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UNVEILING THE IMPACT OF IMPROVEMENT METHODOLOGIES ON EMPLOYEE ENGAGEMENT: INSIGHTS FROM CENTRAL EUROPEAN COMPANIES

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Abstract. Improvement methodologies (IMs) consist of many components; however, employee engagement (EE) is particularly important in bottom-up initiated process improvement. This study aims to investigate EE with reference to IMs used by companies. EE measurement constructs focused on process improvement has been developed and verified as reliable. This study examines a sample of 380 medium- and large-sized companies. The ANOVA procedure proves that: (1) IMs support EE in companies, and (2) the absence of IMs leads to lower EE. However, support for EE is specific and does not primarily concern issues directly related to process improvement. This study also discovers the multi-use of IMs by companies. IMs such as Lean, strongly focused on EE by their assumptions, only moderately support EE in companies. The study found no exceptionally effective IM which allows for the easy gain of EE in the investigated companies' current state of implementation. The results imply that companies are approximately halfway towards the effective use of IMs. They should rethink the use of IMs, transform their leadership style, and better motivate employees to engage in bottom-up process improvement, which is indispensable.

Keywords: employee engagement, process improvement, lean management, six sigma, TQM.

JEL Classification: M11, M14, D21, D22, D23.

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1. Introduction

In a globally competitive world, companies use many systems, concepts, and tools to operate better, improve processes, and achieve numerous advantages. Employee engagement (EE) plays a special role in operational improvement; many companies desire and strive to achieve it. For example, at Kia Motors (Tomlinson, 2010), special programmes are devoted to EE. They consider three components of EE: beliefs (mental), feelings generated by the brand (emotional), and discretionary effort (behaviour). However, human resources (HR) literature widely discusses a three-component model of employee commitment. This model consists of: (1) affective commitment, which is the emotional attachment to a company; (2) continuance commitment, which is attachment based on the values associated with work (e.g. pension); and (3) normative commitment, which is based on the motivation to meet social norms in the organisation (Meyer & Allen, 1997). When examining EE in comparison to employee commitment, commitment is perceived as an employee's positive emotional attachment to the

organisation, while EE represents the intersection of maximum employee contribution to the company and maximum employee satisfaction, which is a sustainable level of performance that benefits both parties (Lauby, 2018). EE has a wider meaning than commitment and is more related to organisational development.

Lean Manufacturing/Management, Six Sigma, and other improvement methodologies (IM) continue to reflect a strong desire for effective implementation in companies. Studies report a very high rate of failure in Lean implementation (Bhasin, 2012); failures lead to high costs and result in discouragement and even resistance (Sreedharan et al., 2020), which reinforces the opposition to process improvement. The impact of IM failure on employees can be harmful to their confidence at work (Mostafa et al., 2013). Additionally, problems with Lean actions can lead to the termination of Lean projects at companies (Scherrer-Rathje et al., 2009). As Connor and Cormican (2022) state, the implementation of Lean methodology is extremely challenging and requires a comprehensive cultural shift at all levels of the organisation, similar to other IMs. Cadden et al. (2020) prove that especially the softer dimensions of organisational culture, i.e., employee orientation and open communication, are positively associated with internal Lean integration.

A persistent search for IM implementation success factors and favourable circumstances is indispensable. EE is essentially at the heart of all IMs, and is an interesting business field, academic interest, and investigation (Kossyva et al., 2022). Successful Lean implementation requires high commitment and engagement from frontline employees (Angelis et al., 2011; Gatchalian, 1997; Knapić et al., 2022). Authors emphasise that genuine, continuous improvement can be achieved only through EE because employees are directly responsible for process improvements, establishment, performance, and maintenance (De Menezes et al., 2010). A long-term increase in EE level at workplaces by supporting bottom-up innovation requires consistency, and a lack of EE may be a barrier to company development (Skowron-Mielnik, 2014). Hines (2022) argues that human factors (including EE), which are exceptionally important for Lean management and other IMs, are poorly investigated in the literature. Additionally, Benkarim and Imbeau (2022) state that EE and HR management practices pertaining to Lean practices are still insufficiently explored in the literature. Jack Welch, a popular consultant and manager, believes that EE level is the most important measure for any company (Welch & Welch, 2006).

EE is a key issue in management, and research on IMs is important, particularly because it is a basic condition for IM effectiveness. This study aims to determine whether IMs used by companies support EE in process improvement in a bottom-up model. For this purpose, EE will be conceptualised along with the development of a measurement tool considering process improvement elements. The literature on IMs is also reviewed, with a focus on process continuous improvements. In the deliberations below, the primary focus is on Lean and similar approaches, as these methodologies have made the greatest contribution to current process improvement methodologies. The research aim is executed through an empirical investigation and statistical analysis.

2. The human factor in IMs

Human factors, including employees' role in IM adoption, have become an increasingly important topic in recent studies (Bagherzadeh et al., 2016; Magnani et al., 2019). The Lean concept is evolving in companies, and more attention is being paid to the so-called Lean philosophy, which emphasises employee initiatives in the organisation as the only road that leads to perfection (Hines et al., 2004; Koenigsaecker, 2005). Respect for employees is an ever-louder call for companies to move forward, away from tools and techniques, and towards real lean adoption (Emiliani & Stec, 2005; Hines, 2022; Liker & Meier, 2007).

The literature often adopts a leadership perspective on continuous improvement. Based on a comprehensive literature review, Alnadi and McLaughlin (2021) identified several leadership practices crucial for Lean Six Sigma success. A few of them are: (1) employee motivation, (2) employee empowerment, (3) coaching and developing employees, and (4) a culture of improvement; all factors are strongly interconnected and believed to greatly enhance EE. Connor and Cormican (2022) argue that apart from leaders' commitment and support, having the appropriate infrastructure, EE, and fostering a supportive organisational culture are significant Lean success factors. It is likely that other IMs originating from Lean Management and TQM success factors are either the same or highly similar.

Strengthening the process improvement culture is a frequently raised issue in IM practice (Antony & Banuelas, 2002; Bortolotti et al., 2015; Zu et al., 2010). Improvement culture has its origins in Lean and TQM methodologies (Gatchalian, 1997; Sing Kwong Lam, 1997), stimulating and challenging employees towards positive changes in processes (Alnadi & McLaughlin, 2021). Empowerment within a company involves transferring more decisions and responsibilities to line employees. According to Connor and Cormican (2022), this is a crucial tenet in Lean implementation that shifts problem-solving and decision-making from supervisors and quality departments to individual workers and teams. The literature suggests that empowerment significantly enhances EE and employee commitment, and decreases their intention to switch to another employer (Aij & Teunissen, 2017). However, one of the crucial issues in empowering people involves direct process executors making faster and better decisions (Poksinska et al., 2013).

Programmes for IM adoption and development should first focus on employee motivation. Employees provide ideas for improvement and actively participate in process enhancements; thus, employee motivation is accomplished through recognition and rewards (Poksinska et al., 2013). A manager's clear vision of development is also an important component of motivation (Toledo et al., 2019). Coaching and other types of employee development in IMs aim to transfer practical knowledge of processes and improvement methods to employees so that they are ready to effectively undertake Kaizen actions (Jadhav et al., 2014). Authors have demonstrated a positive relationship between employee involvement in Lean Management and some operational indicators, such as reduced set up times and quality improvement (Fullerton et al., 2014).

It may be assumed that EE is a critical issue and even an effective condition in any continuous improvement system, such as TQM, Lean Management, and Six Sigma (Brajer-Marczak, 2014; Dombrowski & Mielke, 2013; Gattiker & Carter, 2010; Hines, 2022; Jackson, 2004; Jekiel,

2011; Knol et al., 2022; Liker & Meier, 2007), and is a success factor for their adoption within organisations (Losonci et al., 2011); additionally, a lack of EE has been concluded to be the cause of the failure of IM implementation programmes (Secchi & Camuffo, 2019). However, this is symptomatic that all drivers related to human factors are deeply rooted in the Toyota Production System approach (Alnadi & McLaughlin, 2021; Liker & Meier, 2007), which is widely perceived as a generic Lean approach (Womack et. al, 1991).

3. EE conditions

Authors claim that work engagement is a complex concept consisting of components such as a positive work attitude, a state of mind characterised by vigour and dedication, and other similar factors (Schaufeli et al., 2002). Kossyva et al. (2022) underline that EE is not only associated with employee satisfaction or motivation, but goes even further, i.e., an employee's emotional commitment to their job, which brings extraordinary outcome-oriented results. Building EE is key for many industries; companies even build dedicated strategies to achieve and elevate EE. Carmaker Kia Motors set a strategy towards engagement comprising: (1) leadership development, (2) employee recognition using rewards and awards, (3) internal communication, (4) organisational development related to the enhancement of organisational culture, and (5) employee development (Tomlinson, 2010). Lam et al. (2015) indicate several EE influence tactics that contribute to continuous improvement initiatives. The most important influencing factors are collaboration, consultation, ingratiation, inspirational appeals, and rational persuasion.

HR is a separate area in EE studies. Some studies suggest that the antecedents of EE originate from two levels: individual and organisational. Organisational antecedents include job design, job features, performance agreement, job identification, construed external organisational support, organisational integrity, interpersonal interactions, and organisational image (Kossyva et al., 2022). The list of organisational antecedents is longer; nevertheless, this shows the complexity of the factors that influence EE in an organisation. Other authors (Kupczyk & Pietrakowski, 2018) have highlighted a variety of organisational factors associated with EE, including, the level of care demonstrated by managers towards employees, appreciation of employees' work performance, clarity of employer expectations, and opportunities for employees to express their opinions and participate in decision-making.

At the individual level, there are other antecedents, such as trust in senior management, enthusiasm for development, perceived learning climate, perceived stress, and even the perception of setbacks (Kossyva et al., 2022). Another study by Espírito Santo and Cardoso (2017) identified workers' well-being and work-life balance as key antecedents of EE. The literature provides several EE models (Davis & Van der Heijden, 2022; Sambrook, 2021; Wildermuth, 2010), which are mostly deeply rooted in HR management perspectives; thus, psychological variables are strongly emphasised.

Benkarim and Imbeau (2022) studied the employees of a Canadian aerospace company with reference to EE in a Lean programme practised at this company. They discovered several EE conditions, the first of which was that interviewees 'agreed that job security is paramount to their commitment to the continuous improvement process' (Benkarim & Imbeau, 2022, p. 6). Other conditions included appropriate communication regarding initiatives and processes,

fair treatment by managers, supervisor support, training, occupational health and safety, and respect towards employees. Studies argue that EE is affected by numerous factors, including macro-external factors (such as political, economic, social, technological, environmental, and legal), and micro-factors (such as competitors, suppliers, and customers). These factors affect the internal context and enable or limit the opportunity for managers to target possible EE (Davis & Van der Heijden, 2022).

EE is conceptualised and measured in several ways; for example, the Utrecht Work Engagement Scale proposed by Schaufeli et al. (2006) covers employee vigour during work hours and considers that EE is perceived as the opposite of burnout (Cole et al., 2012; Vance, 2006). Another frequently used measurement tool is the 18-item Job Engagement Scale developed by Rich et al. (2010); its variables consist of emotional, cognitive, behavioural, and physical factors. From a practical managerial viewpoint, the most widespread tool is the Gallup Institute (Q12), which comprises 12 questions in simplified form. In the Q12 tool, there are items that refer to attitudes and behaviours at work, such as whether one does their best at work, whether work is perceived as important, and whether one has learned something at work (Buckingham & Coffman, 1999).

The current literature does not offer any widely accepted scale for investigating EE in organisational improvement initiatives in a bottom-up model, as may be expected from widespread IMs among companies. Q12 (Buckingham & Coffman, 1999) is an excellent starting point when preparing a battery of questions for empirical investigation owing to its practical orientation and wide validation in business; however, the manifestations of EE, which would appear when employees are engaged in continuous improvement, typically in Lean Management, TQM, and other IMs, should also be taken into consideration when developing items for EE assessment.

As argued before, EE is a field of special importance. In organisational improvement, EE is an enabling factor; thus, further research on EE is crucial. Authors (Connor & Cormican, 2022) suggest that there is a latent gap in EE in improvement initiatives. Therefore, this study puts forward the following hypotheses: *#H1*: *The use of IMs in companies significantly enhances EE in process improvement*; *#H2*: *The absence of IMs in companies results in a lower level of EE*. These hypotheses will be verified through survey research on a sample of larger companies, as indicated in the methodology section below.

4. Methodology

This study focuses on medium- and large-sized companies with staff headcounts of over 50 employees (UE's SME definition, European Commission, 2003). Smaller companies use IMs less frequently and are less versed in IMs; therefore, they are not included in this study. The study was conducted in Poland, one of the largest Central European (CE) economies. The CE macro region is considered having specific characteristics in many economic variables (Szczepańska-Woszczyna et al., 2022). The general pool encompasses 31,500 entities, according to the National Statistics Bureau of Poland. A minimum representative sample of 380 companies were selected. Surveys were conducted using the Computer Assisted Personal Interviewing (CAPI) methodology at the end of 2022. The company respondents were top managers, namely, COOs, CEOs, or other board members responsible for operations.

The EE measurement tool was prepared based on the IM literature reviewed above, particularly Lean and Quality Management studies, Q12 items (Buckingham & Coffman, 1999) and its overall approach were taken into consideration as particular inspiration. Referring to Q12 tool, the perspective of questions was changed as managers, not employees, were interviewed. Developed measurement tool includes process improvement behaviours, such as identification with a company's development vision and employee loyalty. The battery of questions is presented in Table 1. The seven-points Likert scale was used as offering wide scope of choices, the scale is the continuum between disagree and agree. The Cronbach's alpha is 0.94, proving a good level of reliability for this construct, as shown in Table 1 below.

Table 1. EE construct

No.	Items	Reliability
EE1	Our employees are committed to their work	No. of items: 12 Variance: 186.30576309 Standard deviation: 13.649386913 Cronbach's alpha: 0.939361770
EE2	The quality of production and/or services are important to our employees	
EE3	Employees often submit ideas related to improvements in their workplace	
EE4	Employees willingly stay after working hours if required to do so by the company	
EE5	Employees feel that their job provides them the opportunity to do what they could do best	
EE6	Employees always know what to do and when to do it	
EE7	Employees like their job	
EE8	Employees have close friends at work	
EE9	Employees speak well about their job and their company	
EE10	Employees feel proud of their work and their company	
EE11	Employees are not actively looking for other job offers	
EE12	Employees identify with the company's goals and values	

The interviewed managers were presented with several IMs and asked whether they implement these methodologies in their companies. These include TQM (TQM), systems according to ISO 9001 and related standards (ISO 9000), Lean Manufacturing/Management (LM), Six Sigma (SS), Lean Six Sigma (LSS), Business Process Management (BPM), EFQM model (EFQM), Theory of Constraints (TC), Agility Management (AM), and their own corporate model of excellence (CM). Respondents were allowed to indicate any number of IMs as these methodologies can coexist in organisations. These IMs are considered the most process improvement-oriented. The option of 'No IM implemented in the company' (NIM) was also provided. Analysis of Variance (ANOVA) was employed to determine whether there are significant differences in EE levels between groups of companies that use and do not use specific IMs. Levene's F-Test for Equality of Variances is the most commonly used statistic in ANOVA (Hinkle et al., 2003).

5. Engagement into process improvement

Managers' opinions regarding EE level in the investigated companies are presented in Table 2, where basic statistics are presented for each EE item. Generally, according to the respondents, EE in their companies is quite high; the average of all 12 items is 5.03 on a 7-point scale. The highest rated was EE2 (av. 5.44), indicating that quality is of highest importance for employees. The next two most highly rated EE components were EE1 (av. 5.42) and EE6 (av. 5.26), which relate to employee work commitment and clarity in what needs to be done and when to do it in the workplace, respectively. These three items contain basic aspects of everyday work: devotion to process quality, and well-performed and coordinated duties, tasks, and responsibilities of employees. Thus, from this perspective, the highly rated items refer to basic primary work duties, which are also EE components.

Table 2. EE item statistics

Items	N	Average	Variance	Standard Deviation
EE1	380	5.423684	1.817380	1.348102
EE2	380	5.442105	1.877906	1.370367
EE3	380	5.031579	2.067602	1.437916
EE4	380	4.594737	2.880183	1.697110
EE5	380	4.926316	2.105374	1.450991
EE6	380	5.255263	2.079788	1.442147
EE7	380	5.057895	1.854159	1.361675
EE8	380	5.102632	2.155666	1.468219
EE9	380	5.021053	2.025941	1.423355
EE10	380	4.881579	2.321032	1.523493
EE11	380	4.652632	2.528093	1.589998
EE12	380	4.973684	2.168171	1.472471

Item EE4 was the lowest rated, with an average of 4.59 out of 7. This item refers to the willingness to work longer hours if required by the company. This is likely the greatest issue across all 12 items, possibly because it involves discussions about employer abuse and debates relating to work-life balance. It must be highlighted that this requirement to work longer hours should not eventually become a common work practice; this item (EE4) refers to an employee's willingness to work longer hours in special circumstances which could occur in a company. The next lowest-rated item was EE11 (av. 4.65), which refers to not actively seeking another job. To a certain extent, this item is influenced by job market conditions. This involves factors such as, inter alia, salaries, and whether the studied country is developing. According to Eurostat, Poland's average salary in 2022 was only 55% of the average among European Union member countries. When earnings are low, their importance increases for employees, becoming an external barrier to EE in companies. Gathered data allowed identification of company's industries in a general division, i.e. manufacturing, customer services, B2B services, no significant differences between activity sectors were found in terms of EE level.

The declarations by companies using particular IMs is exploited using the ANOVA procedure. The larger the F-ratio, the greater the difference between variances, indicating that the independent variable has a significant effect on the dependent variable (Hinkle et al., 2003). In Table 3, only significant ANOVA outputs are presented with reference to companies' use of particular IMs. Figure 1 illustrates the chart of a significant pair of variables with the highest F-statistic, for the visual authentication of differences and their direction.

Table 3. ANOVA output for IMs

Items	MS	F	p
ISO 9000			
EE5	2.071714	7.157877	0.007788
EE12	2.144070	5.260179	0.022367
LM			
EE10	2.299903	4.481831	0.034910
SS			
EE5	2.082223	5.21396	0.022960
EE9	1.985001	8.81681	0.003175
EE10	2.276513	8.41163	0.003946
EE11	2.459802	11.52213	0.000761
BPM			
EE3	2.048164	4.596898	0.032667
EE5	2.087555	4.235073	0.040282
EFQM			
EE5	2.085282	4.651851	0.031650
EE10	2.285400	6.909061	0.008926
TC			
EE1	1.780183	8.91908	0.003006
EE4	2.766919	16.51444	0.000059
EE5	2.088433	4.07444	0.044242
EE6	2.059539	4.72613	0.030327
EE7	1.826867	6.66210	0.010225
EE9	1.971057	11.55327	0.000748
EE10	2.247831	13.34211	0.000296
EE11	2.438131	14.98429	0.000128
EE12	2.134805	6.92356	0.008855
CM			
EE2	1.848073	7.118166	0.007959

As the ANOVA output shows, there are several significant differences between the groups of companies using particular IMs and those that do not. The value of the F-statistic is much higher than one. It is clear, as presented in the example in Figure 1, that when IMs are implemented, EE is at a higher level. Among the ten IMs considered in this study, seven were found to have significant differences in the variances of some EE variables, which is generally a positive observation, providing proof of the positive role of IMs in the efforts towards EE in process improvement. Of the 12 EE items, 11 appeared to have a significant difference with at least one IM (Table 3). However, the influence of each IM is not equal; TC seems to be the most influential IM, as it exhibits significant differences in nine of the EE items. Altogether, based on the ANOVA results #H1 can be considered as positively verified. In the research sample of medium and large enterprises, IMs demonstrably support EE in process improvement; however, the supportive roles of each IM are not equal.

Table 4 presents the ANOVA output of the EE items with the independent variable NIM, i.e., not implementing any IMs. As many as 9 out of 12 EE variables were found to have significant differences, where managers declared that they do not use IMs. The direction of the differences is negative, as shown in the example of a pair in Figure 2. The values of the F-statistics are also reasonably high, ranging from 13.44 to 3.95. Given the relatively numerous significant ANOVAs, #H2 is also positively verified. Moreover, companies that do not implement IMs experience lower EE levels. The positive role of IMs in EE for process improvement has been empirically proven; however, many peculiarities and fields of doubt are clarified in the discussion section.

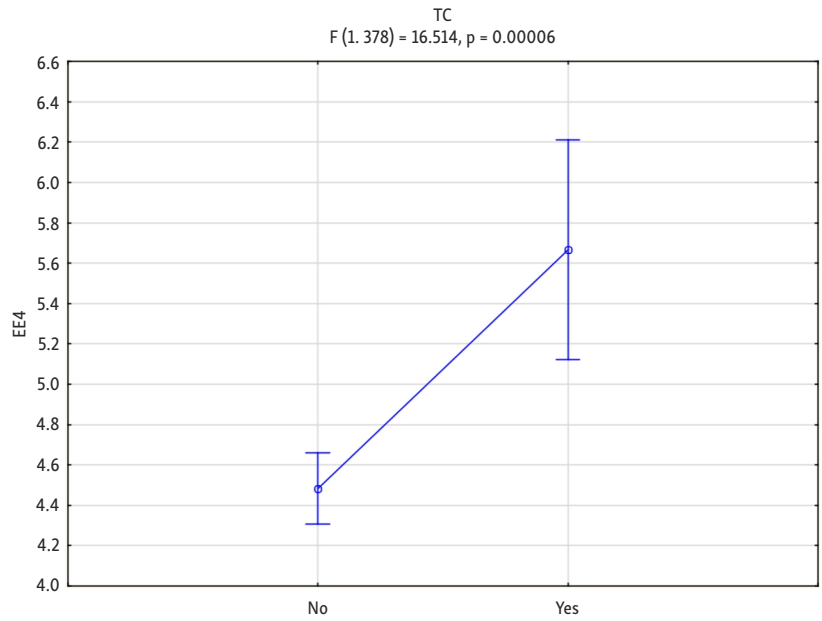

Figure 1. Distribution of EE4 in the case of TC use

Table 4. ANOVA output for NIM

Items	MS	F	p
NIM			
EE2	1.863379	3.95474	0.047460
EE4	2.788640	13.44147	0.000281
EE5	2.076664	6.23971	0.012916
EE6	2.046981	7.07415	0.008153
EE7	1.831654	5.65664	0.017886
EE9	1.998909	6.12537	0.013763
EE10	2.272654	9.06781	0.002776
EE11	2.468653	10.12559	0.001583
EE12	2.099986	13.30595	0.000302

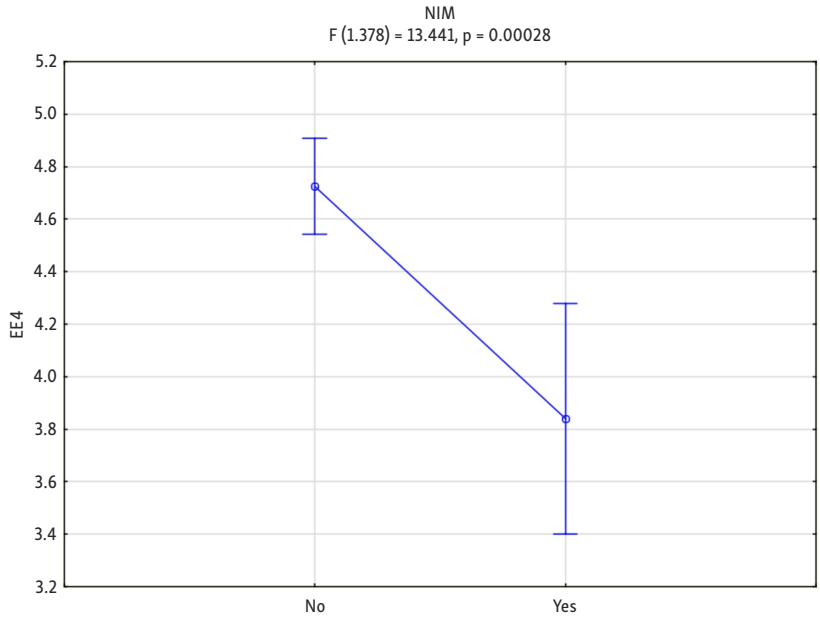

Figure 2. Distribution of EE4 in the case of NIM

6. Discussion

First, according to the analysis of variances, the significant differences in EE levels between using and not using particular IMs are differentiated. Several elements of EE are particularly important because of the influence of IMs. Table 5 presents the significant differences in variance identified using the ANOVA. For item EE8 no significant differences were observed. This item pertains to the presence of close friendships at work and is possibly weakly supported by IMs. The occurrence of this engagement component is rarely mentioned in the IM literature, and is slightly more prevalent in the HR literature in a broader context, without specific focus on process improvement.

Table 5. Number of significant differences in variances of EE

Items	ISO 9000	LM	SS	BPM	EFQM	TC	CM	Sum
EE1						x		1
EE2							x	1
EE3				x				1
EE4						x		1
EE5	x		x	x	x	x		5
EE6						x		1
EE7						x		1
EE9			x			x		2
EE10		x	x		x	x		4
EE11			x			x		2
EE12	x					x		2
Sum	2	1	4	2	2	9	1	

Item EE5 appeared in five pairs of variables, while item EE10 appeared in four pairs. The first item indicates that employees within a company are in roles where they perform at their best. Having the right people in the right roles during the process is crucial for achieving high productivity. This is beneficial for employees because they can gain satisfaction from their jobs while enhancing processes because they are performed well. Another item (EE10) concerned employees' pride in their work and the company. People can be proud of their jobs and employers if they do something valuable, are treated well at work, and the company itself is respected in society. Both items most frequently related to IMs EE are closely related to work satisfaction and Lean philosophy mentioned in the Lean literature (Hines et al., 2004; Koenigsaecker, 2005; Liker & Meier, 2007). Supposedly, for an employee, being proud of the job performed and believing they are in the appropriate role forms a foreground for long-term and successful process improvement in the bottom-up model, which is inspired and led by line employees.

Three more EE items in the ANOVA showed a significant output that appeared more than once. Items EE9 and EE11, which appeared twice with significant differences, are closely related to employee loyalty; EE9 relates to employees speaking well of their job and the company, and EE11 refers to not actively seeking another job. Both suggest that in companies using IMs, employees feel content and secure enough to be loyal, speak positively about the company, and are not searching for another job. E12 (which also appeared twice) concerns employee identification with a company's goals and values. Particularly, the latter is important for continuous improvement, as it is considered in most IMs, where the vision of organisational change is crucial (Hines et al., 2004; Womack et al., 1991). However, it is symptomatic that items EE2 and EE3 directly consider process quality, and submitting ideas for improvements appeared only once with significant differences. Both are fundamental elements of process continuous improvement. As expected, they would be strongly associated with IMs; however, the ANOVA showed that they are not strongly associated.

Another important issue is why some IMs strongly support EE, whereas others were not proven to have such an impact. TQM, LSS, and AM do not show any significant differences across the EE items (Table 5), which is peculiar because TQM and LSS are fundamentally based on employee-led process improvement, along with EE and employee initiatives (Sing Kwong Lam, 1997; Gatchalian, 1997; Sreedharan et al., 2020). In contrast, TC showed significant differences nine times (Table 5). TC, in its main literature conceptualisations, focuses on throughput maximisation through the systematic elimination of internal and external constraints (Cox & Spencer, 1998; Goldratt, 1990). From its primary perspective, TC is neither particularly focused on EE nor on the process of continuous improvement; this finding is peculiar. Additionally, another frequent IM which has four significant relationships with the EE items is SS. In its generic approach, SS does not place strong emphasis on EE (Breyfogle et al., 2001).

New insights into the impact of IMs on EE may lead to mutual use of particular IMs by companies. Table 6 presents how frequently IMs are used, and the number of companies that use one IM that also stated to use another one. The data also show the percentage of companies that use a particular IM and simultaneously use another – the percentage values are in the rows underneath the count values. As the data show, some IMs are more likely to be shared with others, whereas others are less likely.

Table 6. Use of IMs by the investigated companies

	TQM: yes	ISO9000: yes	LM: yes	SS: yes	LSS: yes	BPM: yes	EFQM: yes	TC: yes	AM: yes	CM: yes
TQM: yes	**18**	8	7	9	1	1	4	2	3	6
	100%	44%	39%	50%	6%	6%	22%	11%	17%	33%
ISO9000: yes	8	**114**	29	23	17	26	12	9	17	33
	7%	100%	25%	20%	15%	23%	11%	8%	15%	29%
LM: yes	7	29	**72**	17	16	16	5	12	19	18
	10%	40%	100%	24%	22%	22%	7%	17%	26%	25%
SS: yes	9	23	17	**60**	15	12	14	9	14	12
	15%	38%	28%	100%	25%	20%	23%	15%	23%	20%
LSS: yes	1	17	16	15	**50**	11	3	11	18	13
	2%	34%	32%	30%	100%	22%	6%	22%	36%	26%
BPM: yes	1	26	16	12	11	**51**	5	10	11	17
	2%	51%	31%	24%	22%	100%	10%	20%	22%	33%
EFQM: yes	4	12	5	14	3	5	**24**	4	7	6
	17%	50%	21%	58%	13%	21%	100%	17%	29%	25%
TC: yes	2	9	12	9	11	10	4	**36**	12	13
	6%	25%	33%	25%	31%	28%	11%	100%	33%	36%
AM: yes	3	17	19	14	18	11	7	12	**58**	41
	5%	29%	33%	24%	31%	19%	12%	21%	100%	71%
CM: yes	6	33	18	12	13	17	6	13	41	**140**
	4%	24%	13%	9%	9%	12%	4%	9%	29%	100%

The most frequently practiced IM among the investigated companies is CM, with 140 respondents declaring to have proprietary and original organisational approaches to process improvement. Observing the percentages, CM is not often used with other IMs, except AM, and 71% of companies declaring using AM also implement CM. The data show that ISO 9000 is the second most used IM and is most frequently used alongside other IMs. The ISO systems family is highly formalised, typically confirmed by a certificate, and treated as the minimum approach to quality management (Tarí et al., 2012). Its wide co-use has been fostered by its adoption as formalised proof that an organisation is on the path towards quality excellence and has met the minimum requirements.

According to the literature and global companies, LM is typically focused on process continuous improvement; it is often declared as used along with other IMs. However, the focus needs to be on TC as the most impactful IM in terms of its influence on EE. It should be noted that TC is not widely used, 36 respondents declared that they use it. As seen in Table 6, companies that declared the use of TC also declared the use of LM (33%) and LSS (31%), which are high percentages. These data can be interpreted as suggesting that TC, at least to some extent, is impactful because its use goes hand-in-hand with the use of other IMs, which are strongly focused on EE.

To understand the impact of TC on companies' EE more accurately, the perception of TC in the investigated business ecosystem must be considered. TC has become popular in Poland in recent years, mostly because of its glamour of perceived simplicity, its focus on critical issues (constraints), and on revenue maximisation. TC is not a complicated, practical, or handy methodology, which is why many fast-growing and well-developing companies have begun using it. The gathered data, along with the knowledge of the investigated companies' ecosystems, allow for the statement that the co-use of some IMs under the umbrella of an IM, such as TC, is the most influential approach to achieve high EE in process improvement at this moment.

Achieving long-term effects of process improvement require a high level of EE, as demonstrated in the literature section. The structure of the significant differences in EE in companies that practise particular IMs indicates some shortcomings in the implementation and exploitation of IMs when referring to EE and people empowerment. According to the data (Table 5), the LM approach implementation creates a significant difference in only one EE item, which concerns employee pride at work, while the LSS and TQM approaches make no significant differences in EE variances; additionally, TQM is rarely practised by the investigated companies. As these IMs strongly focus on EE, the question arises as to why this happens.

If these IMs individually have a minor impact on EE, the study's findings can be understood by what is mentioned in some studies: there is a poor understanding of the Lean philosophy (and other IMs' philosophies), along with a weak awareness of the potential benefits of continuous improvement (Connor & Cormican, 2022; Psychogios et al., 2012). Additionally, the implementation of IMs is often superficial, poorly executed, and not strategically oriented (Bhasin, 2012; Fullerton et al., 2014). If methodologies such as LM, TQM, and LSS are not based on superior EE in bottom-up process improvement, they cannot be considered as functioning effectively. This is consistent with the observed weak support for the selected EE items that are fundamental for process continuous improvement, EE2 and EE3, which concern process quality and the submission of improvement ideas by employees.

The general view is that companies that use many IMs also offer a potentially good working environment for their employees, so that they are more engaged; however, this is not the primary engagement in process improvement. This is also in line with the most influential IM, which mentions little or even nothing about process improvement in the continuous formula – TC. The use of many IMs by companies is likely motivated by the search for a highly effective methodology that produces high process productivity. However, without the widespread EE in process change initiatives, this high productivity would be impossible, as evidenced by the Toyota Production System (Alnadi & McLaughlin, 2021; Liker & Meier, 2007). EE appears to be a fundamental symptom of the effective use of IM in companies. In summary, if there is low EE in process improvement, IM(s) are ineffective; therefore, it is necessary to enhance them, to avoid wasting company money and effort.

Undoubtedly, this is a significant challenge for companies in the studied business ecosystems. It involves renewing the understanding of commonly known IMs in a novel way, taking into consideration the hitherto established management styles and organisational cultures, and seeking the most convenient transformation path towards an approach that is bottom-up-initiated, engages employees widely, and modifies processes. Shifts in leadership styles, as considered in the literature, are a key component of several IMs and, simultaneously, are challenging (Emiliani & Stec, 2005; Kaziliūnas, 2008). A special role of organizational culture in a context of business performance and competitive advantage is underlined by hitherto literature (Lorincová et al., 2022; Rocha et al., 2022). It should be emphasised that only significant positive changes in a company's processes can produce high productivity and provide competitive effects to companies. This does not exclude the exploitation of other competitiveness sources that the examined companies may currently be relying on. These challenges are typical across the entire macro region of CE, where observed variables, management styles, and fundamental managerial assumptions are similar; this is partly owing to the shared legacy of being part of post-transition economic systems.

This study adds another voice to important discussions initiated by certain scholars (e.g., Emiliani & Stec, 2005) and continued effectively by others (e.g., Hines, 2022; Connor & Cormican, 2022). These discussions revolve around the shortcomings and conditions of using Lean Management and other IMs in companies, the missing links and fields of ignorance in IMs, and the misunderstanding of IMs' practical exploitation by business ecosystems. Although it is devoted to EE, it highlights the real shortcomings and limitations of the practical use of IM by companies in the business ecosystems of CE countries. The special management context and approaches in CE business ecosystems are also underlined by the literature in different organizational spheres (Ionescu et al., 2022; Jagódka & Snarska, 2023). However, EE is of fundamental importance globally, as is the effective use of IMs. Thus, the discoveries and stated implications may bring inspiration and insights to all researchers and consultants.

7. Conclusions

According to this study, which is based on a large sample of companies from one of the largest CE economies, IMs affect the EE of companies. Simultaneously, the study demonstrated that not implementing any IMs is associated with a significantly lower EE level. This proves

the positive general influence of IMs on this crucial aspect of organisational development. Both hypotheses #H1 and #H2 were positively verified. However, the results suggest that companies in CE are approximately halfway towards the effective use of IMs. The impact of IMs covers practically all aspects of EE, however EE5 (Employees feel that their job gives them the opportunity to do what they could do best) and EE10 (Employees feel proud of their work and their company) are supported the most. At the same time, EE components directly indicated bottom-up process improvement, such as focusing on process quality (EE2) and the submission of improvement ideas (EE3) are not supported much. Thus, despite the positive influence of IMs on EE, the EE in companies that practise IMs does not primarily focus on continuous improvement.

The investigated companies are characterised by intensive multiuse of IMs. In fact, IMs have much in common; thus, this study suggests that companies believe in the power of IMs within their formal and superficial frameworks. Nevertheless, they have not yet transformed their management systems and styles towards gaining wide bottom-up-initiated changes in these processes. The fact that TC, which is not particularly focused on EE, appears to have the greatest influence on EE, also supports this hypothesis. The results suggest that gaining EE is not easy, and there is no single 'golden' IM to do so.

Lean (LM) and other IMs are probably used by companies in a different way than they are intended, not with a primary goal of process continuous improvement. They are used as a management system in a general sense, as a collection of techniques, such as the imitation of world-class companies such as Toyota, but rarely with the intention of real bottom-up process improvement. There is a need for a (re)interpretation of IMs to CE business ecosystems management styles and fundamental business assumptions. Clear guidance is required on which components of IMs and in what manner they should be employed within companies, and ways to pivot leadership and motivation systems to foster employee engagement in process improvement.

Several further research issues have emerged in this study. The coexistence of IMs in a company appears to be an important issue that needs to be studied by scholars, apart what has already been investigated. An important question is how IMs coexist within companies in terms of their organisational structures. How are these methodologies combined in terms of management principles? Which methodologies are superior and which are the minor contributors to the improvement system existing in companies? Is there a reasonable mix of IM components? These questions and similarities are interesting for practical and consultation purposes. Particularly, what is the most effective mix of IMs components for achieving high EE for different company types? As mentioned above, an important issue is the path of transformation from an ongoing management style, leadership, and motivation towards these strongly supporting processes to improve EE. What are the facilitators and incentives which managers can effectively employ? Abbreviated issues are also interesting when considering selected business ecosystems, such as CE.

The limitations of this study mainly refer to the comprehensive penetration of a company's behaviour in striving for EE and its use of IMs. At consecutive stages of the research, various misinterpretations could have occurred by both the respondents and researcher. There are possible misunderstandings regarding the real intentions and mechanisms of the

managers interviewed. Further clarification of the issues under investigation and confirmation of the current interpretations would require a series of explorations using a qualitative methodology. The results obtained are important and new to the ongoing literature in that further in-depth research on companies is indispensable.

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