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Conditions for the intensity of Business Process Management usage

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Abstract

This paper reviews and assesses the factors that determine the intensity of Business Process Management (BPM) usage. The aim of the research is to identify which factors influence the degree of BPM implementation. The main hypothesis posited is that it is possible to identify the factors associated with higher BPM intensity. A survey was conducted with 746 respondents from around the world. The results from Spearman's rank correlation indicate a positive relationship between the intensity of BPM usage and the strategies implemented to enhance the maturity of operational processes, as well as a positive correlation between BPM intensity and Activity-Based Costing. The Chi-Square Test results show that the intensity of BPM usage varies across different sectors. The Utilities and Health Care sectors represent the largest share of firms engaged in BPM, while the Consumer Staples and Industrials sectors exhibit comparatively lower levels of BPM intensity. The results of Ordinal Logistic Regression indicate that company size and the level of technological sophistication in operational activities are strong positive drivers of BPM intensity. Additionally, participation in strategy formulation and implementation, along with decentralized decision-making have a moderate and positive impact on BPM usage. Conversely, organizational culture and company age are negatively associated with the likelihood of achieving higher BPM intensity. The main contribution of this study is the identification of specific, statistically significant drivers of BPM intensity. However, it is important to note that the research relies on self-reported data, which may be subject to biases or inaccuracies. Another limitation is that this study focused exclusively on respondents from 26 countries. In some of these countries, survey response rates are low.

Keywords: Business Process Management, resultant resource-based theory, contingency theory

JEL classification M11, M12, M40

1. Introduction

Business Process Management (BPM) is one of many Strategic Management Accounting (SMA) tools that support the implementation, execution, and analysis of business processes. BPM stages include process identification, process modeling, process analysis, process design, implementation, and process monitoring. BPM is therefore a specific information process focused on process improvement. The European Association of Business Process Management (EABPM) defines BPM as a systematic approach aimed at capturing, shaping, executing, documenting, measuring, monitoring, and managing both automated and non-automated processes to achieve coordinated and balanced enterprise goals (European…, 2009). A. Scheer et al. (2003) define BPM as the systematic analysis, improvement, and control of an organization's business processes in the context of achieving its business goals. Broadly speaking, analysis is treated as a field of knowledge and skills focused on an effective, continuous method of achieving business goals, requiring the integration of strategic activities across the entire organization (Association, 2019). From the definitions provided by various authors, it can be concluded that BPM should not be viewed solely through the lens of updating or improving process quality. Instead, BPM should be considered in conjunction with the achievement of organizational goals, particularly profit realization.

The development of BPM can be attributed to several factors: confirmation in numerous studies that process-oriented organizations achieved better financial results than non-process-oriented ones, and the emergence of new technologies, such as Enterprise Resource Planning Systems (ERP systems), which made it possible to optimize the use of information and its flow; these systems and easier access to information enabled improvements in ongoing processes. Additionally, Workflow Management Systems (WfMS), systems that facilitate the introduction of changes in business processes, direct work to selected individuals, and over time monitor and analyze business processes, along with Business Intelligence (BI)—the process of transforming data into information and information into knowledge used to increase a company’s competitiveness (Dumas et al., 2018).

The theoretical foundations of BPM development and the factors influencing the level of BPM implementation are based on two theories: the resource-based theory and the contingency theory. In the former, the effective use of resources is connected to process improvement. Contingency theory, on the other hand, explains organizational success in terms of contextual factors.

The resource-based view of the firm (RBV) and the resultant resource-based theory (RBT) introduces efficient resource configuration as a vital framework for explaining and predicting the basis of a firm’s competitive advantage and performance (Barney et al. 2011; Slotegraaf et al. 2003; Vorhies and Morgan 2005). Resources are broadly understood in this theory, and the most important thing is that competitors, even though they have the same resources, will not be able to achieve similar results. What is essential here is knowledge of how the collected resources are used, i.e., resource mobility. The concept of critical competencies emerged from the resource-based theory, advanced by Prahald and Hammel in 1990 [cited in Marcinkowska, 2017]. A core competence should be understood as a set of skills and resources, creating a competitive advantage.

RBT builds on previous research, particularly the work of Penrose (1959), whose research strongly emphasized the resource-based approach. For Penrose, the essence of the company is strongly related to the concept of resources because he defines it as "a collection of productive resources, where the administrative decision determines the choice of different uses of these resources over time" [Penrose, 1959, p. 21, cited in Kozlenkova et al., 2014]. Bocolo [2018] developed an eccentric model to explore the factors that influence environmental performance in a company based on the belief-action-outcome framework and natural resource-based view theory. Data were collected by employing online surveys from companies' respondents. Partial least squares-structural equation modeling and the Statistical Package for Social Sciences were used to analyze the data. The results show that the behavior of information technology (IT) professionals and IT executives additionally influences environmental performance. A paper by Esteve-Perez and Manez-Castillejo [2006] examined a company's determinants. Hazard models test several hypotheses mainly drawn from the Resource-Based Theory of the Company. According to the Resource-Based View, a company's ability to develop distinct capabilities enhances its ability to adapt to the changing competitive environment and improves its survival prospects. The results confirm that companies that develop company-specific assets throught advertising and R&D (independently of the technological intensity of the industry) enjoy better survival prospects. According to the resource-based theory, Gallego-Alvarez et al. analyzed the bidirectional relationship between corporate social responsibility (CSR) practices and innovation. The results shows show a negative bidirectional relationship between the two strategic decisions.

The contingency theory appeared in the 1960s in organizational sciences. In later years, it gained importance in other areas, including corporate financial reporting systems [e.g., Thomas 1991], management accounting [Hayes 1978, Otley 1980, Otley 2016], or corporate planning [Brock 1995, Grinyer et al. 1986]. In general, two essential findings within the convergence theory can be cited:

- effectiveness of leadership style has been shown to depend upon certain variables in the leadership situation. "Contingency theory of Performance Management is based on the argument that there is no universally appropriate Performance Management system that applies equally to all organizations in all conditions, but particular features of the system and its effectiveness will depend on specific organizational and contextual factors" [Wadongo & Abdel-Kader 2014, p. 685].
- In organizational structure, some studies indicate that the pattern must fit the environment to maximize performance. Although the organizational structure has been related to company effectiveness [Kushner & Poole, 1996] as well as organizational decline [Galaskiewicz & Bielefeld, 1998, cited in Wadongo & Abdel-Kader 2014, p. 686], there seems to be a lack of evidence on the impact of fit between company structures, strategy, and Performance Management on the company effectiveness in a systems approach [Wadongo & Abdel-Kader 2014, p. 686].

Organizational theory researchers have long maintained that a company's interaction with its environment is essential to its performance (Perrow, 1967; Thompson, 1967). Therefore, it is essential to examine the external factors that influence the level of BPM implementation. Equally significant are internal organizational factors that impact the extent of BPM implementation. Other internal situational variables often include company

size, organizational structure, culture, and leadership, among others (Wadongo & Abdel-Kader, 2014, p. 686). Contingency theory has conducted many studies related to the application of various management accounting methods. Examples include Neralla (2020) and Ussahawanitchakit (2017). Dumas et al. (2018) identified six orthogonal factors critical for successful BPM implementation: strategic harmonization, process governance, methods, IT, people, and culture. Rosemann and de Bruin compiled these key success factors into a BPM maturity model (Dumas et al., 2018).

Building on existing research and the analyzed factors influencing the intensity of BPM usage, the authors identified the most significant factors affecting the intensity of BPM use.

2. Materials and methods

This research aims to determine the factors that influence the intensity of BPM use. The following central hypothesis was adopted: It is possible to identify factors that increase the likelihood of BPM occurring. This hypothesis is to be supported by confirming the following specific hypotheses:

H1. There is an association between the GICS sector and the intensity of BPM use.
H2. Organizations that utilize BPM more intensively also tend to utilize activity-based costing (ABC) (indicating a complementary relationship).
H3. There is a relationship between the intensity of BPM use and the adopted strategy, which supports the development of operational processes and improves their level of maturity.
H4. Contingencies impact the dependent variable intensity of BPM use.
H5. Strong explanatory variables for the intensity of BPM use include, above all, company size and the technological advancement of the business.

The following general scientific and applied research methods were used in the research process: analysis and synthesis, deduction and induction, systematization and generalization, and abstract–logical methods.

The empirical research was conducted through a survey study. The analysis employed Python and its associated libraries, including pandas, seaborn, and statsmodels. Spearman's rank correlation was used to analyze the relationship between the intensity of BPM usage and the strategies implemented to enhance the maturity level of operational processes, as well as the intensity of BPM and Activity-Based Costing. Additionally, a Chi-Square Test was conducted to examine the intensity of BPM usage across different sectors. Furthermore, an Ordinal Logistic Regression model was built to evaluate the impact of contingencies on the intensity of BPM usage.

Data collection occurred in December 2024 via a web-based survey targeting company owners, business executive officers, (CEO, CFO), managers, Finance/Accounting directors and specialists in accounting and finance, and other professionals involved in strategic decision-making processes, including financial analysis and impact assessment. The survey was disseminated to 18,035 companies, yielding 746 responses, which reflects a response rate of 4.1%. The participating companies operated across 26 different countries (Table 1).

Table 1: Geographic origin of respondents

Country	Number of respondents	Country	Number of respondents
Poland	330	South Africa	11
USA	95	Indonesia	10
Germany	54	Slovakia	9
Canada	39	Austria	8
France	34	Belgium	5
India	27	Portugal	4
Thailand	24	Finland	4
Spain	14	Hungary	4
Czech Republic	14	Cyprus	3
Sweden	14	Greece	2
Denmark	14	Luxembourg	1
Italy	13	Malta	1
Netherlands	11	Croatia	1

Source: own study

The companies conducted operational activities in different sectors. Figure 1 presents the distribution of companies across the 11 GICS sectors in the sample.

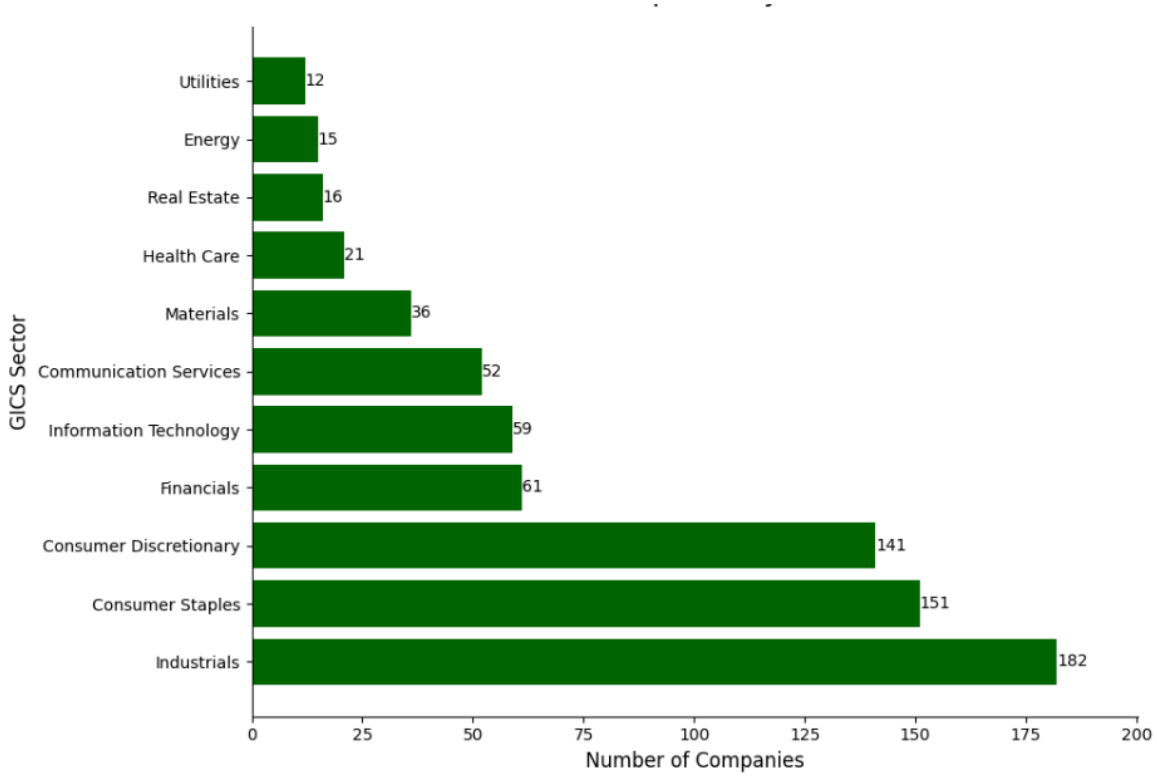

Figure 1: Distribution of surveyed companies across sectors

Source: own study

3. Results

Firstly, the respondents were asked about conditions affecting companies' characteristics. The responses are coded on a 5-level Likert scale, 1 being the lowest level and five being the highest. The variables used in the study and their statistics are presented in Table 2.

Table 2: The statistics of contingency variables

Variable		mean	standard deviation	1st quartile	median	3st quartile
S	size of a company measured by the number of employees	2.97	1.28	2.00	3.00	4.00
OS	decision-making decentralization	2.79	1.10	2.00	3.00	4.00
PE	participation in strategy formulation and implementation by managers and employees (not belonging to Senior Management)	2.89	1.06	2.00	3.00	4.00
UE	environmental uncertainty	3.13	0.92	3.00	3.00	4.00
TS	technologically sophisticated operating activity	3.12	1.00	3.00	3.00	4.00
LS	environment of trust and open communication	3.69	0.87	3.00	4.00	4.00
OC	organizational culture	3.84	0.93	3.00	4.00	5.00
BG	organization’s strategic goals are clearly defined and communicated	3.68	0.92	3.00	4.00	4.00
AD	adapt to changes	3.64	0.89	3.00	4.00	4.00
SU	long-term sustainability and growth	3.68	0.88	3.00	4.00	4.00
CP	competitive pressure	3.41	0.83	3.00	3.00	4.00
SQ	quality of the organizational structure	3.50	0.82	3.00	4.00	4.00
AG	age in operation	3.28	1.09	3.00	3.00	4.00

Source: own study

An analysis of BPM usage intensity was conducted using a 5-level Likert scale, with results illustrated in Figure 2. The findings indicate that BPM has been implemented in 81% of the surveyed enterprises; however, only 31% are utilizing it at a high level of intensity.

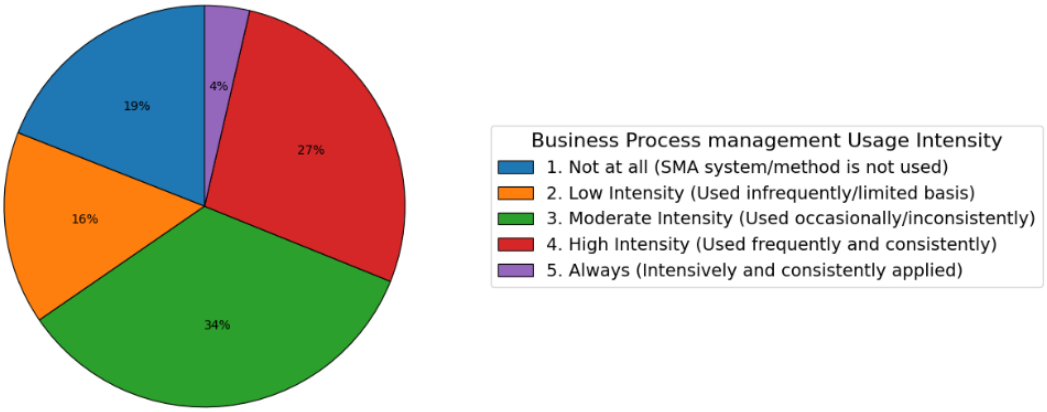

Figure 2: Business Process Management usage intensity
Source: own study

To evaluate the relationship between the categorical variables of Intensity and Sector, we conducted a Chi-Square Test of Independence. The results yielded a Chi-Square Statistic (χ^2) of 73.133, with 40 Degrees of Freedom (df) and a p-value of .001. These findings indicate that the intensity of BPM usage is not uniform across different sectors.

The accompanying stacked bar chart (Figure 3) illustrates the percentage distribution of BPM intensity within various sectors. The Utilities and Health Care sectors represent the largest share of firms engaged in BPM, while the Consumer Staples and Industrials sectors demonstrate comparatively lower intensity levels. In contrast, companies within the Information Technology, Utilities, and Energy sectors exhibit the most robust utilization of BPM, with a significant proportion of firms reporting high usage levels (intensity level 4 and 5). It is also noteworthy that 95% of companies within the healthcare sector have implemented BPM. The Hypothesis H1 was supported.

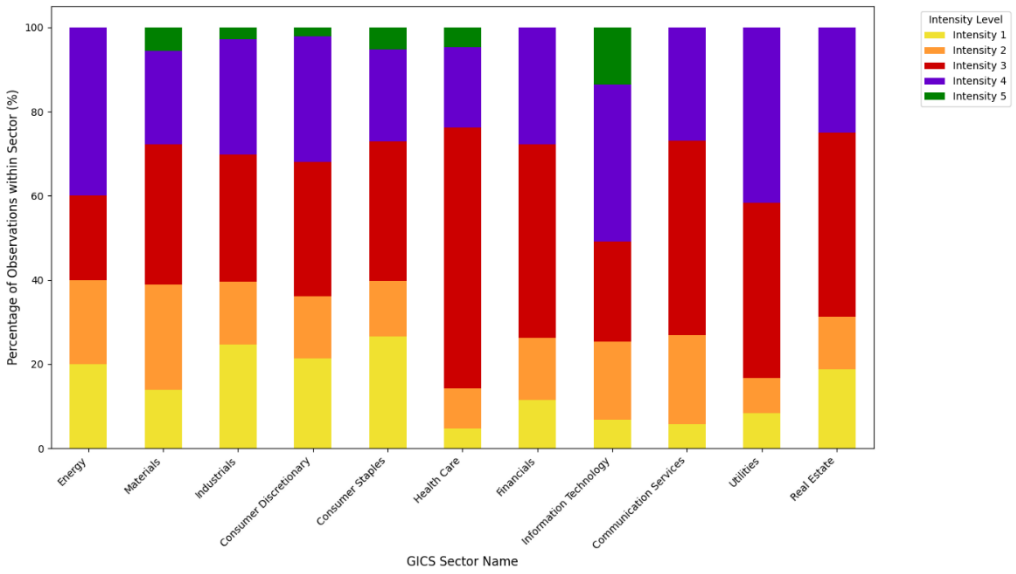

Figure 3: The distribution of intensity BPM within sectors
Source: own study

The analysis of Spearman's rank correlation reveals a moderate, statistically significant positive correlation between the intensity of BPM usage and the intensity of Activity Based Costing (ABC, method of calculating the unit cost of production based on activities) usage (Spearman's ρ=.481, p=.000). This means that as the intensity of BPM usage increases, the intensity of ABC usage also tends to increase. The clouds cluster along the diagonal (bottom-left to top-right) in the Jittered Scatter Plot visually confirm a positive correlation (Figure 4). The findings confirm the Hypothesis H2.

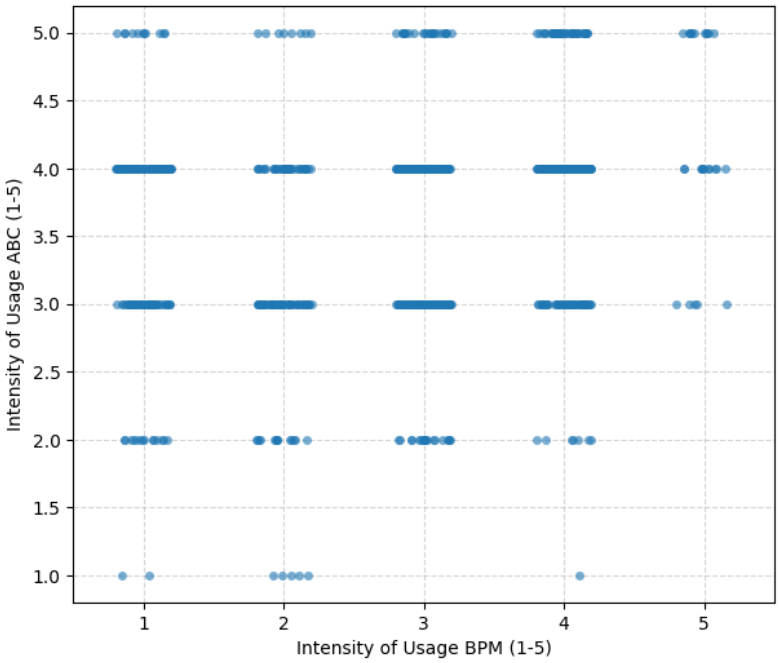

Figure 4: Jittered Scatter Plot used visual confirmation of the relationship between the intensity of usage BPM and ABC
Source: own study

We employed Spearman's rank correlation to analyze the relationship between the intensity of BPM usage and the strategies implemented to enhance the maturity level of operational processes. The findings indicate a weak yet statistically significant positive correlation between BPM usage intensity and the adopted strategies for developing these operational processes (Spearman's $\rho = .228$, $p = .000$). While a trend is evident, the relationship is not particularly strong; a higher rank in BPM usage is only marginally associated with a greater rank in the strategies aimed at improving operational process maturity. The results support the H3.

Furthermore, we constructed an Ordinal Logistic Regression model to evaluate the influence of various factors on the dependent variable: the intensity of BPM usage as measured by a 5-point Likert scale. This statistical methodology was chosen for its capability to predict an ordinal dependent variable based on independent variables that may be either categorical or continuous. This approach maintains the ordinal nature of the categories without assuming equal distances between the scores.

Through this model, we assessed the log-odds of transitioning the target variable to a higher intensity category. The Odds Ratio (OR) provides insight into the strength of the relationship. This model illustrates the likelihood of an increase in the 'BPM usage intensity' category as specific predictors change, holding other variables constant (ceteris paribus). Detailed results are presented in Table 3 and Figure 5.

Table 3: The statistics of contingency variables

Variable	Coefficient	Standard error	Z statistic	p value	Odds Ratio (OR)	Effect
S	0.5951	0.095	6.288	0.000	1.81	Strong Positive (81% increase in odds)
OS	0.1900	0.092	2.074	0.038	1.21	Moderate Positive (21% increase in odds)
PE	0.2065	0.097	2.119	0.034	1.23	Moderate Positive (23% increase in odds)
UE	0.0593	0.079	0.751	0.453	1.06	Not significant, no effect
TS	0.4106	0.091	4.528	0.000	1.51	Strong Positive (51% increase in odds)
LS	0.0224	0.097	0.231	0.817	1.02	Not significant, no effect
OC	-0.2583	0.091	-2.850	0.004	0.77	Moderate Negative (23% decrease in odds)
BG	-0.0105	0.092	-0.114	0.909	0.99	Not significant, no effect
AD	0.0345	0.088	0.394	0.694	1.04	Not significant, no effect
SU	0.0807	0.092	0.879	0.379	1.08	Not significant, no effect
CP	-0.1240	0.082	-1.517	0.129	0.88	Not significant, no effect

SQ	0.0174	0.084	0.206	0.879	1.02	Not significant, no effect
AG	-0.2535	0.079	-3.202	0.001	0.78	Moderate Negative (22% decrease in odds)
1/2	-1.7084	0.106	16.054	0.000	0.181	Significant, categories: 1 and 2 are distinct
2/3	0.0430	0.087	0.491	0.623	1.044	Not significant, categories: 2 and 3 are not distinct
3/4	0.5331	0.056	9.504	0.000	1.704	Significant, categories: 3 and 4 are distinct
4/5	0.9728	0.074	13.192	0.000	2.645	Significant, categories: 4 and 5 are distinct

Source: own study

We identified several significant factors that influence the intensity of BPM usage among firms. Company size emerged as the most important predictor of BPM intensity. Specifically, an increase of one unit in company size is associated with an 81% increase in the odds of being classified in a higher intensity category for BPM implementation, holding other factors constant.

Furthermore, the level of technological sophistication in operating activities is also a strong predictor. A one unit increase in this technological sophistication correlates with a 51% increase in the odds of achieving a higher intensity of BPM implementation.

Additionally, participation in strategy formulation and implementation, denoted as PE, along with decision-making decentralization, referred to as OS, exert moderate but significant positive effects. Specifically, these variables increase the odds of higher BPM implementation intensity by 23% and 21%, respectively.

In contrast, two variables—organizational culture (OC) and age (AG)—are negatively associated with the likelihood of achieving higher BPM intensity. Elevated levels of organizational culture and age correlate with reduced BPM usage intensity, with these factors decreasing the odds of higher BPM intensity by 23% and 22%, respectively.

The remaining seven variables (UE, LS, BG, AD, SU, CP, SQ) do not demonstrate a statistically significant impact on BPM intensity. Our results confirm the H4 and H5.

The robustness of our model is evident, supported by the goodness-of-fit statistics, which include Log-Likelihood (-976.52), AIC (1987), and BIC (2065). The successful termination of the optimization process further bolsters the reliability of the model. We also assessed the coefficients that delineate the cut points for category separation. The findings reveal that the cut points between categories 1 and 2, 3 and 4, and 4 and 5 are highly significant (p=.000), indicating strong confidence in the separation of these categories. However, the threshold between categories 2 ("Low Intensity") and 3 ("Moderate Intensity") is not significant (p=.623), suggesting that two categories may be very similar for respondents.

The forest plot (Figure 5) supports our findings by visually highlighting the significant drivers of BPM Usage Intensity. The vertical center line in the plot indicates an Odds Ratio of 1.00, which signifies no effect. Variables positioned to the left of this line, specifically

AG and OC, exhibit a negative impact, whereas those on the right side, including S, TS, PE, and OS, serve as positive drivers. The color scheme utilized in the plot reflects statistical significance: red indicates that a variable is statistically significant (p-value < 0.05), while gray denotes a lack of statistical significance. Additionally, the factors are arranged based on their Odds Ratio, with the highest OR at the top reflecting the strongest positive effect and the lowest OR at the bottom indicating the strongest negative effect.

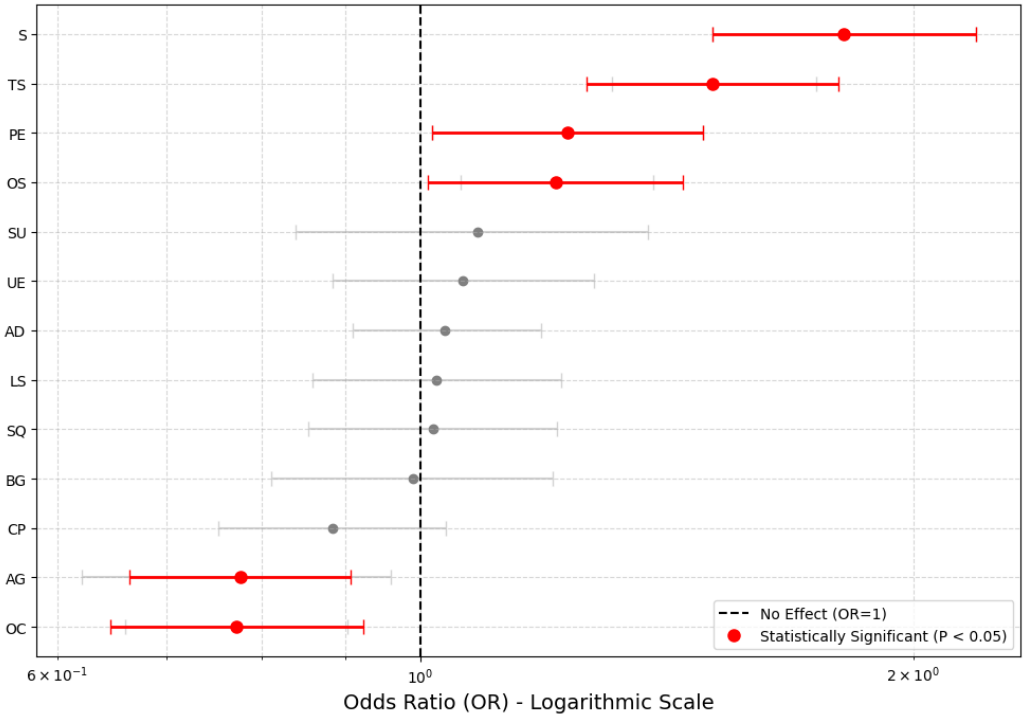

Figure 5: Forest Plot: Impact of Factors on Usage Intensity (Ordinal Regression)
Source: own study

4. Discussion

BPM has become one of the most important management concepts in recent years. BPM is a critical component of any organization's success. To meet organizational needs, BPM must align with strategy (Bai & Sarkis, 2013) and adjust operations to environmental demands (Maddern et al., 2013). Grisold et al. (2019) and Madern et al. (2013) share a similar view. These authors believe that BPM should help an organization better adapt to an increasingly dynamic environment. Likewise, research conducted for this article also shows a connection between the intensity of BPM application and strategy, supporting the development of operational processes to improve their maturity. Additionally, participation in strategy formulation and decentralization of decision-making have a moderate, positive effect on the intensity of BPM application.

A literature review has shown a positive link between organizational size and performance management. Organizational structure is another factor that has been positively connected with the adoption of performance management systems. The review indicates that culture and leadership are fairly well-covered in both theoretical and empirical studies. In contrast, technology, IT, structure, strategic orientation, and the external environment have not been consistently linked to performance management in

research (Wadongo & Abdel-Kader, 2014, p. 686). The study examined the factors that influence the intensity of BPM application. Company size was found to be a strong predictor of BPM application intensity, while organizational culture was one of the factors that decreased the chances of reaching higher BPM application intensity.

The literature also reveals significant connections between the use of IT systems, the level of BPM development, knowledge management, and the quality and effectiveness of processes implemented in the company (Bitkowska et al., 2023).

5. Conclusion

BPM plays an important role in the adaptation of organizations to the dynamically changing market environment. This approach allows for a better understanding and managing of internal processes, their optimization and integration with modern technologies.

This article explored the factors that influence BPM intensity, including company size, decision-making decentralization, participation in strategy formulation and implementation, environmental uncertainty, advanced technological operations, a culture of trust and open communication, organizational culture, clearly communicated strategic goals, adaptability to change, long-term sustainability and growth, competitive pressure, the quality of organizational structure, and company age. Company size and technologically advanced activities are strong predictors of these factors. The study also revealed that BPM application intensity varies by sector: the healthcare sector has the highest percentage of companies using BPM, while the information technology sector demonstrates the most intensive use of BPM. Additionally, the application of the ABC method and strategies supporting operational development shows a positive correlation with BPM intensity. BPM is crucial for helping organizations adapt to a rapidly changing market environment. This approach enables a better understanding and management of internal processes, as well as their optimization and integration with modern technologies. The specific circumstances under which BPM is implemented more intensely are also significant.

This study makes several important contributions. First, it enhances the science by contributing to the discussion on the factors that determine the intensity of BPM usage. Second, one of the key managerial contributions is the identification of specific, statistically significant drivers of BPM intensity. Managers aiming to increase the intensity of process management should concentrate their efforts and budgets on effective, direct strategies. These include fostering a more inclusive and empowered organizational culture, actively involving both managers and employees from outside senior management in strategy formulation and implementation, and promoting autonomy through increased decision-making decentralization. Third, the sectoral analysis enables cross-industry benchmarking. Companies within a specific sector can compare their BPM usage profile to the sector average, allowing them to determine whether they are leaders or laggards.

However, the findings should be interpreted with caution due to certain limitations. Primarily, the research relies on self-reported data, which may be subject to biases or

inaccuracies regarding perceived usage and beliefs. Additionally, the survey questionnaire had limited response options, utilizing a 5-point Likert scale. Another limitation is that this study focused exclusively on respondents from 26 countries.

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