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SOCIAL MEDIA INSTITUTIONALIZATION IN POLISH MUNICIPALITIES: ASSOCIATIONS WITH BUDGET COMMUNICATION AND AUDIENCE ENGAGEMENT ON FACEBOOK

Waldemar Rydzak

*Department of Information
Economics,*

*Poznań University of Economics
and Business, Poznań, Poland*

E-mail:

waldemar.rydzak@ue.poznan.pl

ORCID 0000-0001-5771-933X

**Małgorzata Magdalena
Hybka**

*Poznań University of Economics
and Business, Department of Public
Finance, Poznań, Poland*

ORCID 0000-0002-3524-3489

Jacek Trębecki

*Department of Information
Economics,*

*Poznań University of Economics
and Business, Poznań, Poland*

ORCID 0000-0001-9775-173X

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ABSTRACT. This study examines whether the institutionalization of social media communication is associated with the presence, form, framing, and audience engagement of municipal budget content in Poland. It combines Facebook post data, lemmatized text, survey-based Social Media Institutionalization Index (SMI) scores, and financial-demographic characteristics. The main analyses cover December 1, 2023–April 15, 2024. The study includes 518–520 municipalities from six Polish voivodeships, representing approximately 21% of all Polish municipalities and 52% of municipalities in the regions covered. The publication-structure model uses 84,678 posts, while budget-content and engagement analyses use 42,592 posts matched to the lemmatized dataset, including 7,326 budget-related posts (17.20%). Logistic, negative binomial, and linear regression models control for month, municipality type, voivodeship, and structural characteristics. Higher SMI was associated with lower odds that a lemmatized post was budget-related and was not significantly associated with the presence of non-empty text or fiscal versus development-investment framing. Higher SMI was positively associated with engagement for non-budget posts, whereas the corresponding association for budget posts was weaker and not statistically significant. The findings indicate that institutionalization relates differently to engagement across content categories and does not automatically increase the visibility or alter the semantic framing of municipal budget communication.

Keywords: social media institutionalization, municipal budget communication, local government, audience engagement, Poland

Introduction

The municipal budget is among the most important instruments of public management at the local level. It defines revenue and expenditure priorities, organizes the execution of public tasks, and establishes the framework for developmental activities. For this reason, the budget carries not only operational significance but also public and relational weight: it is one of the primary points of reference based on which residents evaluate the actions of local government authorities. The literature emphasizes that the transparency of public information and citizens' access to knowledge about institutional actions strengthen accountability, legitimacy, and trust in administration (Bertot et al., 2010; Twizeyimana & Andersson, 2019).

The development of social media has altered the conditions of communication between municipalities and residents. Facebook, as the dominant platform in local government practice, combines informational, relational, and image-building functions. This shift is part of a broader transformation of state–citizen interaction through digital channels, in which cross-country panel evidence shows that e-government development improves quality of life primarily through the expansion of online services and digital infrastructure rather than through human-capital investment, with effects that are largely immediate rather than cumulative – a pattern consistent with the present study's expectation that organizational readiness for digital communication, rather than communication volume alone, conditions civic outcomes (Vasylieva et al., 2026). Research shows that social media can increase the accessibility of public messages, accelerate the flow of information, and enable immediate audience reactions, but the effectiveness of the message depends on its type, form, and local utility (Bonsón et al., 2012; Waters & Williams, 2011; Coutinho et al., 2023; Mishchuk et al., 2026). Therefore, the mere presence of a municipality on a platform does not predetermine the quality of communication.

Against this background, budget content constitutes a special case. On one hand, it relates to one of the most critical areas for evaluating municipal performance, as it concerns expenditures, investments, funding sources, and public priorities. On the other hand, it is typically more complex, technical, and less intuitively attractive than daily, event-driven, or promotional messages. Therefore, the budget can be presented either in a more fiscal language, focused on the plan, revenues, expenditures, and taxes, or in a development-investment language, emphasizing projects, funds, tasks, and the tangible material results of actions. In this sense, the budget functions in social media not only as a financial document but also as a narrative resource utilized to justify the policies of local authorities and present their agency (Afonso, 2014; Bertot et al., 2010; Klun et al., 2019; Twizeyimana & Andersson, 2019).

In the literature on public administration and social media, increasing importance is attributed to the institutionalization of communication. This refers to the organizational embedding of communication practices: the presence of guidelines, management support, training, basic evaluation mechanisms, and a stable assignment of responsibility for managing social media channels (Criado & Villodre, 2022; Sharif et al., 2015). However, a higher level of institutionalization does not have to mean a simple increase in the number of publications, nor does it automatically imply better communication of every type of content. Instead, it may create distinct conditions for organizing the message, its consistency, monitoring, and audience engagement.

In this context, the fundamental research problem of this article concerns the relationship between the institutionalization of communication in social media and the communication of budget content by municipalities. We are interested in whether a higher level of organizational embedding of communication is associated with more frequent engagement with budget content, the structure of the publication stream, audience engagement, and the

framing of the budget in social media. Such a framework allows for combining reflection on the budget as a specific area of public information with an empirical question regarding the dimensions in which the institutionalization of communication matters for how content belonging to one of the most cognitively demanding areas of local government operation is presented.

1. Literature review and theoretical framework

1.1. The budget as a specific area of public communication

In the public finance literature, the budget is conceptualized not only as an instrument for planning and resource allocation but also as a mechanism for justifying public decisions to the environment. Its communication can therefore be treated as a special case of public information communication with high institutional weight. From the perspective of agency theory, accountability, and legitimacy, budget communication strengthens social control over the decisions of authorities, reduces information asymmetry, and can increase acceptance of the actions taken (Afonso, 2014; Ebrahim, 2003; Ríos et al., 2024; Rukavina, 2023). Cross-country structural modeling of public-sector transparency and trust corroborates this mechanism at a more aggregate level: public trust exerts a substantially stronger influence on macroeconomic stability than transparency indicators alone, implying that the communicative framing through which fiscal information reaches citizens – rather than the mere disclosure of budget data – may be the more decisive channel through which local budget communication translates into public confidence (Vasylieva et al., 2023).

However, the budget is communicationally challenging. The language of revenues, expenditures, forecasts, taxes, or deficits is technical and can be opaque to audiences outside the administration. Therefore, budget content often requires transformation into a more communicable narrative that refers to projects, investments, funds, and the results of actions. This shift does not carry solely stylistic significance. It alters the way residents can understand the link between financial decisions and the daily functioning of the local community (Bertot et al., 2010; Klun et al., 2019; Twizeyimana & Andersson, 2019).

1.2. Institutionalization of communication in social media

Research on social media in public administration shows that the professionalization of communication practices depends less on the mere presence of institutions on platforms than on the extent to which these practices are embedded in the organization. In this view, institutionalization involves a transition from occasional activities to more stable practices supported by procedures, training, management support, and basic mechanisms for evaluating effects (Criado & Villodre, 2022; Sharif et al., 2015). This interpretation is consistent with broader research on digital capacity and technology adoption in public administration. Research on ICT adoption points to the importance of top-management support, formalized strategies, employee competences, training, and organizational coordination (Želazny, 2015), while studies of AI adoption emphasize the alignment of institutional support, human capital, skills, and governance arrangements (Zhidebekkyzy et al., 2026). This organizational-embedding perspective is further supported by evidence from municipal settings themselves: mixed-method research on South African local government shows that the effectiveness of internal communication systems – including regular feedback, open channels, and recognition of employee input – directly shapes employee performance and, by extension, an organization's overall capacity to execute communication tasks consistently (Sineke et al., 2023). This

suggests that the institutionalization dimensions examined here through the SMI may partly reflect broader internal-communication maturity rather than social-media-specific practices alone. Although these studies do not concern social media communication specifically, they provide a broader rationale for viewing its institutionalization as a multidimensional form of organizational embedding rather than as a simple measure of publication activity. In the municipal context, such embedding may create conditions for more stable and orderly communication practices without necessarily increasing the relative presence of particular content categories.

In this article, the degree of such embedding is captured by the SMI indicator, which reflects the extent to which social media communication practices are incorporated into municipal structures and routines. Rather than measuring publication activity itself, the index captures selected conditions under which communication is planned, supported, and evaluated. The SMI is therefore interpreted as a measure of organizational maturity in communication that may differentiate how communication is organized and executed, rather than as a mechanism that automatically increases the visibility of every type of content.

Evidence from public-transport decarbonization initiatives illustrates why such organizational embedding matters for engagement outcomes: strategic communication was found to shape stakeholder support almost entirely through psychological mediators – a sense of importance and a sense of ownership – rather than through message frequency alone, implying that the institutionalization of communication practices matters less for whether a topic is raised than for whether audiences come to feel implicated in it (Perdana & Wisesa, 2025).

1.3. Form of expression, explanatory capacity, and framing of budget content

Research on municipal social media indicates that the effectiveness of communication depends both on the type of content and on the form of its presentation. It is the form of expression that influences the clarity of the message, the possibility of expanding meanings, and the potential for audience reactions (Bonsón et al., 2012; Bonsón et al., 2015; Waters & Williams, 2011). In the case of budget content, this issue is particularly critical because it is more cognitively complex than many other topics present in local communication.

From this point of view, the textual component carries special significance. It allows not only for signaling the presence of a topic but also for developing the meaning of the message, embedding information in a broader context, and explaining the relationships between a financial decision and its local consequences. In this sense, textuality can be treated as an indicator of a greater explanatory capacity of the message. For budget communication, this is important because it enables presenting more difficult and technical content in a form that is potentially more understandable to residents.

However, this does not automatically mean that a more developed form of expression must lead to a change in the thematic framing of this content. Increasing the share of text posts may create better conditions for explaining the budget, but it does not predetermine whether the budget will be presented more fiscally or more from a development-investment standpoint. In other words, the form of expression and its semantic framing should be treated as two related yet analytically distinct levels of communication.

1.4. Research gap

Previous studies have typically developed two separate strands. The first concerned the budget as a specific type of public content. The second focused on the institutionalization and

professionalization of municipal communication in social media. However, it was much less frequently asked whether the organizational embedding of communication is associated with the manner of engaging with a message that is particularly cognitively demanding and critical from the standpoint of evaluating the actions of authorities, such as budget content. This article positions itself precisely within this gap. Its main research problem relates to whether a higher level of communication institutionalization in social media is associated with the presence of budget content, the form of expression, audience reactions to such posts, and any change in the framing of budget content. Such a framework allows for separating the association of institutionalization with topic visibility, message form, its reception, and its semantic organization.

2. Research questions and hypotheses

The point of reference for this article is the assumption that communicating budget content constitutes a specific test of communication practices in social media. The budget belongs to topics of high public weight, but at the same time, it requires the sender to have the capacity to order the message, develop content, and give it a form understandable to recipients. From this perspective, the level of communication institutionalization does not have to directly increase the frequency of addressing the budget topic itself. It may, however, differentiate the conditions for organizing the message, its reception, and the way budget content is semantically conceptualized.

Consequently, the research problem was broken down into four levels of analysis. The first concerns the presence of budget content in the stream of publications. The second refers to the structure of this stream, understood as a message form that enables the development of more complex public content. The third concerns the reactions of the audience toward budget posts. The fourth relates to the framing of budget content, and thus to the question of whether a higher level of communication institutionalization is associated with a change in the proportion between the fiscal and development-investment approaches.

2.1. Research questions

Based on this, four research questions were formulated:

RQ1. Is a higher level of communication institutionalization in social media associated with a greater probability of municipalities addressing budget content?

RQ2. Is a higher level of communication institutionalization associated with a more developed structure of the publication stream, expressed by a greater probability of publishing posts that contain text?

RQ3. Does a higher level of communication institutionalization modify audience engagement toward budget posts?

RQ4. Is a higher level of communication institutionalization associated with a change in the framing of budget content, understood as a shift between the fiscal and development-investment approaches?

The first question allows for verifying whether the organizational embedding of communication translates into the mere presence of the budget in the publication stream. The second question concerns the form of expression and verifies whether more institutionally developed municipalities more frequently utilize forms that allow for developing more demanding public content. The third question refers to the reception of content and focuses on whether institutionalization modifies user reactions toward budget posts. The fourth question no longer concerns the form, but the semantic profile of the message, allowing for separating

the association of institutionalization with message organization from its potential association with the way the budget is conceptualized.

2.2. Research hypotheses

Considering the literature and the logic of the research design, two main hypotheses, one auxiliary hypothesis, and one exploratory question were adopted.

H1. A higher level of communication institutionalization in social media is associated with a more developed structure of the publication stream, manifested by a greater probability of publishing posts that contain text.

This hypothesis stems from the assumption that more organizationally mature communication practices can favor a more developed and narratively embedded message. The presence of a textual component holds not only formal but also substantive significance here, as it conditions the ability to communicate more complex public content, including the budget. H2. A higher level of communication institutionalization in social media is associated with a different level of audience engagement toward budget posts.

This hypothesis does not assume a positive effect *a priori*. Previous studies suggest that the organizational embedding of communication may influence the execution quality of the message and its reception, but they do not predetermine that this effect must take the form of increased reactions toward every category of content. Therefore, a key element of the empirical test of H2 is the interaction between the SMI level and the status of the budget post.

H3. A higher level of communication institutionalization does not have to be associated with more frequent engagement with budget content.

This hypothesis serves an auxiliary function. It does not assume a positive impact of professionalization on the volume of budget communication, because the presence of this theme may be largely a consequence of the logic of the subject matter itself, rather than the level of organizational advancement of communication.

RQ4 is exploratory and does not specify a directional expectation. The literature and previous budget analyses suggest that budget content can be framed both fiscally and from a development-investment standpoint, but there are insufficient grounds to assume a unidirectional impact of institutionalization on this distinction in the current article. For this reason, we treat the relationship between SMI and framing as a question requiring empirical verification, rather than as a thesis with a predetermined direction of effect.

2.3. Analytical model

The adopted analytical model assumes four successive steps: 1. In the first step, the relationship between SMI and the probability that a textual post concerns the budget is examined. 2. In the second, the relationship between SMI and the structure of the publication stream, captured by the variable *has_text*, is analyzed. 3. In the third, it is verified whether the SMI level modifies audience engagement toward budget posts. 4. In the fourth, the relationship between SMI and the framing of budget content, measured by the share of fiscal vocabulary in the total pool of budget vocabulary, is examined.

Such an arrangement allows for clearly separating four levels of the problem: topic presence, form of expression, its reception, and its semantic framing. This distinction is of fundamental importance for the interpretation of the results. The institutionalization of communication may be associated with selected dimensions of message organization and reception without altering either the frequency of addressing a given topic or the manner of its

semantic conceptualization. This very possibility constitutes one of the key interpretative axes of this article.

3. Data and methods

3.1. Research design and analytical logic

The study is quantitative and combines content analysis with modeling of the relationships between the level of communication institutionalization in social media and the characteristics and reception of publications posted by municipalities on Facebook. The primary unit of analysis is a single post published on the official profile of a municipality. The adopted research logic corresponds to the four research questions formulated in the previous section. In the first step, it was analyzed whether a higher level of institutionalization is associated with the presence of budget content in the stream of publications. In the second, it was examined whether it is associated with the structure of this stream, understood as the presence of a textual component. In the third, it was verified whether the level of institutionalization modifies audience engagement toward budget posts. In the fourth, it was analyzed whether a higher level of institutionalization is associated with a change in the framing of budget content, understood as the proportion between the fiscal and development-investment approaches.

3.2. Data sources

The empirical setting is Poland. The analysis was based on four complementary data sources, combined at the level of the municipality and the individual post. The first dataset included posts published by Polish municipalities on Facebook after the measurement of communication institutionalization. For each observation, identifiers of the municipality and profile, publication date, post content, and basic reception metrics were available, including the number of reactions, comments, shares, and the number of followers assigned to the day of publication. The second dataset was textual and contained the results of linguistic processing of the posts, including the number of tokens and the counts of 18 lemmas linked to budget themes. The third dataset comprised survey data describing the organizational embedding of communication in social media at the municipality level and served as the baseline for constructing the SMI indicator. The fourth dataset encompassed baseline financial-demographic characteristics of the municipalities, linked to the year of the SMI measurement. The inclusion of these data allowed for separating the association between communication institutionalization and publication characteristics from baseline structural differences between municipalities. This combination of sources enabled linking the organizational characteristics of municipalities with the features of individual publications, their content profile, their reception by users, and the financial-demographic context of local government units.

3.3. Study period and construction of analytical samples

The study was strictly limited to the period directly following the SMI measurement, so as to avoid treating the institutionalization indicator as a historical measure applied to earlier years. The final main analysis covered posts published from December 1, 2023, to April 15, 2024. This time scope allows for juxtaposing a cross-sectional measurement of organizational

advancement in communication with the publication practice observed immediately after the survey study.

Due to the distinct methodological status of raw and lemmatized text, two linked analytical samples were constructed. The first included all posts observed in the study period for municipalities with an SMI measurement and a complete set of baseline financial-demographic characteristics; it served for the analysis of whether a post contained non-empty text in the Message field. The second included posts successfully matched to the lemmatized dataset and was used for budget-content and audience-engagement analyses. Framing analyses were conducted within the corresponding subset of budget-related posts.

The all-post sample comprised 84,678 posts from 520 municipalities. The raw Message field contained non-empty text for 69,543 posts from 519 municipalities. A total of 42,592 posts from 518 municipalities were successfully matched to the lemmatized dataset and formed the sample used for budget-content and engagement analyses. Of these, 7,326 (17.20%) were classified as budget-related. The 518-520 municipalities represented approximately 21% of all 2,477 municipalities in Poland and about 52% of the 998 municipalities located in the six voivodeships covered by the study. For the framing analysis, an extended specification covering January 1, 2023, to April 15, 2024, was estimated to test whether the association between SMI and the framing profile remained stable over a broader monthly window. The main models, however, continued to use the shorter period directly following the SMI measurement.

Table 1. Construction of the analytical samples

Analytical sample	Period	Unit of analysis	Posts	Municipalities
Publication-stream structure (has_text)	Dec. 1, 2023-Apr. 15, 2024	Individual post	84,678	520
Budget-content and engagement models	Dec. 1, 2023-Apr. 15, 2024	Lemmatized post	42,592	518
of which: budget-related posts	Dec. 1, 2023-Apr. 15, 2024	Budget-related lemmatized post	7,326 (17.20%)	-

Source: own compilation

Note: Non-empty text was observed in 69,543 posts from 519 municipalities. Two municipalities in the all-post sample had no matches in the lemmatized dataset.

3.4. Operationalization of communication institutionalization

The primary explanatory variable is the Social Media Institutionalization Index (SMI). The original five-component SMI proposed by Criado and Villodre (2022) was reproduced in the Polish municipal survey using the same published components, equal weighting, and scoring range. The Polish implementation of the index and the survey data are described in Bischoff et al. (2026). The data were collected in a nationwide survey of Polish municipalities conducted in autumn 2023. The five components capture social media policy guidelines, leadership support, social media training, evaluation mechanisms, and self-perceived social media development. Binary items were coded 0 for “no” and 1 for “yes”. Responses to the two five-point items were transformed to the 0-1 range as $(x-1)/4$. The five normalized components were then summed with equal weights. Only municipalities with complete SMI scores were included in the analytical samples; missing components were not imputed.

$$SMI_i = \sum_{k=1}^5 Z_{ik}, \quad 0 \leq Z_{ik} \leq 1, \quad 0 \leq SMI_i \leq 5$$

A higher value indicates a higher level of organizational embedding of social media communication. Descriptive statistics for the components and the final index in the 518-municipality analytical sample are presented in Table 2.

Table 2. Construction and descriptive statistics of the Social Media Institutionalization Index

Component	Measurement and coding	Mean	SD	Min	Max
Policy guidelines	Survey item on the existence of written social media guidelines; no=0, yes=1	0.08	0.27	0	1
Leadership support	Five-point assessment of support from institutional leadership; normalized as $(x-1)/4$	0.74	0.19	0	1
Social media training	Survey item on training for staff responsible for social media; no=0, yes=1	0.44	0.50	0	1
Evaluation mechanisms	Survey item on a system for evaluating or measuring social media results; no=0, yes=1	0.35	0.48	0	1
Self-perceived development	Five-point assessment of the municipality's level of social media development; normalized as $(x-1)/4$	0.64	0.20	0	1
SMI total	Sum of the five equally weighted components	2.24	1.04	0.50	5.00

Source: own compilation

Note: $N=518$ municipalities; theoretical SMI range: 0-5. Missing components were not imputed.

3.5. Operationalization of budget content and framing

Budget content was identified based on lemmatized text and dictionary counts. A post was recognized as budget-related if it contained at least one of 18 lemmas relating to local finance and the budget. This set included, among others, lemmas associated with revenues and expenditures, financial planning, taxes, investments, projects, funds, and grants. On this basis, a binary variable *is_budget_post* was constructed, taking the value 1 for posts classified as budget-related and 0 for the remaining posts. This classification was applied only to posts successfully matched to the lemmatized dataset.

Additionally, within budget posts, two primary dimensions of content framing were distinguished: fiscal framing and development-investment framing. The fiscal category included lemmas referring to the financial plan, revenues, expenditures, taxes, and other strictly fiscal categories: *budget, revenue, expenditure, tax, deficit, subvention, amount, plan, forecast*. The development-investment category included lemmas associated with investments, projects, funds, resources, grants, subsidies, and tasks: *investment, project, fund, resources, grant, subsidy, task*. The two remaining lemmas, *debt* and *money*, were treated as a residual category, not included in the main framing indicator.

The framing variables were constructed according to a common category-share rule. For observation u and lexical category k , the partial indicator equals the number of tokens assigned to category k divided by the total number of tokens in all J categories included in the relevant indicator:

$$\text{Share}_{ku} = N_{ku} / \sum_{j=1}^J N_{ju}$$

In the present analysis, the denominator contains fiscal and development-investment tokens. Accordingly, *share_fiscal* and *share_invest* sum to one whenever at least one token from either category is present:

$$\begin{aligned} \text{share_fiscal} &= \text{tokens_fiscal} / (\text{tokens_fiscal} + \text{tokens_development}) \\ \text{share_invest} &= \text{tokens_development} / (\text{tokens_fiscal} + \text{tokens_development}) \end{aligned}$$

Lower values of this indicator were interpreted as a relatively larger share of development-investment narrative. The framing indicators were calculated exclusively for budget observations, because only within them was it possible to meaningfully capture the internal semantic structure of the message.

3.6. Operationalization of publication stream structure

To capture the form of expression, a binary variable *has_text* was constructed directly from the Message field in the post-level dataset. It equals 1 when the field contains non-empty text and 0 otherwise. The variable therefore distinguishes posts with a textual component from entries without one. Its definition is independent of whether a post could be matched to the lemmatized dataset; the lexical match was used only to define the samples for budget-content, framing, and engagement analyses.

3.7. Operationalization of audience engagement

Audience engagement was described using the count variable *engagement_count*, calculated for each post as the sum of reactions, comments, and shares. This approach corresponds to the dominant research practice in analyses of municipal communication in social media, where user reactions are treated as a baseline indicator of content reception:

$$\text{engagement_count}_p = \text{reactions}_p + \text{comments}_p + \text{shares}_p$$

To limit the impact of differences in the potential reach of profiles, an offset based on the logarithm of the number of followers on the day of publication was applied in the engagement model. This solution separates associations with communication characteristics from differences resulting from the size of the profile's audience.

Table 3. Construction of the principal analytical variables

Variable	Type	Unit of analysis	Construction
SMI	Continuous index	Municipality	Sum of five equally weighted components normalized to 0-1; range 0-5
is_budget_post	Binary	Lemmatized post	1 if at least one of the 18 budget lemmas is present; 0 otherwise
has_text	Binary	Post	1 if the Message field contains non-empty text; 0 otherwise
engagement_count	Count	Post	Reactions + comments + shares
share_fiscal	Proportion	Municipality × year-month	Fiscal tokens / (fiscal tokens + development-investment tokens)
share_invest	Proportion	Municipality × year-month	Development-investment tokens / (fiscal tokens + development-investment tokens)

Source: own compilation

Note: Framing shares are defined only when *fiscal + development-investment tokens* > 0.

3.8. Control variables

In all models, a set of control variables relating to basic structural, territorial, and temporal characteristics of communication was included. They encompassed the month of publication, municipality type based on the official TERYT classification, voivodeship, and baseline financial-demographic characteristics of the municipalities. Municipality type was

coded as urban, rural, or urban-rural, with urban municipalities as the reference category. These characteristics included: population size, total income per capita, the share of own revenue in total revenue, debt-to-revenue ratio, shares of young and older residents, and the unemployment rate. The financial-demographic variables were linked to the year of the SMI measurement and treated as baseline characteristics of the municipality, rather than as variables matched according to the publication date of an individual post. Such a solution allows for treating the structural characteristics of municipalities as an organizational context for the level of communication institutionalization and limits the risk of controlling publications from early 2024 with financial variables originating from a later period. Control variables were included to separate the association between SMI and publication characteristics from more general differences between local government units, regional variation, and short-term publication volatility during the study period.

3.9. Statistical models

The empirical analysis comprises three main models and an auxiliary framing analysis. All specifications include SMI and a common set of controls: month of publication, municipality type, voivodeship, and baseline financial-demographic characteristics of the municipalities. The engagement model additionally includes budget-post status and its interaction with SMI. In models estimated on the lemmatized post sample, text length was controlled for using the logarithm of the number of lemmas plus one, thereby separating the association of SMI with budget status or engagement from differences attributable to message length.

First, for the question regarding the presence of budget content, a logistic regression model was estimated in which the dependent variable was `is_budget_post` and the main predictor was the SMI level. The model was estimated on posts successfully matched to the lemmatized dataset.

Second, for the question regarding the publication stream structure, a logistic regression model was estimated for the variable `has_text`. All posts observed after the SMI measurement were analyzed to test whether a higher level of institutionalization was associated with a greater probability that the Message field contained non-empty text.

Third, for the question regarding the reception of budget content, a negative binomial model was used for the variable `engagement_count`. The model included the SMI level, the `is_budget_post` variable, the interaction $SMI \times is_budget_post$, control variables, and an offset based on the number of profile followers. Such a specification allowed for evaluating whether the association between SMI and audience reactions differed between budget and non-budget posts. Conditional SMI slopes for both content categories were derived from the interaction model.

Fourth, an auxiliary analysis concerning the framing of budget content was conducted. For this purpose, a linear model was estimated at the municipality $\times$ year-month level, in which the dependent variable was the `share_fiscal` indicator and the main predictor was the SMI level. The analysis was limited to observations containing budget content, and the estimation was supplemented with the same set of control variables: month, type of municipality, voivodeship, and baseline financial-demographic characteristics of the municipalities. The model was weighted by the number of budget tokens to give more weight to observations based on richer textual material. Additionally, auxiliary tests were performed at the level of individual budget posts, verifying whether the SMI level is associated with a predominance of development-investment over fiscal narrative or vice versa.

In the logistic models and the negative binomial model, standard errors clustered by municipality were applied. Analogously, in the framing analysis, standard errors clustered by municipality were used to account for the dependence of observations within the same local government unit.

3.10. Data construction limitations

The adopted research strategy has several limitations. First, the SMI indicator is cross-sectional and refers to a single moment of measurement, so it cannot be interpreted as a historical measure of organizational advancement in communication in earlier years. Second, the baseline financial-demographic characteristics of municipalities were treated as a structural context linked to the SMI measurement, rather than as variables dynamically changing with the post publication date. Third, the identification of budget content and the analysis of its framing were possible only for posts successfully matched to the lemmatized dataset; visual messages and posts without lexical matches therefore remained outside the content analysis. Fourth, lexical data were not available for all posts containing non-empty raw text. Fifth, the article's main models rely on a relatively short window after the SMI measurement and do not allow for a full analysis of the long-term dynamics of budget communication. These limitations delineate the scope of possible inference and require caution when formulating conclusions.

4. Research results

4.1. Institutionalization of communication and the presence of budget content

The first logistic model examined whether SMI was associated with the probability that a post matched to the lemmatized dataset concerned the budget. The model was estimated on 42,592 posts and controlled for month, municipality type, voivodeship, baseline financial-demographic characteristics, and text length.

Higher SMI was associated with lower odds that a lemmatized post was classified as budget-related (OR=0.924, $p=0.013$; Table 4). Relative to January, the odds were higher in February, March, and April and lower in December, whereas municipality-type effects were not statistically significant (Table 5).

The result indicates that higher institutionalization was associated with a lower relative presence of budget content in the lemmatized publication stream. The model does not establish why this association occurs, but it rules out a positive SMI association under the adopted specification.

4.2. Institutionalization of communication and publication stream structure

The second logistic model examined the association between SMI and the probability that the Message field contained non-empty text. It was estimated on 84,678 posts and included the same structural, territorial, temporal, and financial-demographic controls.

The SMI coefficient was positive but not statistically significant (OR=1.115, $p=0.200$; Table 4). Consequently, H1 was not supported: after adjustment for the control variables, SMI was not significantly associated with the probability that a post contained non-empty text.

Table 4. Main SMI effects in the logistic models

Outcome	b	SE	OR	95% CI	p
Budget-post status (is_budget_post)	-0.079	0.031	0.924	[0.869; 0.983]	0.013
Non-empty textual component (has_text)	0.109	0.085	1.115	[0.944; 1.317]	0.200

Source: own compilation

Note: Budget-post model: $N=42,592$ lemmatized posts from 518 municipalities; textuality model: $N=84,678$ posts from 520 municipalities. Both models include month, official TERYT municipality type, voivodeship, and baseline controls, with standard errors clustered by municipality. The budget-post model additionally controls for log text length.

Table 5. Selected temporal and municipality-type effects in the budget-post model

Predictor	b	SE	OR	95% CI	p
December vs January	-0.160	0.049	0.852	[0.774; 0.937]	0.001
February vs January	0.229	0.048	1.257	[1.145; 1.380]	<0.001
March vs January	0.124	0.051	1.132	[1.024; 1.250]	0.015
April vs January	0.288	0.072	1.334	[1.158; 1.535]	<0.001
Rural vs urban	0.041	0.162	1.042	[0.759; 1.431]	0.799
Urban-rural vs urban	-0.038	0.134	0.962	[0.740; 1.252]	0.776

Source: own compilation

Note: Reference categories are January and urban municipality. The remaining specification is identical to the budget-post model in Table 4.

4.3. Institutionalization of communication and audience engagement toward budget posts

The third model examined audience engagement using negative binomial regression with an offset based on the number of followers on the day of publication. The model included SMI, budget-post status, their interaction, and the full set of controls.

SMI was positively associated with engagement for non-budget posts in the lemmatized sample ($IRR=1.079$, $p=0.011$). For budget posts, the corresponding SMI slope was not statistically significant ($IRR=0.968$, $p=0.300$). The interaction between SMI and budget-post status was negative and significant ($IRR=0.897$, $p<0.001$), indicating that the SMI-engagement association was significantly weaker for budget posts (Table 6). H2 was therefore supported as a hypothesis of differential engagement, although the difference did not take the form of an engagement advantage for budget content.

Table 6. Key effects from the negative binomial engagement model

Effect	b	SE	IRR	95% CI	p
SMI slope: non-budget posts	0.076	0.030	1.079	[1.018; 1.145]	0.011
SMI slope: budget posts	-0.033	0.031	0.968	[0.910; 1.029]	0.300
Difference in slopes (SMI $\times$ budget status)	-0.109	0.027	0.897	[0.850; 0.946]	<0.001

Source: own compilation

Note: $N=42,592$ lemmatized posts from 518 municipalities. The model includes the controls specified in Section 3.9, uses log followers as an offset, and applies municipality-clustered standard errors. The budget-post slope is the linear combination of the SMI coefficient and the interaction term.

4.4. Institutionalization of communication and framing of budget content

The fourth stage examined whether SMI was associated with fiscal versus development-investment framing. In the main municipality $\times$ year-month model for December 2023-April 2024, the association between SMI and share_fiscal was not statistically significant. The null result was reproduced in the extended January 2023-April 2024 specification and in two post-level auxiliary models (Table 7).

These results provide no evidence that the organizational embedding of social media communication predetermines whether municipal budget content is framed more fiscally or more in development-investment terms. RQ4 therefore did not reveal a significant relationship between SMI and the semantic profile of budget communication.

Table 7. SMI and the framing of budget content

Analysis	Period / outcome	b	SE	OR (logit)	95% CI	p
Municipality $\times$ year-month, weighted linear model	Dec. 2023-Apr. 2024: share_fiscal	0.012	0.014	n.a.	[-0.015; 0.040]	0.392
Municipality $\times$ year-month, weighted linear model	Jan. 2023-Apr. 2024: share_fiscal	0.008	0.010	n.a.	[-0.012; 0.029]	0.436
Post-level auxiliary logit	Development-investment predominance	0.007	0.041	1.007	[0.929; 1.091]	0.873
Post-level auxiliary logit	Fiscal predominance	-0.003	0.045	0.997	[0.912; 1.089]	0.943

Source: own compilation

Note: Short-window linear model: $N=1,922$ municipality $\times$ year-month observations (500 municipalities); extended linear model: $N=6,439$ (518 municipalities); post-level logit models: $N=7,318$ posts (500 municipalities). Linear models are weighted by budget-token counts. All models use the controls specified in Section 3.9 and municipality-clustered standard errors.

4.5. Synthesis of results

The results show that the association between communication institutionalization and budget content is selective and depends on the level of analysis. Higher SMI was associated with lower odds that a lemmatized post was budget-related, was not significantly associated with the presence of non-empty text, and was not significantly associated with fiscal versus development-investment framing.

The clearest differentiated pattern concerns audience engagement. Higher SMI was positively associated with engagement for non-budget posts, whereas the corresponding association for budget posts was not statistically significant. The negative SMI $\times$ is_budget_post interaction confirms that the SMI-engagement association was significantly weaker for budget posts. These findings indicate that institutionalization is related to engagement differently across content categories and does not operate as a mechanism that uniformly increases the presence, textuality, attractiveness, or specific framing of budget content.

5. Discussion

The results show that the institutionalization of communication in social media has selective associations with budget content. Higher SMI was associated with a lower relative presence of budget content in the lemmatized publication stream, was not significantly associated with the presence of non-empty text or distinct framing, and was positively associated with engagement only for non-budget posts. The organizational embedding of communication therefore does not transform all dimensions of budget communication in the same way.

The first important conclusion concerns the presence of budget themes. Higher SMI was associated with lower odds that a lemmatized post was budget-related. This finding is consistent with the view that the relative presence of budget content may depend not only on the organizational maturity of communication but also on the rhythm of the budget process, the current local agenda, the decisions of authorities, and the assessment of the communicative utility of a given topic. The budget is not a standard category of informational content. Its communication can be strongly linked with specific moments of the budget procedure, resolutions, investments, taxes, fees, or the need to justify financial decisions. General institutionalization therefore does not by itself ensure a larger budget share in the publication stream.

The second conclusion concerns the form of expression. Theoretically, it can be assumed that more institutionalized communication favors more developed forms, including posts containing a textual component. Text enables adding context, explaining the consequences of financial decisions, and linking the budget to specific local problems. In the full model, however, SMI was not significantly associated with the probability that the Message field contained non-empty text. Thus, after accounting for temporal, territorial, typological, and financial-demographic differences, there was no evidence that institutionalization differentiated the textuality of the publication stream. This result is consistent with a cautious conceptualization of communication professionalization as an organizational process that can create conditions for more orderly practices but does not automatically determine the specific form of every publication (Criado & Villodre, 2022; Sharif et al., 2015).

The third conclusion concerns audience engagement. Higher SMI was positively associated with engagement for non-budget posts, whereas the corresponding slope for budget posts was not statistically significant. The negative interaction indicates a significantly weaker SMI-engagement association for budget content. H2 was therefore supported as a hypothesis of differential engagement, but the result does not indicate a budget-specific engagement advantage.

The fourth conclusion concerns framing. The lack of a significant association between SMI and the share of fiscal or development-investment framing indicates that the organizational embedding of communication does not predetermine the semantic profile of budget content. This result holds both in the main analysis window and in the variant covering a longer observation period. This means that the way the budget is framed may depend more on the nature of specific issues, financial decisions, investments, local problems, or the editorial style than on the general level of communication institutionalization.

These results correspond well with a broader reflection on social media in public administration. The mere presence of a public organization in social media does not mean a high quality of communication, just as institutionalization itself does not have to improve every dimension of expression. Professionalization can strengthen procedures, organizational stability, and measurement, but the present results show that its association with engagement differs by content type. Content that is particularly cognitively demanding, such as the budget,

requires additional editorial, explanatory, and contextualizing work. In this sense, the results are consistent with the findings of Bischoff and co-authors (2026), according to which the institutionalization of communication is more strongly linked with the organization of practices than with a simple increase in the attractiveness of every content category.

From a theoretical perspective, the most important contribution of the article lies in separating four levels of analysis: topic presence, form of expression, reception, and framing. The results show that these levels do not have to be associated with institutionalization in the same way. Higher SMI was associated with lower odds of budget-related content, was not significantly associated with non-empty text or semantic framing, and had different engagement associations for budget and non-budget posts. Institutionalization should therefore be treated as an important but insufficient condition for altering the way particularly complex topics are communicated.

It is also worth emphasizing the importance of the adopted time window. The main models cover the period directly after the SMI measurement, which limits the risk of relating a cross-sectional institutionalization indicator to the distant past. At the same time, this implies caution when formulating conclusions about the long-term dynamics of budget communication. The extended framing analysis for the period from January 2023 to April 2024 serves a verification function and shows that the lack of association between SMI and the semantic profile of budget content also holds within a wider horizon.

6. Practical implications

The results indicate that general institutionalization should not be treated as a way to increase the relative visibility of budget content. In the present sample, higher SMI was associated with lower odds that a lemmatized post was budget-related. Organizational embedding cannot substitute for editorial decisions regarding when, how, and for what purpose the budget is to be communicated to residents. From a practical standpoint, budget communication therefore requires separate thematic planning. Municipalities should treat information about revenues, expenditures, investments, taxes, fees, or financial limitations as a distinct category of public content that requires a conscious selection of the publication moment, scope of information, and method of explanation.

The results concerning engagement also suggest caution when evaluating the effectiveness of budget communication solely on the basis of the number of reactions. Higher SMI was positively associated with engagement for non-budget posts, but not with engagement for budget posts. In the case of topics with high public weight, other evaluation criteria are therefore also essential: information transparency, clarity of justifications, accessibility of language, and the possibility of linking financial decisions to the local context. The professionalization of communication should be supplemented with specialized budget communication practices. Organizational routines may support social media management, but in the case of the budget they do not replace explanatory, editorial, and contextualizing work. Effective budget communication requires a conscious translation of financial information into content that is understandable and useful for residents.

7. Limitations and future directions

The adopted design of data and models delineates the boundaries of result interpretation. The principal technical limitations include the cross-sectional nature of SMI, the use of baseline financial-demographic characteristics, the restriction of content analysis to textual material,

incomplete lexical coverage, and the short observation window. The results describe statistical associations and do not support causal inference.

A second limitation concerns the method of measuring content reception. Audience engagement was measured using reactions, comments, and shares. These are important indicators of user activity in social media, but they do not predetermine content comprehension, changes in residents' knowledge, or the quality of the relationship between the municipality and the audience. In the case of budget communication, high engagement does not have to mean a better explanation of financial decisions, and low engagement does not have to mean a lack of informational value of the message.

A third limitation concerns the operationalization of framing. The applied distinction between the fiscal and development-investment approaches allows for capturing the baseline semantic profile of budget content, but it does not exhaust all possible ways of presenting the budget.

Future research should develop the analysis in several directions: 1. First, it is worth extending the observation period and verifying whether the associations between SMI and budget communication change in successive phases of the budget cycle. 2. Second, combining lexical analysis with qualitative and visual analysis is needed to capture not only the presence of keywords but also the method of explaining financial decisions. 3. Third, it is worth analyzing the comments and reactions of residents not only quantitatively but also semantically, to verify whether budget content provokes questions, approval, criticism, disputes, or requests for additional information. 4. Fourth, future research should encompass organizational processes on the part of municipalities: budget communication planning, the roles of individuals responsible for content preparation, cooperation between financial and communication departments, and publication approval procedures.

Conclusion

The objective of the article was to verify whether the institutionalization of communication in social media is associated with the way municipalities communicate budget content. The analysis included four levels: topic presence of the budget in the publication stream, textuality of posts, audience engagement, and the framing of budget content in the fiscal and development-investment dimensions.

The results show that higher SMI was associated with lower odds that a lemmatized post was budget-related and was not significantly associated with the probability that a post contained non-empty text. No significant association was found between SMI and fiscal versus development-investment framing. The organizational embedding of communication therefore does not automatically translate into more frequent, more textual, or semantically distinct budget communication.

The most explicit differentiated result concerns audience engagement. Higher SMI was positively associated with engagement for non-budget posts, whereas the corresponding association for budget posts was not statistically significant. The negative interaction confirms that the SMI-engagement association differed between the two content categories.

The contribution of the article lies in showing that the institutionalization of communication in social media has selective significance. It is associated with engagement differently across content categories, but it does not constitute an independent mechanism increasing the visibility, explainability, or specific framing of budget topics. Budget communication therefore requires not only a general professionalization of social media activity but also thematically oriented editorial, explanatory, and contextualizing practices.

Data availability

The construction, coding rules, and descriptive statistics of the SMI are reported in the manuscript. Municipality-level SMI values are not publicly disclosed because of the conditions governing the use of the survey data. Additional information may be provided by the authors subject to those conditions.

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