	0.76		0.77	
This firm systematically prepares an annual training plan and budget.	0.92		0.86	
In this firm, there is a job enrichment program to encourage the personal advancement of employees.	0.71		0.68	
This firm uses several approaches to develop employees, such as formal education, assessment, job experiences and interpersonal relationships.	0.75		0.74	
This firm's employees receive training and development in workplace skills on a regular basis (every month/year).	0.86		0.82	
This firm measures and evaluates the returns on the training and development programs attended by employees.	0.83		0.87	
<i>Employee involvement and empowerment (Bwaliez, 2012)</i>				
There is communication between employees.	0.74	CFI = 0.95, IFI = 0.93, TLI = 0.95, SRMR = 0.07, AVE = 0.943, Cronbach's $\alpha$ = 0.887, CR = 0.910	0.67	CFI = 0.99, IFI = 0.97, TLI = 0.97, SRMR = 0.03, AVE = 0.897, Cronbach's $\alpha$ = 0.953, CR = 0.971
There is a system for employee suggestions, whereby suggestions are applied.	0.91		0.93	
In this firm, top management tells employees why their suggestions are implemented or not.	0.89		0.81	
Work teams are assigned for day-to-day participation in issues such as quality control, maintenance, work planning and safety.	0.76		0.83	
In this firm, the upper-level employees give decision-making authority to the lower-level employees.	0.92		0.96	
In this firm, the upper-level employees give the training, tools and management support that employees need to accomplish an empowerment task.	0.88		0.78	
This firm adopts employee empowerment strategies, such as delegating authority, task force and self-directed work teams.	0.81		0.86	
This firm gives more planning responsibility to employees.	0.68		0.72	
A decentralization policy is used in this firm.	0.87		0.85	
Employees are given information on the overall situation and prospects of the firm.	0.71		0.63	
<i>Employee appraisal and performance-related pay systems (Bwaliez, 2012)</i>				
This firm has a formal and systematic performance appraisal process in which it evaluates the achievements of individual targets and identifies the development needs of employees.	0.93	CFI = 0.91, IFI = 0.92, TLI = 0.93, SRMR = 0.04, AVE = 0.862, Cronbach's $\alpha$ = 0.956, CR = 0.922	0.89	CFI = 0.95, IFI = 0.96, TLI = 0.97, SRMR = 0.01, AVE = 0.894, Cronbach's $\alpha$ = 0.824, CR = 0.882
This firm follows a continuous feedback review process rather than providing feedback only once a year or only when things go wrong.	0.80		0.74	
This firm provides appropriate training for performance evaluators.	0.67		0.72	
This firm attends to improving the design and implementation of performance appraisal programs.	0.64		0.79	

This firm makes sure that the system for distributing incentives is clear, fair and easily tracked.	0.73		0.84	
In this firm, incentives are valuable enough to motivate employees and encourage their participation.	0.79		0.86	
This firm provides rewards for applied ideas suggested by either individuals or teams.	0.82		0.90	
This firm provides incentives (e.g., sales commissions, bonuses and payment by results) and rewards (e.g., merit pay, gain sharing and profit sharing).	0.94		0.83	
An employee's performance on the job determines his/her pay more than any other factor.	0.85		0.81	
The performance appraisal results are effectively reflected to promotions and formal rewards for employees.	0.81		0.78	
<i>Safety improvement programs (Bwaliez, 2012)</i>				
This firm has a devoted safety budget.	0.93	CFI = 0.93, IFI = 0.94, TLI = 0.95, SRMR = 0.06, AVE = 0.875, Cronbach's $\alpha$ = 0.948, CR = 0.963	0.82	CFI = 0.94, IFI = 0.96, TLI = 0.95, SRMR = 0.04, AVE = 0.853, Cronbach's $\alpha$ = 0.972, CR = 0.976
This firm has a full-time safety officer.	0.92		0.91	
This firm reports accidents when they occur.	0.91		0.94	
This firm has defined and authorized a safety policy.	0.88		0.83	
This firm has designed the job such that it removes or reduces physical hazards.	0.84		0.90	
This firm uses computerized tools to design safer equipment.	0.54		0.61	
Employees in this firm are forced to wear personal protective equipment.	0.89		0.76	
This firm reduces unsafe behaviour by using posters and other promotional material.	0.86		0.85	
This firm reduces unsafe behaviour by implementing occupational health and safety training.	0.72		0.83	
This firm reduces unsafe behaviour by conducting health and safety inspections regularly.	0.79		0.79	
<i>Firm performance (Bwaliez and Abushaikha, 2019)</i>				
This firm's products are of a superior quality than those of its competitors.	0.71	CFI = 0.93, IFI = 0.91, TLI = 0.95, SRMR = 0.05, AVE = 0.967, Cronbach's $\alpha$ = 0.845, CR = 0.874	0.77	CFI = 0.96, IFI = 0.97, TLI = 0.98, SRMR = 0.02, AVE = 0.811, Cronbach's $\alpha$ = 0.961, CR = 0.953
The profitability of this firm exceeds that of its competitors.	0.95		0.91	
The revenue growth rate of this firm exceeds that of its competitors.	0.91		0.88	
The market share growth of this firm exceeds that of its competitors.	0.93		0.90	
The productivity of this firm exceeds that of its competitors.	0.83		0.78	
The customers are satisfied with the quality of this firm's products compared to those of its competitors.	0.74		0.65	
The customers are satisfied with the firm's delivery lead-time compared to that of its competitors.	0.67		0.62	
The overall competitive position of this firm is better than that of its competitors.	0.82		0.83	
The overall growth of this firm is better than that of its competitors.	0.77		0.84	
The employee satisfaction level of this firm is better than that of its competitors.	0.73		0.81	

#### 4.2. Samples and data collection

The manufacturing firms in Jordan and Germany were selected as the target domain for this study. Germany is currently Europe's largest economy and a major high-quality industrial economy at the global level (ITA, 2022). Its highly esteemed HRM model may deliver important lessons for other nations (Iluk and Iluk, 2017). This provides an excellent opportunity to compare the LHRM systems of a developing country (in this case, Jordan) with a developed country (Germany). To collect the required data from Jordan, the official directories of the industrial (i.e., manufacturing) sectors from the Jordan Chamber of Industry (JCI, 2021) were used to obtain contact information for major manufacturing firms. The questionnaire was sent by email to 550 Jordanian manufacturing firms operating in different fields, including therapeutics and medical supplies, plastic and rubber products, chemicals and cosmetics, food and beverages, and engineering and electrical machinery. Meanwhile, collecting the required data from Germany involved utilizing the network of German manufacturing partner firms to the German Jordanian University (GJU). This was achieved by contacting GJU students who were completing semester-long (i.e., four months) internships at these firms. In cooperation with those students, the questionnaire was sent by email to 400 German manufacturing firms

randomly selected from different industries, including automobiles, food and beverages, chemicals and cosmetics, and electrical equipment and machinery.

Finally, a two-wave panel data was collected from human resource managers, executive managers and firm owners. Interestingly, the final number of valid responses received for each sample was 250, representing a response rate of 45.45% for the Jordanian sample and 62.5% for the German one. Notably, these response rates are close to rates recommended by various previous empirical studies that have been previously conducted in the field of either or both LM and HRM (e.g., Al-Tahat and Bwaliez, 2015; Bwaliez and Abushaikha, 2019; Bwaliez, 2021; Ta'Amnha *et al.*, 2021a, 2021c, 2021d, 2022). **Table 3** presents demographic information about respondents and their firms.

After coding the data collected from the respondents, a detailed statistical analysis was conducted using the AMOS (analysis of moment structures) software version 26.0. A structural equation model was established for both samples to test the questionnaire fitness, model fitness and research hypotheses, as presented below.

**Table 3:** Demographic information about the respondents and their firms

Category	Jordanian sample		German sample	
	Frequency	Percentage (%)	Frequency	Percentage (%)
<i>Job position</i>				
Human resources manager	92	36.8	109	43.6
Executive manager	112	44.8	84	33.6
Firm owner	46	18.4	57	22.8
Total	250	100	250	100
<i>Work experience</i>				
Fewer than 5 years	32	12.8	29	11.6
5 – fewer than 10 years	43	17.2	46	18.4
10 – fewer than 15 years	59	23.6	59	23.6
15 – fewer than 20 years	37	14.8	62	24.8
20 years and above	79	31.6	54	21.6
Total	250	100	250	100
<i>Industry type</i>				
Plastic and rubber	24	9.6	-	-
Engineering, machinery and electrical industries	43	17.2	112	44.8
Chemicals and cosmetics	58	23.2	63	25.2
Therapeutics and medical supplies	26	10.4	-	-
Food and beverages	99	39.6	54	21.6
Automobiles	-	-	21	8.4
Total	250	100	250	100
<i>Number of employees</i>				
10 – fewer than 100 employees	33	13.2	40	16.0
100 – fewer than 250 employees	131	52.4	98	39.2
250 employees and above	86	34.4	112	44.8
Total	250	100	250	100

### 4.3. Questionnaire fitness

Questionnaire fitness was assessed by checking the validity and reliability of the questionnaire items (Hair *et al.*, 2017). Validity concerns whether the questionnaire items really measure what is supposed to be measured, and reliability concerns the extent to which the researcher

will obtain the same results when repeating the study with the same questionnaire and conditions (Thornhill *et al.*, 2009; Hair *et al.*, 2017).

Following Sharabati *et al.* (2020), three types of validity were checked: content, face and construct validity. Because the questionnaire items derive from different scholarly works, we can ensure content validity. Regarding face validity, the questionnaire draft was reviewed by four academic professors and six managers of manufacturing firms in Jordan and Germany. Thereafter, some modifications were made according to their notes and suggestions to ensure that all questionnaire items were unambiguous, appropriate and acceptable to respondents.

For construct validity, unidimensionality, convergent validity and discriminant validity were checked. Unidimensionality refers to the quality of a single construct. A unidimensional construct contains measurement items related to its concept of interest (Hu and Bentler, 1999). The unidimensionality of the main constructs was assessed via confirmatory factor analysis (CFA), which was conducted by finding the comparative fit index (CFI), the incremental fit index (IFI), the Tucker-Lewis index (LTI) and the standardized root mean square residual (SRMR) (Garver and Mentzer, 1999). As **Table 2** shows, for both models, the CFI, IFI and LTI values all exceed the recommended cut-off value of 0.9, and the SRMR value is below the recommended cut-off value of 0.08 (Garver and Mentzer, 1999; Hu and Bentler, 1999).

Convergent validity describes “the closeness with which a measure relates to (or converges on) the construct that it is purported to measure” (Bhattacharjee, 2012, p. 59). It was assessed by finding the factor loading of each individual questionnaire item and the average variance extracted (AVE) of each construct (Hair *et al.*, 2017). According to **Table 2**, the factor loading of each questionnaire item exceeds the minimum cut-off value of 0.5 (Anderson and Gerbing, 1988), and the AVE of each construct exceeds the minimum cut-off value of 0.5 (Fornell and Larcker, 1981; Kline, 2011), implying strong convergent validity for both the Jordanian and German models.

Finally, discriminant validity describes “the degree to which a measure does not measure (or discriminates from) other constructs that it is not supposed to measure” (Bhattacharjee, 2012, p. 59). It was assessed by applying the Fornell-Larcker criterion (Fornell and Larcker, 1981) for the Jordanian and German models. **Table 4** shows that the square root of the AVE value for each construct is greater than the correlation with all other constructs. As such, we can assume strong discriminant validity for both the Jordanian and German models (Fornell and Larcker, 1981).

Cronbach’s  $\alpha$  coefficient and composite reliability (CR) were used to evaluate the reliability of the study constructs (Hair *et al.*, 2017). Cronbach’s  $\alpha$  coefficient and CR both reflect how well the different questionnaire items complement each other in their measurement of different aspects of the same concept (Litwin, 1995; Hair *et al.*, 2017). As **Table 2** shows, Cronbach’s  $\alpha$  and CR values exceed the minimum cut-off value of 0.7 for all study constructs, indicating acceptable construct reliability (Nunnally and Bernstein, 1994; Garver and Mentzer, 1999; George and Mallery, 2010).

**Table 4:** Mean, standard deviation (SD) and Fornell-Larcker criterion for the constructs of the Jordanian and German models

<i>Jordanian model</i>								
Construct	Mean	SD	1	2	3	4	5	6
1. MFE	2.86	0.46	(0.940)					
2. ETD	3.76	0.73	0.595**	(0.937)				
3. EIE	3.02	0.81	0.478**	0.513**	(0.971)			
4. EAPPS	2.91	0.77	0.711**	0.299**	0.248**	(0.928)		
5. SIP	2.87	0.65	0.358**	0.453**	0.674**	0.584**	(0.935)	
6. FP	3.56	0.69	0.602**	0.520**	0.627**	0.624**	0.459**	(0.983)
<i>German model</i>								
Construct	Mean	SD	1	2	3	4	5	6
1. MFE	4.17	0.58	(0.934)					
2. ETD	4.64	0.67	0.671**	(0.958)				
3. EIE	4.32	0.43	0.393**	0.445**	(0.947)			
4. EAPPS	4.51	0.82	0.458**	0.367**	0.512**	(0.946)		
5. SIP	4.37	0.69	0.637**	0.269**	0.395**	0.457**	(0.924)	
6. FP	4.34	0.71	0.554**	0.672**	0.613**	0.732**	0.468**	(0.901)

**Notes:**  $n = 250$ , \*\*Correlation is significant at the 0.01 level (two-tailed), the square root of AVE is in parentheses.

## 5. Results and Discussion

### 5.1. Assessment of common method variance (CMV)

In the social science, research methods are joined with the common method bias test using a single source and single point of time data collection method (Podsakoff *et al.*, 2003). To test the potential for the common method variance (CMV) problem, Harman's (1976) one-factor test to ensure that no one general factor accounted for the majority of covariance between the predictor and criterion variables. Factors with eigenvalues greater than one showed a 75.3% total variance, and the first factor explained 28.7% of the total variance, suggesting that there is no CMV problem based on Podsakoff *et al.* (2003) recommendation that the explained variance by a single factor should remain below 50%.

### 5.2. Outliers

An outlier is a data point referring to an unusually low, high, or distinct observation compared to the remaining ones (Domingues *et al.*, 2018). These data points can influence the findings and lead to errors in sample generalization, unless the same outliers are present in the population. Domingues *et al.* (2018) recommends the use of Mahalonbis distance (D2) to determine and address any outlier problem. This study used D2 to check for multivariate outliers, and based on the study variables, the chi-square threshold is 73.59 with  $p = 0.001$ , with the highest D2 value being 64.89, which indicates the absence of multivariate outliers.

### 5.3. Non-response bias

Non-response bias refers to errors likely to appear when estimating the population characteristics based on the questionnaire data and can lead to the under-representation of

distinct types of respondents. This bias occurs when non-respondents differ from the other respondents (Sala and Lynn, 2009). According to Studer *et al.* (2013), non-response bias is defined as the differences between the non-respondents' and respondents' answers, extrapolated from a time-trend estimation. In this research, the early responses received were compared with the late responses, as late respondents tend to have characteristics in common with non-respondents. The t-tests generated no statistically significant differences between early-wave and late-wave groups, which mean non-response bias is not an issue (Lie *et al.*, 2019).

#### **5.4. LHRM implementation level**

As **Table 5** shows, the average implementation level of LHRM practices is 88.04% among German manufacturing firms and 61.58% among Jordanian firms. This might be due to the highly regulated context of the German HRM system, which is characterized by strong statutory regulations (Muller, 1999).

In particular, MFE practices are implemented in a large majority of German manufacturing firms (83.4%), compared to 57.1% of Jordanian ones. This might be due to the culture of teamwork, multiskilling and job rotation that is inherent in Germany but is less developed in Jordan (Iluk and Iluk, 2017).

For ETD practices, German employers are more interested in extensively training and developing their employees than Jordanian employers. German employers focus on high investment in training and long-term employee development plans (Muller, 1999; Festing, 2012; Iluk and Iluk, 2017). German firms also focus on initial vocational training, with apprentices trained for a period of between 2–3 years in on-the-job, off-the-job systems in firm-specific courses and in vocational schools (Muller, 1999). Additionally, the German government operates in the industry as an enabler by supporting key German firms with training systems. This explains the better implementation level of this practice among German manufacturing firms (92.8%) than Jordanian manufacturing firms (75.1%).

Regarding EIE practices, German employers are clearly more inclined to trust their employees to do tasks and give them more authority than Jordanian employers (Iluk and Iluk, 2017), with German employers now fostering a change from the autocratic and centralized leadership style that was traditionally prevalent in German firms to a cooperative-participative and decentralized style (Grunwald and Lilge, 2019). For this reason, EIE implementation among German manufacturers is high (86.4%) compared to implementation in Jordan (60.3%).

Meanwhile, German manufacturers evaluate their employees more regularly and periodically than Jordanian manufacturers. In the past, the performance-appraisal systems of German firms were usually based on a trait rating. However, in recent years, German firms have extended their appraisal system by introducing elements such as management-by-objectives appraisals, career-development talks and management-development assessment centres (Muller, 1999). German manufacturers also tend to favour performance-related over job- or person-based pay



systems (Muller, 1999). This advanced level of implementation becomes clear in comparisons of EAPPS levels in Germany (90.2%) with EAPPS levels in Jordan (58.1%).

Notably, Germany registers about 1 million notifiable occupational injuries per year, contributing to 7% of the country's annual sick leave (Rommel *et al.*, 2016). This puts pressure on German manufacturing firms to extensively focus on improving its safety programs, which have an extensive state welfare provision. This is clearly demonstrated by the high SIP implementation levels in Germany (87.4%), which are significantly above the corresponding levels in Jordan (57.3%), which has a culture of not reporting injuries.

**Table 5:** Implementation level of LHRM practices in the Jordanian and German models

LHRM practice	Jordanian model	German model	Difference
MFE implementation level	57.1%	83.4%	26.3%
ETD implementation level	75.1%	92.8%	17.7%
EIE implementation level	60.3%	86.4%	26.1%
EAPPS implementation level	58.1%	90.2%	32.1%
SIP implementation level	57.3%	87.4%	30.1%
Average overall LHRM implementation level	61.58%	88.04%	26.46%

### 5.5. Model fitness and hypotheses testing

Model fitness refers to the degree to which the structural equation model matches the observed data. In this study, CFI, IFI, TLI and SRMR were employed to measure model fitness. According to the results summarized in **Table 6**, the overall fitness of all hypotheses is accepted, with CFI, IFI and TLI scores well above the recommended threshold of 0.90, and the SRMR below the recommended threshold of 0.08 (Hu and Bentler, 1999).

**Table 6** indicates that for both models, MFE practices are positively and significantly ( $p < 0.001$ ) associated with EIE and SIP practices and FP, which provides support for hypotheses H1, H2 and H3. Similarly, for both models, ETD practices are positively and significantly ( $p < 0.001$ ) associated with MFE, EIE and SIP practices and FP, supporting hypotheses H4, H5, H6 and H7. Furthermore, for both models, EIE practices are positively and significantly ( $p < 0.001$ ) associated with MFE, EAPPS and SIP practices and FP, providing support for hypotheses H8, H9, H10 and H11. Next, for both models, EAPPS practices are positively and significantly ( $p < 0.001$ ) associated with MFE, ETD, EIE and SIP practices and FP, supporting hypotheses H12, H13, H14, H15 and H16. Finally, again for both models, SIP practices are positively and significantly ( $p < 0.001$ ) associated with ETD and EIE practices and FP, supporting hypotheses H17, H18 and H19. In short, our results indicate that all LHRM practices have a positive and significant impact on the performance of both Jordanian and German firms.

**Table 6:** Testing the fitness of the Jordanian and German models

		Jordanian model	German model

Hypothesis	Relationship	Standardized regression weights	t-value	Model Fitness	Standardized regression weights	t-value	Model Fitness
	<i>MFE with other constructs</i>						
H1	MFE → EIE	0.46	5.72**	CFI = 0.91, IFI = 0.91, TLI = 0.91, SRMR = 0.04	0.49	4.63**	CFI = 0.92, IFI = 0.91, TLI = 0.91, SRMR = 0.02
H2	MFE → SIP	0.43	4.61**		0.48	3.87**	
H3	MFE → FP	0.77	4.59**		0.78	4.35**	
	<i>ETD with other constructs</i>						
H4	ETD → MFE	0.88	3.48**	CFI = 0.94, IFI = 0.95, TLI = 0.94, SRMR = 0.03	0.91	4.39**	CFI = 0.96, IFI = 0.95, TLI = 0.90, SRMR = 0.07
H5	ETD → EIE	0.65	4.55**		0.67	3.61**	
H6	ETD → SIP	0.60	4.74**		0.61	4.22**	
H7	ETD → FP	0.89	4.34**		0.91	5.21**	
	<i>EIE with other constructs</i>						
H8	EIE → MFE	0.81	3.65**	CFI = 0.95, IFI = 0.94, TLI = 0.96, SRMR = 0.05	0.84	4.87**	CFI = 0.92, IFI = 0.92, TLI = 0.93, SRMR = 0.06
H9	EIE → EAPPS	0.57	4.15**		0.63	4.69**	
H10	EIE → SIP	0.46	4.68**		0.49	3.98**	
H11	EIE → FP	0.79	5.82**		0.82	4.01**	
	<i>EAPPS with other constructs</i>						
H12	EAPPS → MFE	0.71	4.73**	CFI = 0.94, IFI = 0.93, TLI = 0.91, SRMR = 0.06	0.75	3.99**	CFI = 0.90, IFI = 0.91, TLI = 0.90, SRMR = 0.07
H13	EAPPS → ETD	0.62	4.82**		0.64	4.62**	
H14	EAPPS → EIE	0.66	5.78**		0.69	5.31**	
H15	EAPPS → SIP	0.68	4.64**		0.72	4.75**	
H16	EAPPS → FP	0.78	4.38**		0.79	4.28**	
	<i>SIP with other constructs</i>						
H17	SIP → ETD	0.38	4.46**	CFI = 0.94, IFI = 0.95, TLI = 0.93, SRMR = 0.07	0.41	3.98**	CFI = 0.92, IFI = 0.93, TLI = 0.96, SRMR = 0.05
H18	SIP → EIE	0.64	4.76**		0.65	4.67**	
H19	SIP → FP	0.52	5.31**		0.54	4.38**	

Note: \*\*  $p < 0.001$

**Figures 2 and 3** present the standardized regression weights of the relationships between the constructs in the Jordanian and German models. In both models, improving or undermining any one of the LHRM practices will impact the other practices and FP in accordance with the standardized regression weight of the corresponding relationships. It is worth noting that the standardized regression weights of the relationships between LHRM practices in the German model are more substantial than the corresponding weights in the Jordanian model. This indicates that the LHRM practices implemented by German manufacturers mutually reinforce each other more effectively than those implemented by Jordanian firms. Furthermore, the standardized regression weights of the relationships between LHRM practices and FP (represented by hypotheses H3, H7, H11, H16 and H19) in the German model are more substantial than the corresponding weights in the Jordanian one. This means that German manufacturers are better able to enhance their performance by implementing LHRM practices than the Jordanian manufacturers.

### 5.6. LHRM implementation level and its impact on FP

**Figure 4** depicts the relationship between the impacts of LHRM practices on the performance of Jordanian firms (i.e., the standardized regression weights listed in **Table 6** and **Figure 2**) compared to the implementation level of these practices (listed in **Table 5** for the Jordanian model). The horizontal dashed line represents the average LHRM implementation level (61.58%), and the vertical dashed line represents the average impact of LHRM practices on FP (0.75). Meanwhile, **Figure 5** depicts the relationship between the impacts of LHRM practices on the performance of German firms (i.e., the standardized regression weights listed in **Table**

6 and Figure 3) compared to the implementation level of these practices (listed in Table 5 for the German model). The horizontal dashed line represents the average LHRM implementation level (88.04%), and the vertical dashed line represents the average impact of LHRM practices on FP (0.768). The two dashed lines in Figures 4 and 5 divide the diagram into four quarters in terms of the impact of LHRM practices on FP and their implementation level: low impact and high implementation, high impact and high implementation, high impact and low implementation, and low impact and low implementation. According to Martensen *et al.* (2007), the most attention should be paid to those LHRM practices that have a substantial impact on FP and which demonstrate a low implementation level.

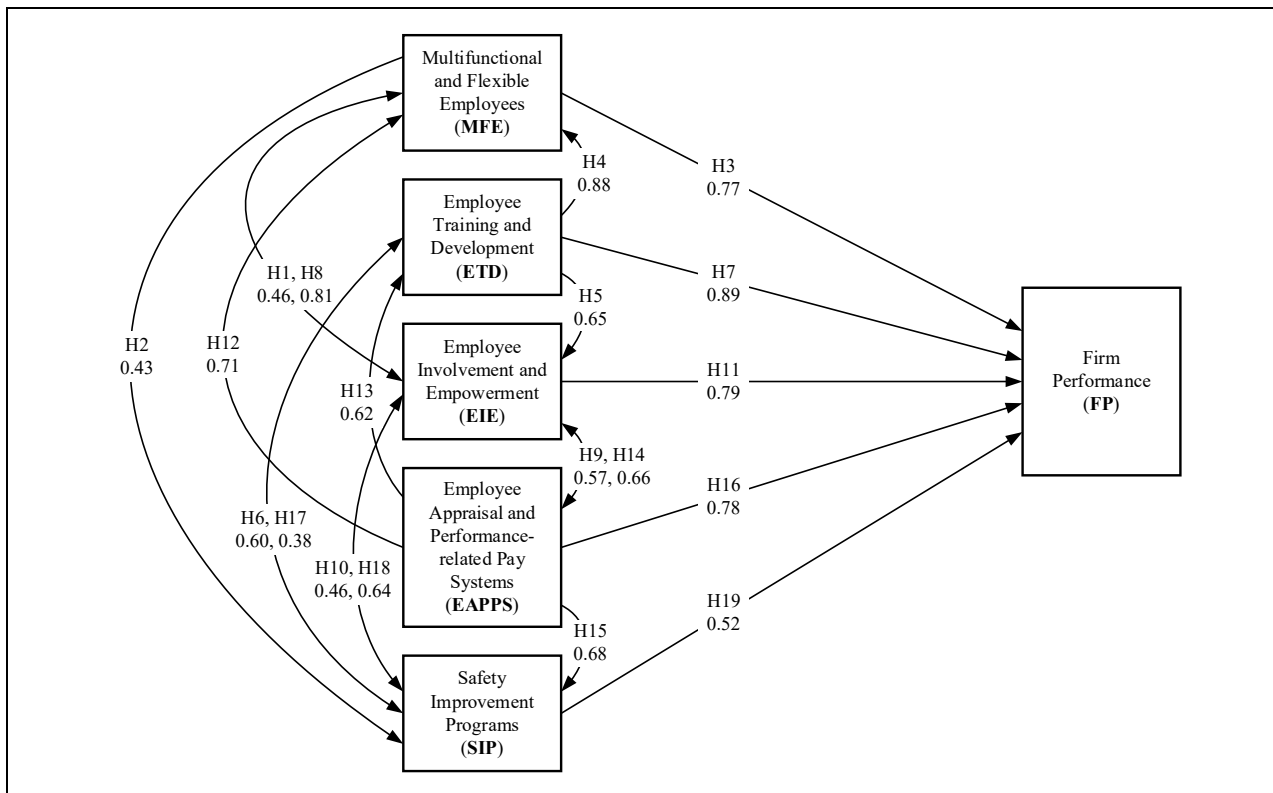
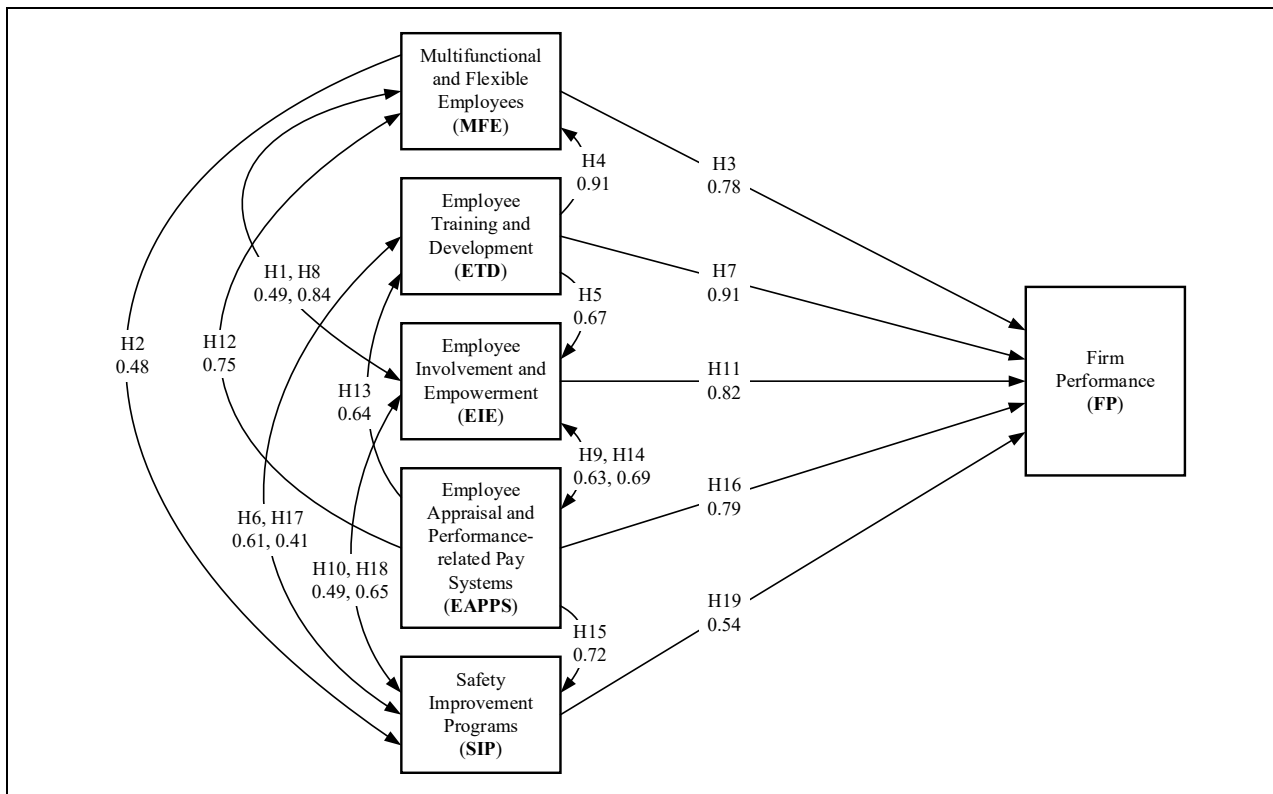


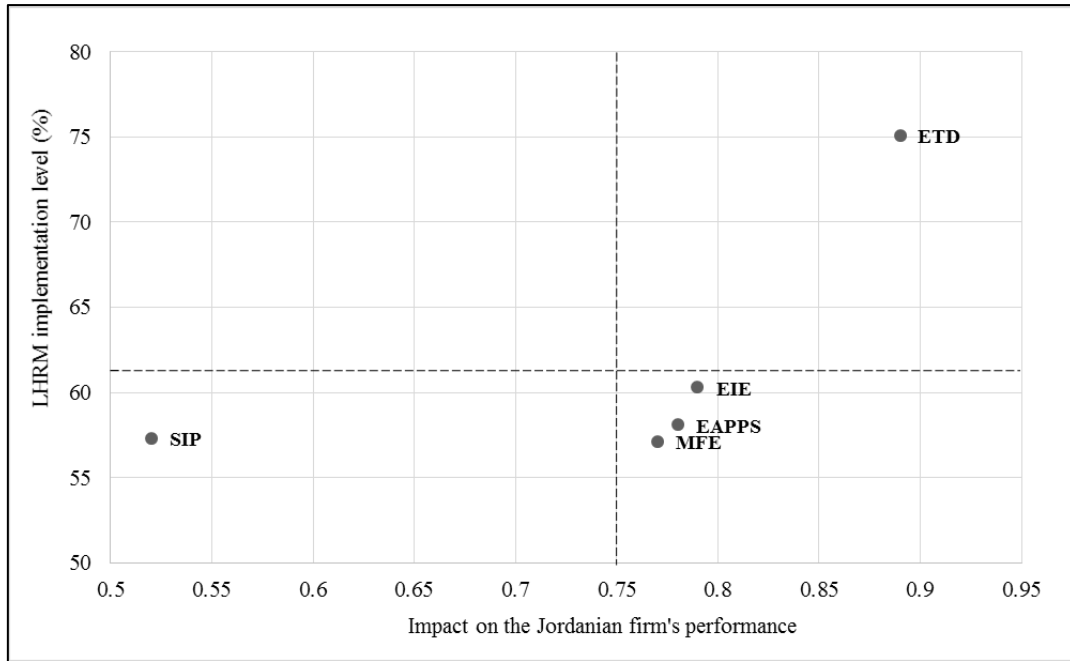
Figure 2: Standardized regression weights of the relationships between the constructs in the Jordanian model



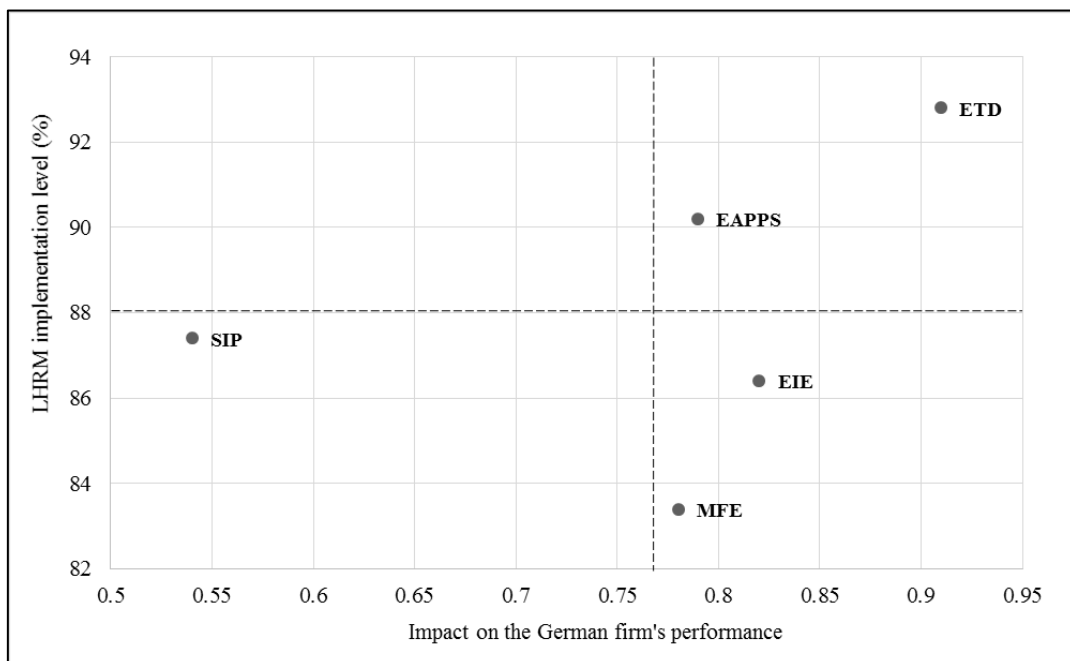
**Figure 3:** Standardized regression weights of the relationships between the constructs in the German model

According to **Figure 4**, the greatest potential (i.e., highest priority) for improving LHRM practices among Jordanian manufacturing firms is in EIE, EAPPS and MFE practices because they have a low implementation level despite their high impact on FP. The performance of Jordanian firms can be most enhanced by EIE (Rana and Malik, 2017; García-Juan *et al.*, 2019), EAPPS (Pil and MacDuffie, 1996; Ahmed *et al.*, 2013; Rana and Malik, 2017) and MFE (Sánchez and Pérez, 2001) practices. Notably, SIP practices should not be accorded high priority because of their low impact on FP, and ETD practices should not be accorded high priority because their implementation level is relatively high.

Meanwhile, **Figure 5** shows that the greatest potential (i.e., highest priority) for improving LHRM practices among German manufacturing firms is in EIE and MFE practices because these demonstrate a low implementation level despite their considerable impact on the German firms' performance. The performance of German firms can be improved by EIE (Rana and Malik, 2017; García-Juan *et al.*, 2019) and MFE (Sánchez and Pérez, 2001) practices. Furthermore, SIP practices should be attended to after EIE and MFE practices because their implementation level is appropriate given their impact on FP. Meanwhile, ETD and EAPPS practices should not be accorded high priority because their implementation level is relatively high.



**Figure 4:** Implementation levels of LHRM practices and their impact on the performance of Jordanian firms



**Figure 5:** Implementation levels of LHRM practices and their impact on the performance of German firms

## 6. Conclusions

### 6.1. Theoretical contributions

This study aimed to examine the interrelationships between LHRM practices and the impacts of those practices on FP. The LHRM practices suggested by Al-Tahat and Bwaliez (2015) were adopted in this study, namely, MFE, ETD, EIE, EAPPS and SIP. This study focused on the target domain of manufacturing firms in Jordan and Germany. The hypothesized causal

relationships between the different LHRM practices and between each practice and FP were tested using structural equation modelling.

According to the results, the average implementation level of LHRM practices among German manufacturing firms exceeds the average implementation level among Jordanian firms. ETD and EAPPS practices have the highest LHRM implementation level and the highest impact on FP in the German model, while ETD practices have the highest implementation level and the highest impact on FP in the Jordanian model. Both models also provide strong evidence that LHRM practices affect each other positively and positively impact FP. Improving or undermining any one of the five LHRM practices will affect the other practices and FP according to the standardized regression weights for each relationship. The findings of this study signal towards potentially groundbreaking research and theory development in the LHRM field. To the best of the author's knowledge, this study is the first to highlight the proposed relationships both in general and in the particular context of a comparison between developed and developing countries. It offers important implications for manufacturing managers, who can benefit from implementing LHRM practices to enhance FP in different contexts. These findings provide valuable information for human resources managers and decision makers and open several avenues for future research.

### ***6.2. Practical implications***

Firms must consider including LHRM practices in their HRM systems to improve their overall performance. In particular, Jordanian manufacturing firms should focus on EIE, EAPPS and MFE practices, which have a high impact on FP and currently demonstrate low implementation levels. Meanwhile, German manufacturing firms should focus on EIE and MFE practices due to their substantial impact on FP and their current low implementation levels. EIE practices can be enhanced across both Jordanian and German manufacturing firms via the adoption of concepts such as employee involvement, participation, delegation and empowerment. Similarly, MFE practices can be promoted in both contexts by focusing on multiskilling, flexibility, cross-training and job rotation activities. Furthermore, Jordanian manufacturers can improve EAPPS practices by promoting effective employee appraisal and providing performance-related incentives and rewards. Nonetheless, Jordanian manufacturers should sustain their high level of ETD implementation and not neglect SIP practices, and German manufacturers should sustain their high level of ETD and EAPPS implementation and avoid neglecting SIP practices. Finally, due to the superior implementation of LHRM practices by German manufacturing firms, human resources managers and decision makers in Jordan can use the German model presented in this study as a benchmark for improving their implementation of LHRM practices to ultimately benefit FP.

### ***6.3. Limitations and future research***

There are several limitations of this study that should be considered in future research. First, data were only collected from manufacturing firms. Restricting data collection to a single sector limits the generalizability of results. Thus, the model developed in this study should be applied to, for example, the service sector. This study can also be expanded by involving other Arab and international contexts to increase the validity and generalizability of the findings.

Meanwhile, because this study is cross-sectional, the relationships between constructs can be further investigated by conducting a longitudinal study or field experiment that requires data to be gathered over a longer time span. Furthermore, due to the potential for social desirability bias, future researchers can address this issue using alternative methods to measure FP in relation to LHRM practices. This might involve surveying factory-level employees rather than focusing on managers. It is also worth considering that this study was restricted to a single LM impact area (i.e., the HRM area). Therefore, it is recommended that future researchers integrate LM with other areas, such as new product development, customer relationship management, shop floor management, manufacturing equipment and processes, and warehouse management. Finally, future researchers can investigate the indirect relationship between LHRM practices and FP by examining the mediating and moderating roles of, for example, employee productivity, workplace structure and firm culture.

## References

1. Abdallah, A.B., Alkhalidi, R.Z., and Aljuaid, M.M. (2021), "Impact of social and technical lean management on operational performance in manufacturing SMEs: the roles of process and management innovations", *Business Process Management Journal*, Vo. 27 No. 5, pp. 1418-1444.
2. Agarwal, R., Green, R., Brown, P.J., Tan, H., and Randhawa, K. (2013), "Determinants of quality management practices: an empirical study of New Zealand manufacturing firms", *International Journal of Production Economics*, Vol. 142 No. 1, pp. 130-145.
3. Ahmed, I., Sultana, I., Paul, S.K., and Azeem, A. (2013), "Employee performance evaluation: A fuzzy approach", *International Journal of Productivity and Performance*, Vol. 62 No. 7, pp. 718-734.
4. Alkhalidi, R.Z., and Abdallah, A.B. (2019), "Lean management and operational performance in health care: implications for business performance in private hospitals", *International Journal of Productivity and Performance Management*, Vol. 69 No. 1, pp. 1-21.
5. Alkunsol, W.H., Sharabati, A.A., AlSalhi, N.A., and El-Tamimi, H.S. (2018), "Lean six sigma effect on Jordanian pharmaceutical industry's performance", *International Journal of Lean Six Sigma*, Vol. 10 No. 1, pp. 23-43.
6. Al-Tahat, M.D., and Bwaliez, O.M. (2015), "Lean-based workforce management in Jordanian manufacturing firms", *International Journal of Lean Enterprise Research*, Vol. 1 No. 3, pp. 284-316.
7. Anderson, J.C., and Gerbing, D.W. (1988), "Structural equation modeling in practices: a review and recommended two-step approach", *Psychology Bulletin*, Vol. 103 No. 3, pp. 411-423.
8. Angelis, J., Conti, R., Cooper, C., and Gill, C. (2011), "Building a high-commitment lean culture", *Journal of Manufacturing Technology Management*, Vol. 22 No. 5, pp. 569-586.
9. Anwar, G., and Abdullah, N.N. (2021), "The impact of human resource management practice on organizational performance", *International Journal of Engineering, Business, and Management*, Vol. 5 No. 1, pp. 35-47.
10. Arezes, P.M., Dinis-Carvalho, J., and Alves, A.C. (2015), "Workplace ergonomics in lean production environments: a literature review", *Work*, Vol. 52 No. 1, pp. 57-70.

11. Askin, R.G., and Goldberg, J.B. (2007), *Design and Analysis of Lean Production Systems*. New York, John Wiley & Sons, Inc.
12. Bamber, G.J., Stanton, P., Bartram, T., and Ballardie, R. (2014), "Human resource management, lean processes, and outcomes for employees: towards a research agenda", *The International Journal of Human Resource Management*, Vol. 25 No. 21, pp. 2881-2891.
13. Beckwith, A. (2003), "Improving business performance – the potential of arts in training", *Industrial and Commercial Training*, Vol. 35 No. 5, pp. 207-209.
14. Belekoukias, I., Garza-Reyes, J.A., and Kumar, V. (2014), "The impact of lean methods and tools on the operational performance of manufacturing organizations", *International Journal of Production Research*, Vol. 52 No. 18, pp. 5346-5366.
15. Bessant, J., and Francis, D. (1999), "Developing strategic continuous improvement capability", *International Journal of Operations & Production Management*, Vol. 19 No. 11, pp. 1106-1119.
16. Bhasin, S. (2013), "Analysis of whether lean is viewed as an ideology by British organizations", *Journal of Manufacturing Technology Management*, Vol. 24 No. 4, pp. 536-554.
17. Bhattacharjee, A. (2012), *Social Science Research: Principles, Methods, and Practices*, 2nd ed., Global Text Project.
18. Black, J. (2008), *Lean Production: Implementing a World Class System*, 1st ed., New York, Industrial Press, Inc.
19. Bonavia, T., and Marin-Garcia, J.A. (2011), "Integrating human resource management into lean production and their impact on organizational performance", *International Journal of Manpower*, Vol. 32 No. 8, pp. 923-938.
20. Born, L., and Molleman, E. (1996), "Empowerment and rewards: a case study", *Empowerment in Organizations*, Vol. 4 No. 3, pp. 30-33.
21. Boselie, P., Dietz, G., and Boon, C. (2005), "Commonalities and contradictions in HRM and performance research", *Human Resource Management Journal*, Vol. 15 No. 3, pp. 67-94.
22. Brinia, V., and Pefanis, K. (2013), "The business training in the automotive industry in Greece: the example of Opel", *Industrial and Commercial Training*, Vol. 45 No. 4, pp. 209-217.
23. Brown, K.A. (1996), "Workplace safety: a call for research", *Journal of Operations Management*, Vol. 14 No. 2, pp. 157-171.
24. Brown, K.A., Willis, P.G., and Prussia, G.E. (2000), "Predicting safe employee behavior in the steel industry: development and test of a sociotechnical model", *Journal of Operations Management*, Vol. 18 No. 4, pp. 445-465.
25. Browning, T.R., and Heath, R.D. (2009), "Reconceptualizing the effects of lean on production costs with evidence from the F-22 program", *Journal of Operations Management*, Vol. 27 No. 1, pp. 23-44.
26. Bwaliez, O.M. (2012), *Design and analysis of lean-based workforce management system in Jordanian industries* [Unpublished master's thesis]. The University of Jordan, Amman, Jordan.



27. Bwaliez, O.M. (2021), "Supply chain integration and manufacturing firm performance: the mediating role of innovation performance", *Full Paper Proceeding of the International Conference on Business, Economics, Social Science & Humanities (BESSH-2021)*, 9-10 October 2021, Istanbul, Turkey, Vol. 6 No. 120, pp. 1-15.
28. Bwaliez, O.M., and Abushaikha, I. (2019), "Integrating the SRM and lean paradigms: the constructs and measurements", *Theoretical Economics Letters*, Vol. 9 No. 7, pp. 2371-2396.
29. Cameron, I., Hare, B., and Duff, R. (2013), "An analysis of safety advisor roles and site safety performance", *Engineering, Construction and Architectural Management*, Vol. 20 No. 5, pp. 505-521.
30. Cappelli, P., and Neumark, D. (2001), "Do high-performance work practices improve establishment-level outcomes?", *Industrial and Labor Relations Review*, Vol. 54 No. 4, pp. 737-775.
31. Chauhan, G., and Chauhan, V. (2019), "A phase-wise approach to implement lean manufacturing", *International Journal of Lean Six Sigma*, Vol. 10 No. 1, pp. 106-122.
32. Combs, J., Liu, Y., Hall, A., and Ketchen, D. (2006), "How much do high-performance work practices matter? A meta-analysis of their effects on organizational performance", *Personnel Psychology*, Vol. 59 No. 3, pp. 501-528.
33. Conti, R., Angelis, J., Cooper, C., Faragher, B., and Gill, C. (2006), "The effects of lean production on worker job stress", *International Journal of Operations & Production Management*, Vol. 26 No. 9, pp. 1013-1038.
34. Cua, K., mckone-Sweet, K., and Schroeder, R. (2006), "Improving performance through an integrated manufacturing program", *Quality Management Journal*, Vol. 13 No. 3, S.45-S.60.
35. Dave, Y., and Sohani, N. (2019), "Improving productivity through Lean practices in central India-based manufacturing industries", *International Journal of Lean Six Sigma*, Vol. 10 No. 2, pp. 601-621.
36. de Menezes, L.M., and Wood, S. (2006), "The reality of flexible work systems in Britain", *International Journal of Human Resource Management*, Vol. 17 No. 2, pp. 106-138.
37. de Treville, S., and Antonakis, J. (2006), "Could lean production job design be intrinsically motivating? Contextual, configurational, and levels-of-analysis issues", *Journal of Operations Management*, Vol. 24 No. 2, pp. 99-123.
38. DeNisi, A.S., and Griffin, R.W. (2007), *Human Resource Management*, 3rd ed., Boston, New York, Houghton Mifflin Company.
39. Dermal, V., and Čater, T. (2013), "The influence of training and training transfer factors on organizational learning and performance", *Personnel Review*, Vol. 42 No. 3, pp. 324-348.
40. Dessler, G. (2017), *Human Resource Management*, 15th ed., Harlow, UK, Pearson Education, Ltd.
41. Domingues, R., Filippone, M., Michiardi, P., and Zouaoui, J. (2018), "A comparative evaluation of outlier detection algorithms: experiments and analyses", *Pattern Recognition*, Vol. 74, pp. 406-421.
42. Ekanayake, E.M.H.L., and Preena, G.R. (2021), "Lean human resource management", *Human Resource Management Challenge Environ*, Vol. 12, pp. 43-47.

43. Elnadi, M., and Shehab, E. (2014), "A conceptual model for evaluating product-service systems leanness in UK manufacturing companies", *3rd International Conference on Through-life Engineering Services*, Procedia CIRP, Vol. 22, pp. 281-286.
44. Fernández-Muñiz, B., Montes-Peón, J.M., and Vázquez-Ordás, C.J. (2007), "Safety culture: analysis of the causal relationships between its key dimensions", *Journal of Safety Research*, Vol. 38 No. 6, pp. 627-641.
45. Festing, M. (2012), "Strategic human resource management in Germany: evidence of convergence to the U.S. model, the European model, or a distinctive national model?", *Academy of Management Perspectives*, Vol. 26 No. 2, pp. 37-54.
46. Fornell, C., and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.
47. Forza, C. (1996), "Work organization in lean production and traditional plants – what are the differences?", *International Journal of Operations & Production Management*, Vol. 16 No. 2, pp. 42-62.
48. Gaiardelli, P., Resta, B., and Dotti, S. (2019), "Exploring the role of human factors in lean management", *International Journal of Lean Six Sigma*, Vol. 10 No. 1, pp. 339-366.
49. García-Juan, B., Escrig-Tena, A.B., and Roca-Puig, V. (2019), "The empowerment-organizational performance link in local governments", *Personnel Review*, Vol. 48 No. 1, pp. 118-140.
50. Garver, M.S., and Mentzer, J.T. (1999), "Logistics research methods: employing structural equation modeling to test for construct validity", *Journal of Business Logistics*, Vol. 20 No. 1, pp. 33-57.
51. George, D., and Mallery, P. (2010), *SPSS for Windows Step by Step: A Simple Guide and Reference 17.0 Update*, 4th ed., Boston, Allyn & Bacon.
52. Goetsch, D.L., and Davis, S. (2016), *Quality Management for Organizational Excellence: Introduction to Total Quality*, 8th ed., Essex, England, Pearson Education Ltd.
53. Grunwald, W., and Lilge, H.G. (2019), "Change of leadership style in German enterprises: from authoritative to participative leadership?", In: Dlugos, G., and Weiermair, K. (eds), *Management Under Value Systems*, pp. 721-756. Berlin, De Gruyter.
54. Hair, J.F., Hult, G.T.M., Ringle, C.M., and Sarstedt, M. (2017), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 2nd ed., Sage Publications, Inc., Thousand Oaks, CA.
55. Hare, B., and Cameron, I. (2011), "Site manager safety training", *Engineering, Construction and Architectural Management*, Vol. 18 No. 6, pp. 568-578.
56. Harman, D. (1967), "A single factor test of common method variance", *Journal of Psychology*, Vol. 35, pp. 359-378.
57. Herzog, N.V., and Tonchia, S. (2014), "An instruction for measuring the degree of lean implementation in manufacturing", *Strojniški Vestnik – Journal of Mechanical Engineering*, Vol. 60 No. 12, pp. 797-803.
58. Hiltrop, J.M. (1992), "Just-in-time manufacturing: implications for the management of human resources", *European Management Journal*, Vol. 10 No. 1, pp. 49-55.

59. Ho, H., and Kuvaas, B. (2019), "Human resource management systems, employee well-being, and firm performance from the mutual gains and critical perspectives: the well-being paradox", *Human Resource Management*, Vol. 59 No. 3, pp. 235-253.
60. Ho, H., and Kuvaas, B. (2020), "Human resource management systems, employee well-being, and firm performance from the mutual gains and critical perspectives: the well-being paradox", *Human Resource Management*, Vol. 59 No. 3, pp. 235-253.
61. Horwitz, S.K., and Horwitz, I.B. (2017), "The effects of organizational commitment and structural empowerment on patient safety culture: an analysis of a physician cohort", *Journal of Health Organization and Management*, Vol. 31 No. 1, pp. 10-27.
62. Hu, L., and Bentler, P.M. (1999), "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modeling: A Multidisciplinary Journal*, Vol. 6 No. 1, pp. 1-55.
63. Ibrahim, R., Boerhannoeddin, A., and Bakare, K.K. (2017), "The effect of soft skills and training methodology on employee performance", *European Journal of Training and Development*, Vol. 41 No. 4, pp. 388-406.
64. Iluk, K., and Iluk, Ł. (2017), "The implementation of job rotation as a form of job design within human resources management in Germany", *Human Resources Management – Interdisciplinary Perspective*, Vol. 1, pp. 11-53.
65. Ismael, N.B., Othman, B.J., Gardi, B., Hamza, P.A., Sorguli, S., Aziz, H.M., Ahmed, S.A., Sabir, B.Y., Ali, B.J., and Anwar, G. (2021), "The role of training and development on organizational effectiveness", *International Journal of Engineering, Business, and Management*, Vol. 5 No. 3, pp. 15-24.
66. ITA (2022), "International Trade Administration", available at: <https://www.trade.gov/country-commercial-guides/germany-market-overview> (accessed on 1 July 2022).
67. JCI (2021), "Jordan Chamber of Industry", available at: <https://www.jci.org.jo/Chamber> (accessed on 27 January 2021).
68. Kabir, Q.S., Watson, K., and Somaratna, T. (2018), "Workplace safety events and firm performance", *Journal of Manufacturing Technology Management*, Vol. 29 No. 1, pp. 104-120.
69. Kafetzopoulos, D., Gotzamani, K., and Skalkos, D. (2019), "The relationship between EFQM enablers and business performance: the mediating role of innovation", *Journal of Manufacturing Technology Management*, Vol. 30 No. 4, pp. 684-706.
70. Kaplan, R.S. (2009), "Conceptual foundations of the balanced scorecard", *Handbooks of Management Accounting Research*, Vol. 3, pp. 1253-1269.
71. Kathuria, R., and Partovi, F.Y. (1999), "Work force management practices for manufacturing flexibility", *Journal of Operations Management*, Vol. 18 No. 1, pp. 21-39.
72. Kline, R.B. (2011), *Principles and Practice of Structural Equation Modeling*, 3rd ed., New York, The Guilford Press.
73. Kongtip, P., Yoosook, W., and Chantanakul, S. (2008), "Occupational health and safety management in small and medium-sized enterprises: an overview of the situation in Thailand", *Safety Science*, Vol. 46 No. 9, pp. 1356-1368.
74. Lie, H.C., Rueegg, C.S., Fosså, S.D., Loge, J.H., Ruud, E., and Kiserud, C.E. (2019), "Limited evidence of non-response bias despite modest response rate in a nationwide

- survey of long-term cancer survivors – results from the NOR-CAYACS study”, *Journal of Cancer Survivorship*, Vol. 13 No. 3, pp. 353-363.
75. Litwin, M.S. (1995), *How to Measure Survey Reliability and Validity*, Thousand Oaks, Sage Publications, Inc.
  76. Liu, Y., Combs, J.G., Ketchen Jr., D.J., and Ireland, R.D. (2007), “The value of human resource management for organizational performance”, *Business Horizons*, Vol. 50 No. 6, pp. 503-511.
  77. Loh, K.L., and Yusof, S.M. (2020), “Blue ocean leadership activities improve firm performance”, *International Journal of Lean Six Sigma*, Vol. 11 No. 2, pp. 359-375.
  78. MacDuffie, J.P. (1995), “Human resource bundles and manufacturing performance: organizational logic and flexible manufacturing systems in the world auto industry”, *Industrial and Labor Relations Review*, Vol. 48 No. 2, pp. 197-221.
  79. Magnan, G.M., Vickery, S.K., and Droge, C. (1995), “The use of human resource strategies to support manufacturing flexibility”, *Proceedings of the 1995 Annual Decision Sciences Institute Conference*, pp. 1332-1334.
  80. Martensen, A., Dahlgaard, J.J., Park-Dahlgaard, S.M., and Grønholdt, L. (2007), “Measuring and diagnosing innovation excellence – simple contra advanced approaches: a Danish study”, *Measuring Business Excellence*, Vol. 11 No. 4, pp. 51-65.
  81. Miller, C.C., Washburn, N.T., and Glick, W.H. (2013), “Perspective—The myth of firm performance”, *Organization Science*, Vol. 24 No. 3, pp. 948-964.
  82. Muller, M. (1999), “Human resource management under institutional constraints: the case of Germany”, *British Journal of Management*, Vol. 10, pp. 31-44.
  83. Myers, M.S. (1991), *Every Employee is a Manager*, San Diego, Pfeiffer.
  84. Narayan, V. (2012), “Business performance and maintenance: how are safety, quality, reliability, productivity maintenance related?”, *Journal of Quality in Maintenance Engineering*, Vol. 18 No. 2, pp. 183-195.
  85. Nawanir, G., Kong Teong, L., and Norezam Othman, S. (2013), “Impact of lean practices on operations performance and business performance”, *Journal of Manufacturing Technology Management*, Vol. 24 No. 7, pp. 1019-1050.
  86. Nunnally, J.C., and Bernstein, I.H. (1994), *Psychometric Theory*, 3rd ed., New York, McGraw-Hill, Inc.
  87. Ohno, T. (1988), *Toyota Production System: Beyond Large-Scale Production*, New York, Productivity Press.
  88. Olivella, J., Cuatrecasas, L., and Gavilan, N. (2008), “Work organization practices for lean production”, *Journal of Manufacturing Technology Management*, Vol. 19 No. 7, pp. 798-811.
  89. Osterman, P. (1994), “How common is workplace transformation and who adopts it?”, *Industrial and Labor Relations Review*, Vol. 47 No. 2, pp. 173-188.
  90. Pérez, M.P., and Sánchez, A.M. (2000), “Lean production and supplier relations: a survey of practices in the Aragonese automotive industry”, *Technovation*, Vol. 20 No. 12, pp. 665-676.
  91. Pil, F.K., and MacDuffie, J.P. (1996), “The adoption of high-involvement work practices”, *Industrial Relations*, Vol. 35 No. 3, pp. 423-455.

92. Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., and Podsakoff, N.P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879-903.
93. Pool, R. (2011), "Training for results: innovative synergy between learning and business performance", *Industrial and Commercial Training*, Vol. 43 No. 1, pp. 31-40.
94. Power, D.J., and Sohal, A.S. (2000), "Human resource management strategies and practices in just-in-time environments: Australian case study evidence", *Technovation*, Vol. 20 No. 7, pp. 373-387.
95. Rana, M.H., and Malik, M.S. (2017), "Impact of human resource (HR) practices on organizational performance: modeling role of Islamic principles", *International Journal of Islamic and Middle Eastern Finance and Management*, Vol. 10 No. 2, pp. 186-207.
96. Richard, P.J., Devinney, T.M., Yip, G.S., and Johnson, G. (2009), "Measuring organizational performance: towards methodological best practice", *Journal of Management*, Vol. 35 No. 5, pp. 718-804.
97. Rifai, F.A., Yousif, A.S.H., Bwaliez, O.M., Al-Fawaeer, M.A.R., and Ramadan, B.M. (2021), "Employee's attitude and organizational sustainability performance: an evidence from Jordan's banking sector", *Research in World Economy*, Vol. 12 No. 2, pp. 166-177.
98. Rinehart, J., Huxley, C., and Robertson, D. (2018), *Just Another Car Factory? Lean Production and its Discontents*, Ithaca, Cornell University Press.
99. Rommel, A., Varnaccia, G., Lahmann, N., Kottner, J., and Kroll, L.E. (2016), "Occupational injuries in Germany: population-wide national survey data emphasize the importance of work-related factors", *PLoS ONE*, Vol. 11 No. 2, pp. 1-16.
100. Sabry, A. (2014), "Factors critical to the success of Six-Sigma quality program and their influence on performance indicators in some of Lebanese hospitals", *Arab Economic and Business Journal*, Vol. 9 No. 2, pp. 93-114.
101. Sahoo, S., and Yadav, S. (2018), "Lean production practices and bundles: a comparative analysis", *International Journal of Lean Six Sigma*, Vol. 9 No. 3, pp. 374-398.
102. Saini, S., and Singh, D. (2020), "Impact of implementing lean practices on firm performance: a study of Northern India SMEs", *International Journal of Lean Six Sigma*, Vol. 11 No. 6, pp. 1005-1034.
103. Sala, E. and Lynn, P. (2009), "The potential of a multi-mode data collection design to reduce non response bias. The case of a survey of employers", *Quality and Quantity*, Vol. 43 No. 1, pp. 123-136.
104. Sánchez, A.M., and Pérez, M.P. (2001), "Lean indicators and manufacturing strategies", *International Journal of Operations & Production Management*, Vol. 21 No. 11, pp. 1433-1452.
105. Sangwa, N.R., and Sangwan, K.S. (2018), "Development of an integrated performance measurement framework for lean organizations", *Journal of Manufacturing Technology Management*, Vol. 29 No. 1, pp. 41-48.
106. Schonberger, R.J. (2007), "Japanese production management: an evolution—with mixed success", *Journal of Operations Management*, Vol. 25 No. 2, pp. 403-419.
107. Sezhiyan, D.M., and Nambirajan, T. (2010), "Development of scale to measure supplier selection, supply effort management, and organizational performance", *Asia-Pacific Business Review*, Vol. 6, pp. 12-17.

108. Shah, R., and Ward, P.T. (2003), "Lean manufacturing context, practice bundles, and performance", *Journal of Operations Management*, Vol. 21 No. 2, pp. 129-149.
109. Shah, R., and Ward, P.T. (2007), "Defining and developing measures of lean production", *Journal of Operations Management*, Vol. 25 No. 4, pp. 785-805.
110. Sharabati, A.A.A., Al-Salhi, N.A., Bwaliez, O.M., and Nazzal, M.N. (2020), "Improving sustainable development through supply chain integration: an evidence from Jordanian phosphate fertilizers manufacturing companies", *International Journal of Multidisciplinary Studies on Management, Business, and Economy*, Vol. 3 No. 2, pp. 10-23.
111. Silva, S., Lima, M.L., and Baptista, C. (2004), "OSCI: an organizational and safety climate inventory", *Safety Science*, Vol. 42 No. 3, pp. 205-220.
112. Silvestro, R. (2014), "Performance topology mapping: understanding the drivers of performance", *International Journal of Production Economics*, Vol. 156 No. 1, pp. 269-282.
113. Solgi, Z., Vahdati, H., Mousavi, S., and Nazarpoori, A.H. (2021), "Designing a model of lean human resource excellence; basis for measuring the lean degree of human resources in the public sector", *Management Research in Iran*, Vol. 25 No. 1, pp. 74-93.
114. Stock, G.N., and McFadden, K.L. (2017), "Improving service operations: linking safety culture to hospital performance", *Journal of Service Management*, Vol. 28 No. 1, pp. 57-84.
115. Stone, R.J. (2017), *Human Resource Management*, 9th ed., Milton, John Wiley & Sons Australia, Ltd.
116. Studer, J. Baggio, S., Mohler-Kuo, M., Dermota, P., Gaume, J., Bertholet, N., and Gmel, G. (2013), "Examining non-response bias in substance use research – are late respondents proxies for non-respondents?", *Drug and Alcohol Dependence*, Vol. 132 No. 1-2, pp. 316-323.
117. Sureeratta, C., Napompech, K., and Panjakhajo, V. (2014), "Model of leadership and the effect of lean manufacturing practices on firm performance in Thailand's auto parts industry", *Research Journal of Business Management*, Vol. 8 No. 2, pp. 104-117.
118. Ta'Amnha, M., Samawi, G.A., Bwaliez, O.M., and Magableh, I.K. (2021d), "COVID-19 organizational support and employee voice: insights of pharmaceutical stakeholders in Jordan", *Corporate Ownership & Control*, Vol. 18 No. 3, pp. 367-378.
119. Ta'Amnha, M.A., Bwaliez, O.M., and Magableh, I.K. (2021a), "Employer brand and employee in-role performance: a moderated mediation model of employee's self-efficacy and work engagement", *Journal of Management Information and Decision Sciences*, Vol. 24 No. S6, pp. 1-17.
120. Ta'Amnha, M.A., Bwaliez, O.M., and Samawi, G.A. (2021c), "The impact of employer brand on employee voice: the mediating effect of organizational identification", *Journal of Legal, Ethical, and Regulatory Issues*, Vol. 24 No. S1, pp. 1-14.
121. Ta'Amnha, M.A., Bwaliez, O.M., Magableh, I.K., Samawi, G.A., and Mdanat, M.F. (2021b), "Board policy of humanitarian organizations towards creating and maintaining their employer brand during the COVID-19 pandemic", *Corporate Board: Role, Duties, & Composition*, Vol. 17 No. 3, pp. 8-20.

122. Ta'Amnha, M.A., Bwaliez, O.M., Samawi, G.A., and Al-Anaswah, M.F. (2022), "The direct and indirect impacts of transformational leadership on employee change-oriented organizational citizenship behavior", *Corporate Ownership & Control*, Vol. 19 No. 3, pp. 147-157.
123. Tait, R., and Walker, D. (2000), "Motivating the workforce: the value of external health and safety awards", *Journal of Safety Research*, Vol. 31 No. 4, pp. 243-251.
124. Taj, S., and Morosan, C. (2011), "The impact of lean operations on the Chinese manufacturing performance", *Journal of Manufacturing Technology Management*, Vol. 22 No. 2, pp. 223-240.
125. Thornhill, A., Saunders, M., and Lewis, P. (2009), *Research Methods for Business Students*, Essex, England, Pearson Education Ltd.
126. Thun, J.H., Drüke, M., and Grübner, A. (2010), "Empowering Kanban through TPS-principles – an empirical analysis of the Toyota production system", *International Journal of Production Research*, Vol. 48 No. 23, pp. 7089-7106.
127. Voegtlin, C., Boehm, S.A., and Bruch, H. (2015), "How to empower employees: using training to enhance work units' collective empowerment", *International Journal of Manpower*, Vol. 36 No. 3, pp. 354-373.
128. Vredenburg, A. (2002), "Organizational safety: which management practices are most effective in reducing employee injury rates?", *Journal of Safety Research*, Vol. 33 No. 2, pp. 259-276.
129. Wickramasinghe, G.L.D., and Wickramasinghe, V. (2017), "Implementation of lean production practices and manufacturing performance: the role of lean duration", *Journal of Manufacturing Technology Management*, Vol. 28 No. 4, pp. 531-550.
130. Womack, J.P., Jones, D.T., and Roos, D. (1990), *The Machine that Changed the World*, New York, Rawson Associates.
131. Yang, M.G., Hong, P., and Modi, S.B. (2011), "Impact of lean manufacturing and environmental management on business performance: an empirical study of manufacturing firms", *International Journal of Production Economics*, Vol. 129 No. 2, pp. 251-261.