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Measuring The Impact of OD Interventions on Organizational Performance (OP)

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Keywords: OD Interventions, Automation, Organization Development, Organizational Performance

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Performance is a major challenge. The study examined the impact of OD interventions on organizational performance. The study collected quantitative data using a closed-ended survey form and performed the regression and mediation analysis. The t-statistic, p-values, adjusted R2, F-statistic, and regression coefficient β values were computed. A focus group of experts was conducted to gather qualitative data. A thematic analysis was conducted and the quantitative and qualitative results were merged and insightful findings were obtained. The findings recommend efficient manufacturing processes and systems for producing quality products. New technologies and IT systems have an impact on corporate decision-making processes. One significant technological intervention to support a culture of productivity is plant automation.

Keywords: OD Interventions, Automation, Organization Development, Organizational Performance

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Introduction

OP is putting in the effort and getting the intended outcomes. Many research studies have concluded that the performance of an organization has multiple aspects and dimensions. These include production performance, marketing and sales, environmental, financial, knowledge development, corporate social responsibility, and product quality performance (Dess & Robinson, 1984; Akerele, 2023; Al-Habib, 2020; Ali & Kausar, 2022; Ali et al., 2024; Ali & Xie, 2021; Amoa-Gyarteng et al., 2024; Anderson, 2015; Zhang et al., 2021; Zadeh & Ahmad, 2012; Yavuz, 2020; Xu, 2013; Worley & Lawler, 2006).

The performance of the organization, particularly the production performance, is a further significant challenge. Lower costs per unit and increased output might result from streamlining production procedures and resource use. Customer orders can be fulfilled

using an effective and efficient production system. But each company has a unique set of production system KPIs (Anghel & Almasan, 2022; Baby et al., 2024; Battaglini, 2019; Tsuma, 2013; Truss et al., 2013; Taghizadeh, 2006; Syafarudin, 2021; Sumbal, 2020; Soomro et al., 2011; Sobel, 1987; Smollan & Mooney, 2024; Aherene, 2023).

OD is an approach to putting interventions based on humanistic-democratic principles into practice (Cummings & Worley, 2009; Chakravarthy, 1986; Bushman & Smith, 2001; Burke, 2008; Bryne, 2001; Bryman, 2001; Brown, 2006; Brannen, 2005; Boyatzis, 1982). Organizational psychologists have applied the ideas of OD to solve organizational issues and enhance organizations (Anghel & Almasan, 2022; Baby et al., 2024; Battaglini, 2019; Beckhard, 1969; Beer, 1980; Mishev, 2010; Mintzberg, 1994).

The previous studies have investigated the impact of OD on various aspects of corporate performance (Dess & Robinson, 1984; Akerele, 2023; Al-Habib, 2020; Ali & Kausar, 2022; Ali et al., 2024; Ali & Xie, 2021; Amoa-Gyarteng et al., 2024; Anderson, 2015; Anghel & Almasan, 2022; Baby et al., 2024; Battaglini, 2019; Beckhard, 1969; Beer, 1980; Doval, 2020). Studies concluded that this is challenging to incorporate new technological interventions into an entire system. Corporate planners believe that technological advancements have aided businesses in enhancing their corporate cultures, goods, and standards. However, research work is needed in the future (Girod et al., 2023; Bernard & Philip, 2011; Al-Habib, 2020; Ali & Kausar, 2022; Ali et al., 2024; Ali & Xie, 2021; Amoa-Gyarteng et al., 2024).

A gap in the literature was noted due to the lack of adequate research on OD and PP in Pakistan. There are various important factors that can be used to evaluate production performance, such as cost, flexibility, quality, and efficiency (Osintsev & Khalilian, 2023; Osife, 2012; Oppenheim, 1992; Olson & Henry, 1982; Nyathi & Kekwaletswe, 2023; Nonaka, 1994; Niazi, 2011; Ndakanwa et al., 2024; Motiei et al., 2015; Morgan, 1988; Moore & Rosenbloom, 2016; Mishra & Mohanty, 2014; Mishev, 2010; Mintzberg, 1994; Miller & Davis-Howard, 2023; Miller, 2004; Sivasubramanian & Umaselvi, 2010; Sheng & Mykytyn, 2002; Seibert et al., 2001; Schroeder & Flynn, 2001). The objective of this mixed methods explanatory sequential study was to investigate the impact of five technical OD interventions on production performance. The technical OD interventions include MPCC, MPGC, TC, IT, and automation. The results provide knowledge regarding OD and PP and motivate business planners to design and implement successful OD interventions.

Literature Review

OP is a major corporate challenge. Many aspects of OP like effective monitoring and control systems, powerful tools, efficient coordination mechanisms, efficient networking, accountability systems, and personnel competency and efficient production systems have been identified (Amoa-Gyarteng et al., 2024; Anderson, 2015; Anghel & Almasan, 2022; Bijleveld et al., 2009; Boyatzis, 1982; Brannen, 2005; Brayton, 2024; Zhang et al., 2021; Zadeh & Ahmad, 2012; Yavuz, 2020; Xu, 2013; Worley & Lawler, 2006).

The results of studies show that OP is an important variable in management research. Each sector has a different level of performance. Performance is putting forth the effort and getting the intended outcomes (Amoa-Gyarteng et al., 2024; Anderson, 2015; Anghel & Almasan, 2022; Baby et al., 2024; Battaglini, 2019; Beckhard, 1969; Beer, 1980; Doval, 2020; Beer et al., 1984; Beer et al., 2023; Bennis, 1969; Brown, 2006; Bryman, 2001; Bryne, 2001; Burke, 2008; Bushman & Smith, 2001; Chakravarthy, 1986; Chen & Wu 2022; Cheng, 2001). Previous studies reported that organizational capability (strategic leadership, structure, human resources, finance, programs, infrastructure, and technology) affects performance. OP is used for productivity, efficiency, effectiveness, completeness, growth, and quality.

Management gurus and previous researchers have suggested that organizations should implement initiatives for sustainable OP (Khan & Rehman, 2023; Khan et al., 2022; Khan et al., 2023; Khattak et al., 2023; Kim et al., 2021; Anghel & Almasan, 2022; Baby et al., 2024; Battaglini, 2019; Beckhard, 1969; Beer, 1980; Doval, 2020). They further stated that organizational capabilities and development need long-term strategies and the business environment is under pressure to reduce the cost of production on the basis of existing technology and to improve quality. However, organizations can enhance effectiveness through innovative technology and strategic management policies and other development initiatives (Taghizadeh, 2006; Syafarudin, 2021; Sumbal, 2020; Soomro et al., 2011; Sobel, 1987; Smollan & Mooney, 2024; Sivasubramanian & Umaselvi, 2010; Sheng & Mykytyn, 2002; Seibert et al., 2001; Schroeder & Flynn, 2001).

ED is an important aspect of corporate culture. Enhancing PP is mostly dependent on having skilled and knowledgeable employees (Saunders et al., 2012; Santos & Brito, 2012; Saeed et al., 2023; Sadiq & Governatori, 2015; Ryeowon et al., 2019; Richter et al., 2017; Rhoades & Eisenberger, 2002). Every level of employee's ability needs to be improved. Enhancing

employees' abilities and organizational skills to achieve targeted performance is a collaborative, ongoing process of improving the knowledge, skills, and abilities of employees (Chakravarthy, 1986; Chen & Wu 2022). Competencies are associated with the characteristics of employees that lead to successful performance and results (Battaglini, 2019; Beckhard, 1969; Beer, 1980; Doval, 2020; Girod et al., 2023; Bernard & Philip, 2011; Al-Habib, 2020; Ali & Kausar, 2022; Ali et al., 2024; Ali & Xie, 2021; Amoa-Gyarteng et al., 2024; Anderson, 2015; Anghel & Almasan, 2022; Bijleveld et al., 2009; Boyatzis, 1982).

The application of OD interventions to improve performance is highly encouraged. A diagnostic process is conducted and specific intervention strategies are developed to enhance performance (Battaglini, 2019; Beckhard, 1969; Argyris, 1970). OD interventions like structural, technical, behavioral, and strategic are important groups (Rawley & Lipson, 1985; Ranft Lord, 2002; Raia, 1972; Prajapat et al., 2023; Porter & Millar, 1985; Porras & Robertson, 1992; Phillips & Klein, 2023; Cummings & Worley, 2009; Csiki et al., 2023).

Appelbaum (1997) stated that the integration of new technological interventions into a total system is a difficult task. Corporate planners agree that technological and technical changes have helped companies improve business culture, products, quality, and production systems. Technical intervention strategies have played a major role in ED and performance. Technical interventions focus on innovations like changes in manufacturing and engineering processes, changes in machinery, changes in manufacturing methods, automation, and the implementation of other computerized information systems. Many studies have recommended OD for performance (Truss et al., 2013; Tsuma, 2013; Venkatraman & Ramanujam, 1986; Wendling et al., 2018; Whatfix, 2023; Wood, 1991; Woolliams & Trompenaars, 2013; Worley & Lawler, 2006; Xu, 2013; Yavuz, 2020; Zadeh & Ahmad, 2012). The following are the technical OD interventions and studies have recommended these for performance (Xu, 2013; Yavuz, 2020; Zadeh & Ahmad, 2012; Zhang et al., 2021; Cummings & Worley, 2009; Csiki et al., 2023).

MPCC and MPGC

Components of a work process highly affect the efficiency of employees. Boxall et al. (2015) investigated the effect of processes on performance. They argued that work processes motivate employees and provide opportunities for learning and involvement in the decision-making processes related to them. Organizations are implementing new methods of goods manufacturing to gain operational excellence. Many new MPCCs and MPGCs have been developed and implemented to increase productivity, efficiency, and performance (Mihaela et al., 2022; Michael, 2006; Menges, 2016; Maune, 2014; Martadiani & Aziz, 2021; Marin et al., 2012; Mara & Nicoleta, 2019; Manzoor et al., 2021; Malhotra et al., 2007; Rawley & Lipson, 1985; Ranft Lord, 2002; Raia, 1972; Prajapat et al., 2023; Porter & Millar, 1985; Porras & Robertson, 1992; Phillips & Klein, 2023).

Helander et al. (2015) stated that management support and employee training are important to make the process more efficient. Agarwal and Brem (2015) argued that new manufacturing methods and technology adoption are crucial for an organization to remain competitive in the marketplace. They further stated that industrial and manufacturing organizations are integrating various technologies to gain maximum performance. Globalization has provided an opportunity for integration. Organizations have crossed boundaries and joined global networks to achieve performance (Porras & Robertson, 1992; Phillips & Klein, 2023; Teixeira et al., 2012; Tashakkori & Teddlie, 1998; Tarigan et al., 2022; Taghizadeh, 2006; Syafarudin, 2021; Sumbal, 2020; Soomro et al., 2011). After the literature review, the following hypotheses were developed for testing.

H1: The impact of MPCC on ED is significant.

H2: The impact of MPCC on PP is significant.

H3: ED mediates the association between MPCC and PP.

H4: The impact of MPGC on ED is significant.

H5: The impact of MPGC on PP is significant.

H6: ED mediates the association between MPGC and PP.

IT

Organizations implement IT systems to enhance performance and effectiveness. Organizations sometimes ignore the behavioral aspects of OD strategies during the implementation process. Pakistani business organizations are facing factors that lead to change. Organizations in Pakistan must switch to this revolution of IT. Organizations should replace the traditional approach to business transactions while using the knowledge and concepts of IT. Sivasubramanian & Umaselvi, 2010; Porter & Millar, 1985; Porras & Robertson, 1992; Phillips & Klein, 2023). The following hypotheses were developed for testing because the study of literature demonstrates that organizations use IT systems to improve efficiency and performance.

H7: The impact of IT on ED is significant.

H8: The impact of IT on PP is significant.

H9: ED mediates the association between IT and PP.

TC

OD helps organizations rebuild their strategies, technologies, and machinery (Mara & Nicoleta, 2019; Manzoor et al., 2021; Malhotra et al., 2007; Maik & Frank, 2021; MacCallum & Austin, 2000; Louis, 1958; 1995; Leitão et al., 2022; Kim et al., 2021; Khattak et al., 2023). OD recognizes that organizations are composed of interdependent systems: the technical and the social. Change in one system can affect another system. So, we need to understand the requirements of related systems during the design process of OD interventions. Cummings and Worley (2009) reported that the social and technical aspects of a job are both important and they affect organizational effectiveness.

Great care is required during changes in machinery and other manufacturing methods. Zvi et al. (2014) stated that during the TC process, effective management of the process is important. One should consider the value of managing employees' emotions, attitudes, and behavioral norms to make the changing process of technology more successful. They further stated that leaders can play their role to boost performance behavior and increase success. Research indicates that cutting-edge technology is critical to employee and production performance. Therefore, when the positive relationship was found through the literature analysis, the following hypotheses were created for testing (Porras & Robertson, 1992; Phillips & Klein, 2023; Osintsev & Khalilian, 2023; Osife, 2012; Oppenheim, 1992; Olson & Henry, 1982; OECD, 2001).

H10: The impact of TC on ED is significant

H11: The impact of TC on PP is significant

H12: ED mediates the association between TC and PP

Automation

Plant automation and computerization are also tools of OD. Organizations are motivated to enhance their performance through automation. Automation of plants and other systems improves the productivity of managers and plants. Automation of systems affects aspects like departmentalization, communication channels, hierarchy, span of control, delegation of responsibilities, formalization, and relations among employees and managers. Organizations are strategically opting to automate systems with the help of new IT tools, and the impact of automation on performance has been experienced (Porras & Robertson, 1992; Phillips & Klein, 2023; Osintsev & Khalilian, 2023; Osife, 2012; Nyathi & Kekwaletswe, 2023; Nonaka, 1994; Niazi, 2011; Ndakanwa et al., 2024; Motiei et al., 2015; Morgan, 1988; Moore & Rosenbloom, 2016; Mishra & Mohanty, 2014; Mishev, 2010; Mintzberg, 1994; Miller & Davis-Howard, 2023; Miller, 2004).

Current workplaces have focused on the automation of technologies and plants. Firms invest money in production processes. The current change is to meet the ever-changing global business environment. Hassan et al. (2013) found that the performance of an organization is linked with innovation and new management strategies. New practices of doing business, new methods of manufacturing, and workplace organizing methods enhance performance (Manzoor et al., 2021; Malhotra et al., 2007; Maik & Frank, 2021). After a thorough analysis of earlier research and the positive relationship between automation and ED and performance, the study formulated the following hypotheses.

H13: The impact of Automation on ED is significant.

H14: The impact of Automation on PP is significant.

H15: ED mediates the association between automation and PP

Developing the Conceptual Framework

The study investigated the impact of technical OD interventions (independent variables) on PP (dependent variable) in the presence of a mediating variable (employee development). A conceptual framework (see Figure 1) was created after the appropriate literature review. By defining the variables included in the study and clarifying its objective, the model provides the theoretical foundations and directs the research process. Five independent variables are included in the study These include manufacturing process change (MPCC), manufacturing program change (MPGC), information technology (IT), technology change (TC), and automation. The dependent variable was OP which was operationalized as PP. The mediating variable was ED.

Figure 1

Conceptual Framework

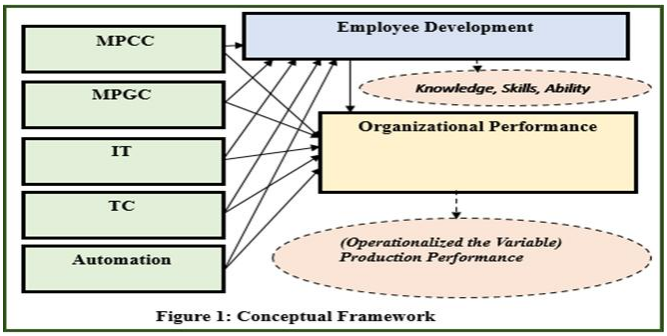

Figure 1: Conceptual Framework

Research Methodology

This research study used the mixed method explanatory sequential research design (Tashakkori and Teddlie, 2003) to investigate and explore the research problem (Creswell, 2002). In this research study, a stratified random probability sampling technique is utilized for the quantitative portion. Firms registered with SECP are considered a complete population. Major industries are divided into 26 strata and a list of firms selected from each stratum is given in Table 1.

Table 1

List of Industries

S.NO	Industry	Number of Firms
1	Textile	131
2	Sugar	64
3	Cement	34
4	Education	54
5	Chemicals	74
6	Construction	15
7	Information Technology	30
8	Beverages	13
9	Pharmaceutical	110
10	Engineering Services	22
11	Aviation	07
12	Tobacco	12
13	Home Appliances	21
14	Banking	49
15	Insurance	24
16	Food	30
17	Super Store	13
18	Auto	08
19	Agri Products	06
20	Leather	03
21	Paint	11
22	Health Services	04
23	Hotel	35
24	Media	10
25	Telecommunication	17
26	Furniture	03

The firms in the same industry group share common characteristics related to OD interventions, ED, and OP. The study selected 800 units for analysis. Focus group interviews are conducted to explore the research problems. The study used a closed-ended questionnaire and gathered quantitative data. Birds (2009) and Bulmer (2004) have reported that questionnaires are a popular and well-established

tool for collecting data in social sciences on public knowledge and perception. We got the responses on a five-point Likert-type scale (1=strongly disagree to 5=strongly agree).

The MPCC was measured by 4-items adapted from the study of Appelbaum (1997) on socio-technical systems. These items are based on his suggestions for assessing socio-technical systems. TC was assessed through the scale of an item and MPGC was assessed through the scale of an item adapted from Cua et al. (2001). Automation was assessed through a five-item scale adapted from Hosseinain et al. (2014). Automation was conceptualized as the automation of plants and other organizational sub-systems. We measured IT using a seven-item scale adapted from Ahmed Abdullah (1998). Cronbach alpha value was reported as .77. The scale has been used in several studies. ED was measured by an 8-item scale adapted from the study of Tsuma (2013).

We conducted a focus group composed of OD and HR specialists, and faculty members to develop a draft and final questionnaire. We explained the purpose of the questionnaire to the experts and they discussed all the aspects. They assessed and reviewed the draft questionnaire. Finally, they developed the final version of the questionnaire. All experts agreed that the items and questions included in the form are suitable and satisfactory for inspecting the influence of OD on ED and OP.

We conducted a pilot study on 50 industrial units selected purposively from the database of the SECP, Pakistan. The questionnaires were mailed and sent through courier service to the Heads of HR. Face-to-face interviews with Heads of HR and Heads of Finance were also conducted to discuss the questionnaire. Their suggestions were valuable and helped to rewrite a few questions because they were not clear to respondents and were difficult to answer. Cronbach's alpha was calculated and it ranged from .70 to .90 which demonstrated reliability. The regression analysis was conducted. The values of β, t-statistic, and p-values, adjusted R2, and F-statistic were determined. The mediation analysis (Baron & Kenny, 1986) was conducted. Sobel and Goodman's tests confirmed the mediation (Preacher & Leonardelli, 2001).

Analysis and Results

800 questionnaires were distributed to the Heads of HRM of 800 industrial units and 762 were received back. Cronbach's alpha values were calculated that vary from 0.77 to 0.98 which show high-reliability MPCC (alpha=0.78), TC (alpha=0.81), MPGC (alpha=0.82), automation (alpha=0.89), IT (alpha=0.86), ED (alpha=.77) and PP (alpha=0.94). A correlation analysis is conducted to check the link among the items of each construct. The values of the correlation coefficient for the items of MPCC varied from .648 to .782 for TC, .417 to .652 for MPGC, .634 to .766 for automation, .392 to .822 for IT, .416 to .907, .217 to .733 for ED, .613 to .653, and .330 to .547 for PP.

Regression Analysis

The regression analysis was conducted (see Table 2) to investigate the effect of technical interventions on mediating variable and dependent variables. The results indicate that MPCC (β=0.317, p<0.001), MPGC (β=0.338, p<0.001), information technology (β=0.373, p<0.001), TC (β=0.124, p<0.001) and automation (β=0.355, p<0.001) positively and significantly affect employee development.

The relationship of IT and TC with PP is not significant. However, MPCC (β=0.113, p<0.001), MPGC (β=0.136, p<0.001), and automation (β=0.356, p<0.001) positively and significantly affect production performance. This shows PP captures the maximum effect of automation and captures the least effect of MPCC.

Table 2

Multiple Regression Analysis

I.V	M.V	P. P
MPCC	0.317* (12.268)	0.113* (3.381)
MPGC	0.338* (13.061)	0.136* (4.091)
Information Technology	0.373* (14.401)	−0.008 (−0.232)
Technology Change	0.124* (4.811)	0.054 (1.614)
Automation	0.355* (13.741)	0.356* (10.669)

I.V	M.V	P. P
Adjusted R^2	0.492	0.155
F-Statistics	(148.090) *	(28.930) *

The first technical intervention is MPCC which positively affects ED (β=0.317, sig. <0.01). The relationship of MPCC with PP is not significant. The effect of MPGCs on ED (β=0.337, sig. <0.01) is positive and significant. It is an important technical OD intervention. This intervention positively and significantly affects ED (β=0.372, sig. <0.01). The relationship between IT and PP is insignificant. The value of R^2 (0.139) of ED represents that 13.9% variation in the dependent variable is explained by the independent variable. The F-statistic (122.132) is significant at less than 1% significant level which reveals that our model is a good fit. The results of regression analysis show that TC has a positive and significant relationship with ED (β=0.124, sig. <0.01). The effect of TC on PP is insignificant. The effect of automation on ED (β=0.355, sig. <0.01) and PP (β=0.055, sig. <0.01) is positive and significant.

Mediation Analysis

Results of regression analysis show a positive and significant impact of MPCC intervention on ED and the results further support the mediation effect of ED between MPCC. ED fully mediates between MPGC and production performance. Results of simple regression analysis show that the direct effect of IT on PP is not significant and regression analyses were not conducted because they do not satisfy the common approach to analyze mediation stated by Baron and Kenny (1986). The direct effect of TC on PP is not significant. The direct effect of automation on PP(β=0.055, sig<0.01) is significant. The direct effect of ED on PP (β=0.306, sig<0.01) is also significant.

Table 3

Mediation Analysis

I.V(s)	D.V	
MPCC		
MPGC	0.039 (1.05)	
IT		
TC		
Automation		0.284* (7.98)
ED	0.290* (7.87)	0.202* (5.66)
Adjusted R^2	0.091	0.160
F-Statistics	38.7*	73.2*

Sobel and Goodman Tests

The results of Sobel and Goodman tests are presented in Table 4.

Table 4

Sobel and Goodman Tests

I.V	M.V	D.V	Sobel Test Statistic	Std. error	p-value	Goodman Test Statistic	Std. error	p-value
MPGC	E. D	P. P	3.403	0.011	0.000	3.426	0.011	0.000
Automation	E. D	P. P	4.945	0.014	0.000	4.963	0.014	0.000

The ED mediates the effect automation on PP. in the light of regression and mediation analysis the H1, H4, H5, H6, H7, H10, H13, H1 and H15 hypotheses were accepted and H2, H3, H8, H9, H11, and H12 were rejected. The following section shows the results of the focus group. Tables 5 and 6 show the experts of the focus group and the moderator guide (Morgan, 1988).

Table 5

Experts of Focus Group

Expert	Educational Qualification	Work Experience (Years)
EI	M.Sc. Chemical Engineering	10
E2	B.Sc. Mechanical Engineering	08
E3	B.Sc. Mechanical Engineering	12
E4	B.Sc. Electrical Engineering	13
E5	M.Phil. Human Resource Management	15
E6	MBA Human Resource Management	18
E7	Chartered Accountant (C.A)	09
E8	B.Sc. Electronics	13
E9	Master of Computer Sciences	20
E10	PhD Chemical Engineering	17

Table 6

Moderator Guide

S. No.	Questions
1.	How do technical OD interventions like MPCC, MPGC, IT, TC, and automation affect ED and PP?

The quantitative results indicate the positive and significant impact of MPCC on ED and the results further support the mediation effect of ED between MPCC. MPCC has no relationship with PP. The current manufacturing processes should be flexible and responsive to control manufacturing constraints. Poor ergonomics and layouts cause production loss. PP can be achieved through continuous reduction of cycle time and operators' training. Similarly, good manufacturing programs must be in place to produce quality products. The association of MPGC with ED and PP is positive and significant.

Panel professionals indicated a solid connection between IT and efficiency. It ensures the quality of work. Quantitative results show that the influence of IT on ED is positive and significant. IT systems and new technologies influence corporate decision-making systems and ensure self-direction. Studies show the optimistic influence of IT on performance (Klein and Dologite, 2000). Motiei et al. (2015) have also concluded that the application of IT improves capabilities.

The quantitative results indicate a very surprising finding that IT has no positive effect on production performance. Sheng and Mykytyn (2002) have also concluded that only integrated systems or Enterprise Resource Planning (ERP) systems improve the production process. Routine transactional systems should be connected with executive support systems and decision support systems to achieve production efficiency. Panel experts agreed that IT is a prerequisite for production efficiency.

Experts shared that organizational growth is critical to achieve the prosperity of employees. Plant automation is a major technical intervention to promote productive culture. Process automation ensures process visibility, process management, process control and smooth production process. Our results show a noteworthy influence of automation on ED and PP. Olson and Henry (1982) highlighted that automation improves attitudes, management processes, and structure and communication systems. Plant automation systems are designed to optimize operations.

Discussion and Findings

Quantitative results reveal that the effect of MPCC on ED is positive and significant and ED partially mediates the association. Surprisingly, the association between MPCC and PP is insignificant. Qualitative findings recommend the optimization of processes to reduce the cost of production and other productive inputs. Well-nested and flexible manufacturing processes contribute to high performance. Research work supported the positive impact of good MPCC on ED and performance (Boxall et al., 2015; Helander et al., 2015; Khan & Rehman, 2023; Joan Ernst van Aken, 2007, Ji et al., 2012; Jacobs & Washington, 2003; Irfan et al., 2021; Hameed & Waheed, 2011; Goshawk & Fender, 2015).

Modern manufacturing systems make huge demands for innovative processes and a skilled workforce. Organizations are at the stage of revolutionary change. Economic globalization provides the opportunity for TQM. Performance can be achieved through new and innovative operations management processes. Previous research studies have also concluded that innovation and

modernization of manufacturing systems and processes improve performance (Heizer and Render, 2004; Mihaela et al., 2022; Michael, 2006; Menges, 2016; Maune, 2014; Martadiani & Aziz, 2021; Marin et al., 2012; Mara & Nicoleta, 2019; Manzoor et al., 2021; Malhotra et al., 2007; Maik & Frank, 2021; MacCallum & Austin, 2000; Louis, 1958; 1995).

The results show that modern manufacturing programs ensure conformance to quality, minimize the cost of production, and optimize the volume and speed of production. Overall productivity is directly related to well-coordinated engineering and operational programs. Zhang et al., 2021; Zadeh & Ahmad, 2012; Yavuz, 2020; Xu, 2013; Worley & Lawler, 2006; Woolliams & Trompenaars, 2013; Wood, 1991; Whatfix, 2023; Wendling et al., 2018; Venkatraman & Ramanujam, 1986).

Modern manufacturing programs ensure effective utilization of the workforce, creation of knowledge, reduce costs and wastes, and increase profits. The results of previous research studies show that manufacturing techniques and technology improve operational efficiency. OD interventions and performance are interrelated (Bryne, 2001; Bryman, 2001; Brown, 2006; Brannen, 2005; Boyatzis, 1982; Bijleveld et al., 2009; Bernard & Philip, 2011; Bennis, 1969; Beer et al., 2023; Beer et al., 1984; Beer, 1980).

Results further projected the critical role of IT intervention in employee development. However, the association between IT and PP is not encouraging. Qualitative findings have positively clarified the quantitative results and stated that IT has a durable influence on efficiency and capability (Saeed et al., 2023; Sadiq & Governatori, 2015; Ryeowon et al., 2019; Richter et al., 2017; Rhoades & Eisenberger, 2002; Rawley & Lipson, 1985; Ranft Lord, 2002; Raia, 1972; Prajapat et al., 2023).

ERPs have huge acceptance in business transactions. ERPs enhance financial management (Calisir and Calisir, 2004). Operational technologies and IT have benefited organizations through enhanced productivity Dubey et al., 2017; Doval, 2020; Dess & Robinson, 1984; Dawadi et al., 2021; Dash, 2020; Cummings & Worley, 2009; Csiki et al., 2023). Loveman (1994), Lichtenberg (1995), and Dewan and Min (1997) have also investigated the relationship between IT and productivity and concluded that sometimes IT does not improve productivity. Results show that the association between IT and PP is not significant. Shin (2001) reported that IT tools improve profitability but IT concepts should be integrated with business strategy and be used with vertical disintegration and diversification.

The automation is a major technical intervention to promote productivity. Plant automation ensures process visibility and improves process control. Automation improves work behavior of employees at workplaces (Saunders et al., 2012; Santos & Brito, 2012; Saeed et al., 2023; Sadiq & Governatori, 2015). An efficient production system is crucial because it results in enhanced productivity. Manpower utilization and machine efficiency are the two positive aspects of any production system.

Manufacturing organizations are moving towards plant and industrial automation to improve the work attitude of employees and productivity at each level. Automation and productivity are two important variables in the literature and many research studies have recommended automation for productivity enhancement (Mara & Nicoleta, 2019; Manzoor et al., 2021; Malhotra et al., 2007).

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