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QUANTITATIVE EVALUATION OF ERASMUS+ SPORT CALLS: COOPERATION PARTNERSHIPS AND CAPACITY BUILDING USING AN INPUT-ORIENTED DEA VRS MODEL

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ABSTRACT

This paper presents a quantitative evaluation of the effectiveness of Erasmus+ projects within the "Cooperation Partnerships" and "Capacity Building" strands in the field of sport. The primary objective is to assess the operational efficiency of these projects to identify best practices (*benchmarking*) and explore opportunities for resource optimization. Methodologically, *Data Envelopment Analysis* (*DEA*) was employed using an input-oriented *VRS* (*Variable Returns to Scale*) model, allowing for an objective comparison of heterogeneous decision-making units (DMUs). The project budget served as the primary input, while the outputs comprised eight variables categorized into reach, relevance, and sustainability.

Analyzing a sample of 534 partnership projects and 42 capacity building projects, the results reveal significant disparities in efficiency. Findings indicate that projects with smaller budgets (approximately €120,000) often demonstrate higher technical efficiency than those receiving maximum funding, where budget increases are not proportionately matched by measurable outputs. For capacity building projects, an average DEA score of 0,697 suggests a potential for 30,3% budget savings while maintaining current output levels. The paper concludes that the DEA model offers a robust framework for the transparent evaluation and strategic allocation of funds within EU sports policy.

Keywords: project management, sport, Erasmus+, operations management, change management, Data Envelopment Analysis.

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KVANTITATIVNA EVALUACIJA ERASMUS POZIVA U OBLASTI SPORTA „PARTNERSKA SARADNJA“ I „IZGRADNJA KAPACITETA“ INPUT-ORIJENTISANIM DEA VRS MODELOM

APSTRAKT

Ovaj rad se bavi kvantitativnom evaluacijom efikasnosti Erasmus+ projekata u oblastima „Partnerska saradnja“ i „Izgradnja kapaciteta“ u oblasti sporta. Osnovni cilj istraživanja je procena operativne efikasnosti ovih projekata kako bi se identifikovali primeri najbolje prakse (*benchmarking*) i ispitivanja mogućnosti za optimizaciju korišćenja resursa. U metodološkom smislu primenjena je analiza obuhvata podataka (*Data Envelopment Analysis – DEA*), korišćenjem input-orijentisanog VRS modela (*Variable Returns to Scale*), koji omogućava objektivno poređenje heterogenih jedinica odlučivanja (DMU). Kao osnovni ulaz (*input*) korišćen je budžet projekta, dok je izlaz (*output*) obuhvatio osam varijabli grupisanih u tri dimenzije: doseg, relevantnost i održivost. Rezultati analize, sprovedene na uzorku od 534 projekta partnerske saradnje i 42 projekta izgradnje kapaciteta, ukazuju na značajne razlike u njihovoj efikasnosti. Utvrđeno je da projekti sa manjim budžetima (oko 120.000 €) često ostvaruju viši nivo tehničke efikasnosti u poređenju sa projektima koji raspolažu maksimalnim finansijskim sredstvima, kod kojih povećanje budžeta nije praćeno srazmernim rastom merljivih rezultata. Kod projekata izgradnje kapaciteta prosečan DEA skor od 0,697 ukazuje na mogućnost smanjenja budžeta za 30,3%, uz zadržavanje istog nivoa rezultata. Rad zaključuje da DEA model pruža pouydan okvir za transparentnu evaluaciju i stratešku alokaciju sredstava u sportskim politikama EU.

Ključne reči: upravljanje projektima, sport, Erasmus+, upravljanje operacijama, upravljanje promenama/ analiza obuhvata podataka.

Introduction

Project management in sport extends beyond the scope of a purely technical discipline; it represents a strategic tool that enables sports organizations to transform their visions into tangible results (Perić, 2017). In practice, however, a gap often exists between organizational ambitions and the resources available to achieve them. Vuković (2018) emphasizes that project funding constitutes a key mechanism for overcoming budgetary constraints, while Lukić (2018) argues that securing external funding, particularly from European Union programmes, requires a high level of expertise in proposal writing and a thorough understanding of funding procedures. Since reliance on a single funding source entails considerable financial risk (Mirković, 2020), the ability of project managers to allocate and utilize available resources efficiently becomes a critical determinant of project success. Accordingly, this study evaluates projects funded through the Erasmus+ programmes *Partnership*

Cooperation and *Capacity Building*, with particular emphasis on analysing technical and allocative inefficiency in order to formulate recommendations for future applicants and project managers.

Erasmus+ Capacity Building projects are designed to promote knowledge transfer and strengthen institutional and administrative capacities through cooperation between organizations from the European Union and partner countries (EACEA, 2024). In contrast, Partnership Cooperation projects primarily foster European values, social inclusion, innovation, and the development of new approaches to learning and participation in sport (Tempus Foundation, 2023; European Commission, 2024). Despite their different objectives, both funding schemes share a common goal of addressing systemic challenges in contemporary sport, ranging from combating negative social phenomena to strengthening social cohesion and promoting volunteerism.

In an environment characterized by increasing demands for accountability and efficient resource utilization, monitoring and evaluation (M&E) has become an essential component of project management. Popović (2021) and Radulović (2019) emphasize its importance in assessing the alignment of project outcomes with public policy objectives. Evaluation, understood as a continuous process encompassing project design, implementation, and the post-project phase, provides the evidence required for informed resource allocation (Jovanović, 2015; Kerzner, 2017). Moreover, it serves as a mechanism for organizational learning, enabling institutions to identify shortcomings, improve future project implementation, and avoid repeating inefficient management practices (Smith & Hayes, 2019; Jovanović & Petrović, 2021).

To objectively assess efficiency in situations involving multiple inputs and outputs, this study applies Data Envelopment Analysis (DEA). Specifically, the Variable Returns to Scale (VRS) model is employed because it enables non-parametric benchmarking and facilitates comparisons among projects of different sizes and operational capacities (García-Unanue et al., 2020; Manoli & Hodgkinson, 2022). Using this approach, the study seeks to examine whether there is scope for improving resource utilization without compromising project outcomes by identifying the efficiency frontier and establishing reference projects that represent examples of best practice.

Methodology

The non-parametric Data Envelopment Analysis (DEA**)** method was employed to evaluate projects funded by the European Union. Its principal advantage lies in its ability to simultaneously assess multiple inputs and outputs without requiring the *a priori* specification of weighting coefficients, thereby reducing subjectivity in performance evaluation (Charnes, Cooper, & Rhodes, 1978). Unlike conventional regression techniques, DEA identifies an *efficiency frontier*, providing practical benchmarks and improvement targets for inefficient decision-making units (Banker, Charnes, & Cooper, 1984).

Within the fields of sport and education, DEA enables the integration of heterogeneous performance indicators into a single composite measure of efficiency (Liu et al., 2013). This study applies the *Variable Returns to Scale (VRS)* model, which is more appropriate than the *Constant Returns to Scale (CRS)* model because it accounts for differences in project size and recognizes that smaller projects do not benefit from the same economies of scale as larger initiatives. Consequently, the VRS model avoids systematically disadvantaging smaller organizations and provides a more realistic assessment of technical efficiency.

To obtain a more comprehensive understanding of project performance, the analysis does not rely on a single DEA model but instead adopts a multidimensional evaluation framework consisting of four separate input-oriented DEA VRS models:

1. Reach model: evaluates efficiency using one input (project budget) and three outputs.

2.Relevance model: evaluates efficiency using one input (project budget) and two outputs.

3. Sustainability and Dissemination model: evaluates efficiency using one input (project budget) and three outputs.

4. Comprehensive model: evaluates overall project efficiency using one input (project budget) and all eight output variables simultaneously.

The variables within these models are defined as follows:

Decision-Making Unit (DMU): each individual project within the *Partnership Cooperation* or *Capacity Building* programme.

Input (common to all models): total financial resources (project budget) allocated to each project.

Outputs (eight variables in total):

Reach: number of partners, number of participating countries, and number of participants.

Relevance*:* number of programme objectives addressed and number of thematic areas covered.

Sustainability and Dissemination: number of trained trainers, number of training modules developed, and number of dissemination events organized.

Mathematically, a separate linear programming problem is solved for each decision-making unit (DMU), denoted as j_0. Depending on whether a partial model is estimated (where $s \in \{3\}$) or the comprehensive model is applied ($s = 8$), the input-oriented VRS formulation is expressed as follows:

$$\min \theta$$

subject to:

$\sum_{j=1}^{n} \quad \lambda jxij \leq \theta x_{ij_0}$ (Input limit for the budget)

$\sum_{j=1}^{n} \quad \lambda jyrj \geq y_{rj_0}$ (Output limits for all 8 variables)

$\sum \quad \lambda j = 1$ (VRS convexity condition - key difference compared to CRS)

$\lambda j \geq 0$

Where θ represents the coefficient of technical efficiency (in the range from 0 to 1), x_{ij} is the value of input (budget) for unit j, y_{rj} is the value of output r for unit j, while λj denotes the weighting coefficients of the projects that form the reference limit of efficiency.

The research is carried out through the following stages:

Data preparation and sparsity rule check: In this phase, variables are normalized and outliers are eliminated. Also, the empirical rule (Rule of Thumb) is checked, according to which the number of projects (n) must be significantly greater than the triple sum of input and output ($n \geq 3 \cdot (1 + s)$). For the most complex, integral model with 8 outputs, the minimum required sample is 3· (1 + 8) = 27 units, which is fully met in both observed datasets (534 partnership projects and 42 capacity building projects).

Running partial DEA models by dimensions: Efficiency coefficients are calculated specifically for the reach, relevance and sustainability dimensions in order to accurately map the sources of partial inefficiency.

Running the integral DEA model: A comprehensive model is run with all 8 outputs at once to generate a final technical efficiency score and conduct overall benchmarking.

Identification of reference units and optimization potential: Based on the results of all models, projects at the efficiency limit (θ = 1) are identified, which serve as best practice models (benchmarks), while for inefficient units (θ < 1), the percentage of required reduction of resources (input slacks) is projected while maintaining the existing results.

Results

The evaluation was carried out using the input-oriented DEA-VRS (Data Envelopment Analysis – Variable Returns to Scale) model. The results are structured along three key dimensions: reach, relevance, and sustainability and dissemination, followed by an integrated analysis of effectiveness.

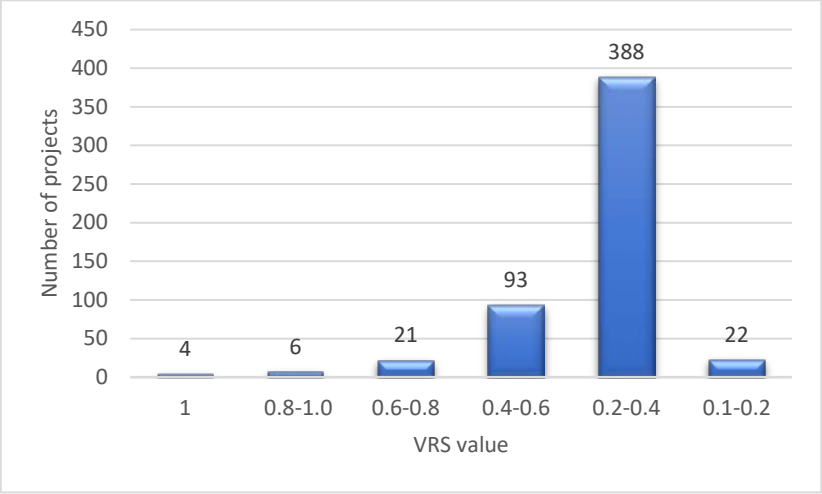
Reach Dimension: Cooperation Partnerships Projects

In this dimension, effectiveness is evaluated through three key parameters:

- Number of partners: the total number of organizations involved in the project.
- Number of countries: the geographical distribution of the consortium.

- Number of participants: the direct reach of project activities in terms of the number of participants.

Figure 1. Effectiveness of Erasmus+ Cooperation Partnerships projects in the field of sport according to their impact reach



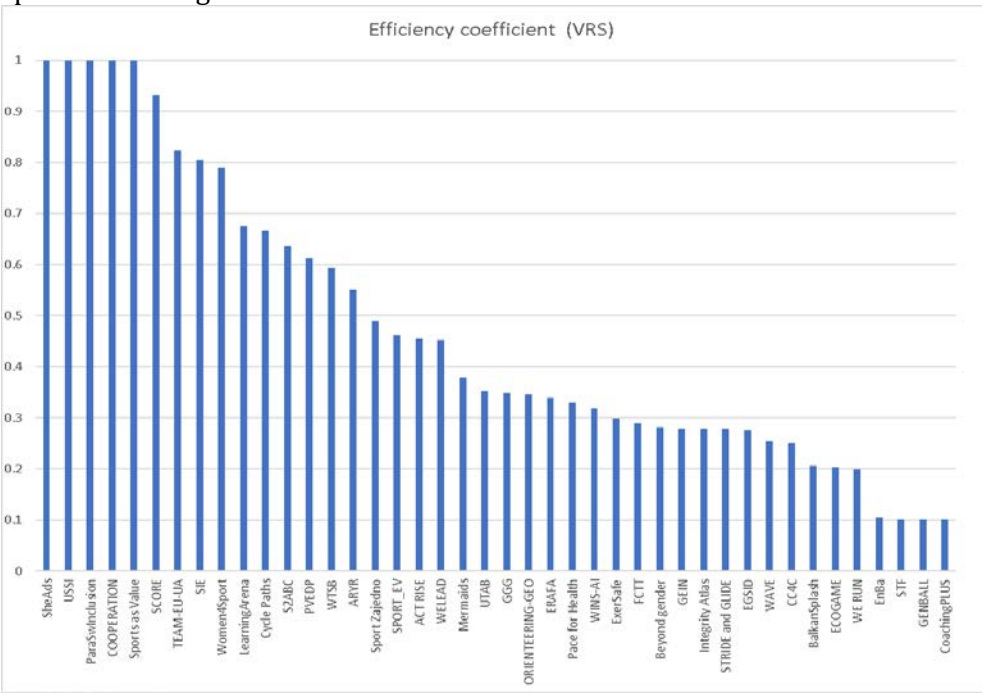
The analysis of the Reach dimension for Cooperation Partnerships projects (Figure 1) revealed the following findings:

- **High prevalence of technical inefficiency:** The largest proportion of projects (388) achieved DEA efficiency scores between 0.2 and 0.4. This indicates that many projects do not achieve an efficient balance between project inputs (e.g., the number of partners and participating countries) and outputs (i.e., the number of participants reached). In many cases, projects involving a larger number of partners and participating countries do not achieve a proportionate increase in participant reach.
- **Fully efficient projects:** Only four projects achieved the maximum DEA efficiency score (VRS = 1.0), thereby forming the efficiency frontier for this dimension. These projects demonstrate the most efficient balance between project resources and participant reach and serve as reference examples of good practice.
- **Appropriateness of the VRS model:** The application of the Variable Returns to Scale (VRS) model is particularly appropriate in this context because it accounts for situations in which changes in project inputs are not accompanied by proportional changes in outputs. In Cooperation Partnerships projects, increasing the number of partners may introduce additional coordination and administrative complexity, meaning that larger project consortia do not necessarily achieve proportionally greater participant reach.

Projects with low efficiency scores (below 0.4) should reassess whether such a large number of partners or participating countries is justified in relation to the intended project outcomes. In many cases, smaller and more focused consortia may achieve higher levels of technical efficiency. Projects involving a large number of partners while exhibiting low efficiency scores may indicate excessive administrative complexity, whereby a disproportionate share of available resources is allocated to coordination and project management rather than to activities that directly contribute to project outcomes and participant engagement.

Reach Dimension: Capacity Building Projects

Figure 2: Effectiveness of Erasmus+ capacity building projects in the field of sports according to their reach.



Unlike the previous category, Capacity Building projects (Figure 2) exhibit greater variability in technical efficiency:

- **Efficiency Leaders:** Five projects – *SheAds*, *USSI*, *ParaSwInclusion, COOPERATION*, and *Sports as Value* – achieved the maximum score (1.0). These projects demonstrated the most efficient combination of project budget, number of partners, participating countries, and participant reach.

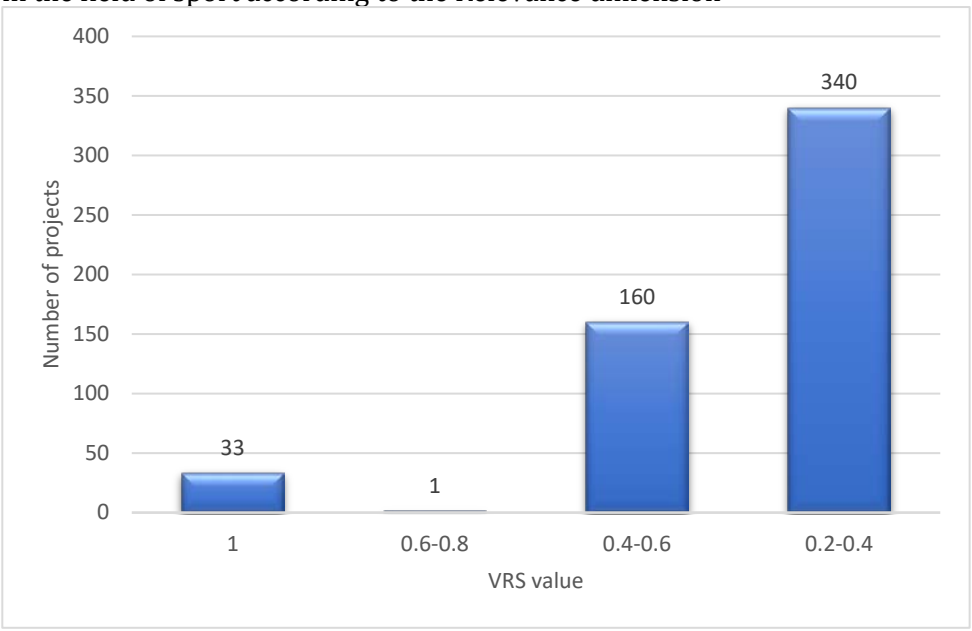
- **Distribution of Effectiveness:** The results reveal substantial variation in project performance:
  - **Average Efficiency:** The mean DEA efficiency score is approximately 0.47, indicating considerable potential for improvement across the majority of projects. On average, comparable levels of project reach could be achieved with fewer resources, or greater reach could be attained using the existing resource base.
  - **Efficiency Structure:**
    - Five projects are fully efficient (DEA score = 1.0).
    - Twenty-three projects (more than half of the sample) exhibit relatively low levels of technical efficiency.
    - The lowest efficiency score is 0.10, indicating substantial inefficiency in resource utilization compared with the projects located on the efficiency frontier.

Projects with the lowest efficiency scores, such as *CoachingPLUS* and *GENBALL*, should examine the organizational and implementation approaches adopted by the reference projects. Their relatively low efficiency is likely attributable to an imbalance between the scale of project partnerships and international participation on the one hand, and the relatively limited participant reach achieved on the other.

Relevance Dimension: Cooperation Partnerships Projects

Relevance measures a project's ability to cover the call's strategic objectives and thematic areas as comprehensively as possible in relation to the allocated resources.

Figure 3. Technical efficiency of Erasmus+ Cooperation Partnerships projects in the field of sport according to the Relevance dimension



The analysis of the Relevance dimension for Erasmus+ Cooperation Partnerships projects in the field of sport produced the following findings:

- **Fully efficient projects (DEA score = 1.0):** Thirty-three projects (e.g., *DESERve*, *STEP*, *Dance4All-Balkans*, and *Judo Kata Alliance*) constitute the efficiency frontier for this dimension. These projects achieved the most efficient alignment between the strategic objectives and thematic priorities of the call and the resources allocated. As reference projects, they provide valuable examples of good practice for identifying planning strategies that contribute to high levels of relevance.
- **Projects with lower technical efficiency (DEA score 0.2–0.4):** This is the largest group, comprising 340 projects. Within the DEA framework, a lower efficiency score does not necessarily indicate poor project management. Rather, it suggests that, relative to the reference projects, these projects require proportionally greater resources to address a comparable number of strategic objectives and thematic priorities. This may indicate a relatively narrow thematic focus or insufficient alignment between planned project activities and the objectives of the Erasmus+ call.
- **Interpretation of the Relevance dimension:** Since DEA evaluates the relationship between project inputs and outputs, the findings suggest that the breadth and quality of alignment with the priorities of the call

represent an important determinant of technical efficiency. Fully efficient projects (DEA score = 1.0) typically demonstrate the ability to:

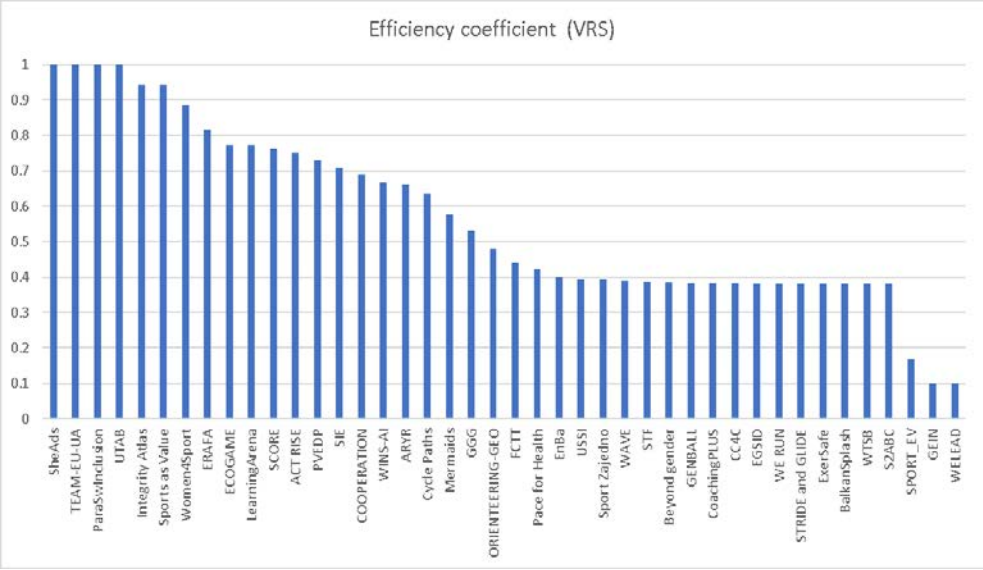
- effectively integrate multiple thematic priorities (e.g., inclusion, digitalisation, and the green transition) within a coherent project framework; and
- align planned activities closely with the strategic objectives of the call, ensuring that available resources contribute directly to the intended project outputs.

The findings indicate substantial potential for improving technical efficiency, as more than 500 projects achieved DEA scores below 1.0. For future Erasmus+ funding calls, applicants should therefore prioritize:

- Strengthening strategic alignment: ensuring that each project activity is explicitly linked to one or more objectives of the Erasmus+ call.
- Promoting multidisciplinary project design: addressing multiple thematic priorities while maintaining internal coherence and avoiding excessive thematic dispersion that could reduce overall project quality.

Dimension of Relevance: Capacity Building Projects

Figure 4. Effectiveness of Erasmus+ capacity building projects in the field of sport, categorized by relevance.



Based on the analysis of 42 Erasmus+ Capacity Building projects in the field of sport, the findings for the Relevance dimension are as follows:

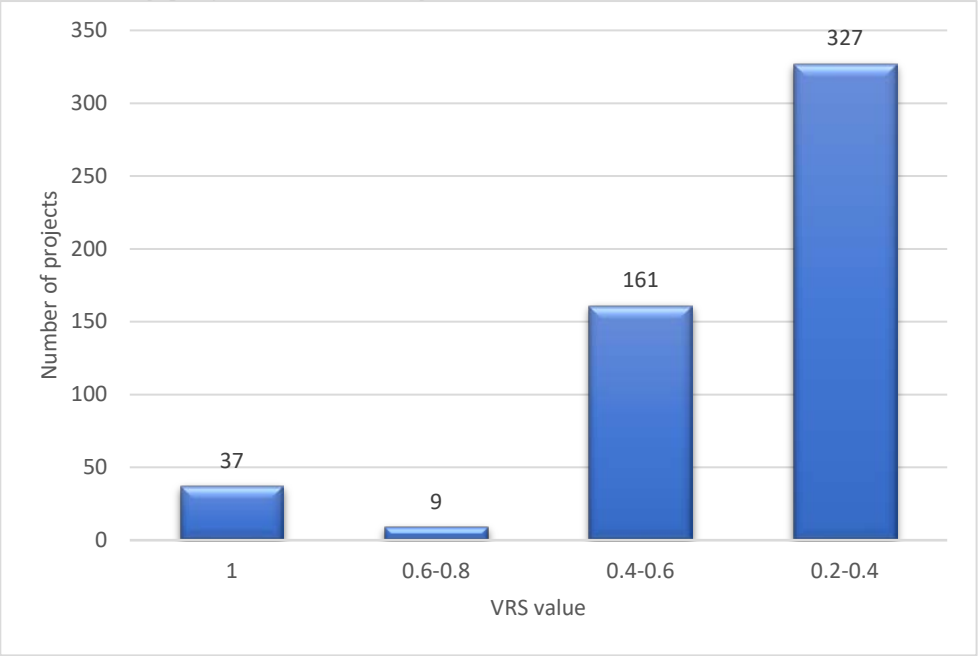
- **Fully efficient projects (DEA score = 1.0):** Four projects – *SheAds*, *TEAM-EU-UA*, *ParaSwInclusion*, and *UTAB* – achieved the maximum DEA efficiency score, thereby forming the efficiency frontier for this dimension. These projects provide valuable reference models for future Erasmus+ initiatives.
- **High technical efficiency (DEA score 0.80–0.99):** Projects such as *Integrity Atlas* and *Sports as Value* achieved efficiency scores close to the frontier, indicating a strong alignment between the strategic objectives and thematic priorities addressed and the resources allocated.
- **Average technical efficiency:** The mean DEA efficiency score for the sample is approximately 0.565, indicating substantial potential for improvement in the majority of projects with respect to their alignment with the strategic objectives and thematic priorities of the Erasmus+ call.
- **Projects with lower technical efficiency:** Nearly 48% of the projects fall within the lower efficiency category, suggesting that many address a relatively limited range of strategic objectives and thematic priorities compared with the fully efficient reference projects.

The findings indicate that the most technically efficient projects are those that successfully address multiple strategic objectives and thematic priorities of the Erasmus+ call within a coherent project framework. In contrast, projects with lower DEA scores, such as *GEIN* and *WELEAD*, appear to adopt a more narrowly focused approach. Although these projects may have achieved positive outcomes within their specific areas of intervention, their limited thematic coverage resulted in lower technical efficiency scores within the DEA framework.

Dimension: Sustainability and Dissemination

This dimension assesses a project's performance in terms of sustainability and dissemination, using the number of trainers trained, training modules developed, and dissemination events organized as output indicators.

Figure 5. Effectiveness of Erasmus+ sports cooperation partnerships projects, measured by project sustainability and dissemination



The results of the DEA analysis reveal substantial variation in the technical efficiency of Erasmus+ Cooperation Partnerships projects in the field of sport, with important implications for their sustainability and dissemination.

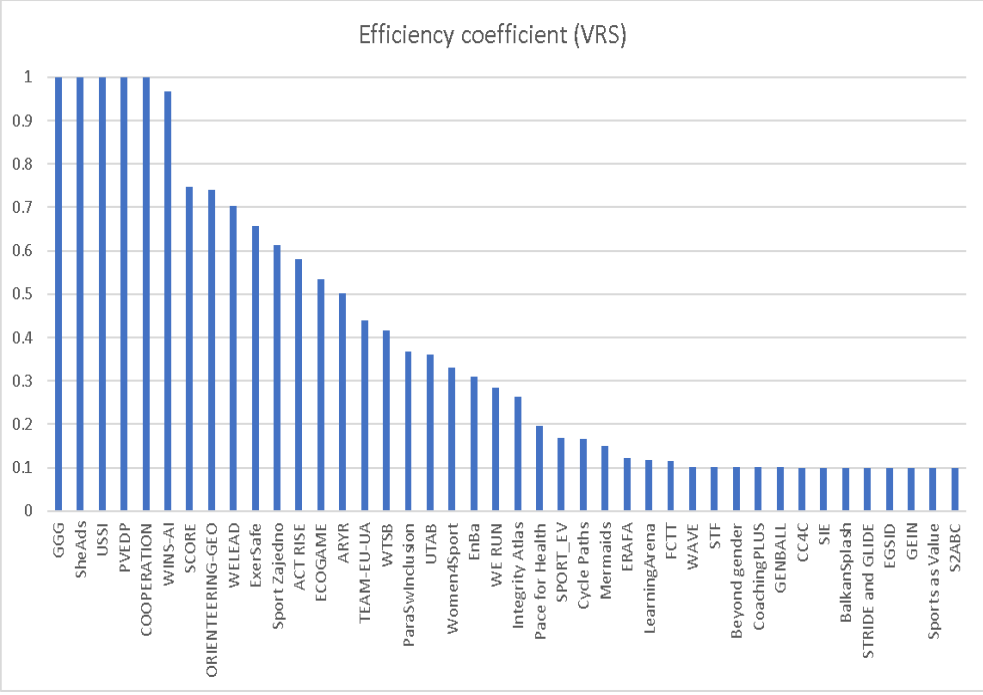
- **High prevalence of technical inefficiency:** The finding that 327 projects achieved DEA efficiency scores between 0.2 and 0.4 indicates considerable scope for improvement. The majority of projects do not utilize available resources efficiently in generating the expected outputs, including the number of trainers trained, training modules developed, and dissemination events organized.
- **Interpretation of performance:**
    - **Fully efficient projects (DEA score = 1.0):** These projects form the efficiency frontier and represent reference examples of good practice. Their performance suggests the implementation of effective dissemination strategies and efficient utilization of available resources.
    - **Projects with lower technical efficiency (DEA score 0.2–0.4):** These projects demonstrate considerable potential for improvement. More efficient organizational structures, better resource allocation, and the adoption of proven dissemination approaches could substantially enhance project outcomes without requiring additional financial resources.

- **From sustainability to long-term impact:** Within this model, sustainability is reflected through a project's capacity to generate lasting outputs beyond the funding period. Lower DEA efficiency scores are associated with weaker dissemination performance, indicating that project outputs are relatively limited in relation to the resources invested. Consequently, projects with lower technical efficiency may have reduced capacity to generate sustainable benefits after the completion of external funding.

The findings suggest that improving the allocation and utilization of available resources is essential for strengthening the sustainability and dissemination of Erasmus+ Cooperation Partnerships projects in the field of sport. Unless the efficiency with which project resources are transformed into measurable outputs is enhanced, dissemination outcomes are likely to remain limited, thereby reducing the long-term impact of project results within the sport sector.

Sustainability and Dissemination Dimension: Capacity Building Projects

Figure 6. Technical efficiency of Erasmus+ Capacity Building projects in the field of sport according to the Sustainability and Dissemination dimension



The results of the DEA-VRS (Variable Returns to Scale) analysis for Erasmus+ Capacity Building projects in the field of sport (Figure 6) reveal substantial variation in technical efficiency.

- **Efficiency frontier (fully efficient projects):** Projects such as *GGG*, *SheAds*, *USSI*, *PVEDP*, and *COOPERATION* achieved the maximum DEA efficiency score (1.0), thereby forming the efficiency frontier for this dimension. Representing 11.9% of the analyzed sample, these projects demonstrate the most efficient utilization of available resources in generating the intended project outputs.
- **Projects with high technical efficiency:** This group includes projects with efficiency scores close to the frontier, such as *WINS-AI* (0.968), indicating only limited scope for further improvement. Projects including *SCORE* (0.747) and *ORIENTEERING-GEO* (0.741) also demonstrate relatively high technical efficiency, although their results suggest opportunities to further strengthen dissemination activities and training-related outputs.
- **Projects with lower technical efficiency:** More than 60% of the analyzed projects fall within the lower efficiency category, with DEA scores declining to 0.10 in some cases (e.g., *S2ABC* and *Sports as Value*). Within the DEA framework, these results indicate that the resources allocated were not translated into project outputs as efficiently as in the reference projects, particularly with respect to dissemination activities and training outcomes.

These findings confirm that DEA evaluates relative technical efficiency rather than absolute project performance. Consequently, projects with comparatively smaller budgets may still be classified as fully efficient when they achieve the highest possible level of outputs relative to the resources available.

Results for the Three Output Dimensions: Cooperation Partnerships Projects

The results obtained from applying the input-oriented DEA-VRS model to Erasmus+ Cooperation Partnerships projects in the field of sport are presented in Figure 7.

Figure 7. Technical efficiency of Erasmus+ Cooperation Partnerships projects in the field of sport

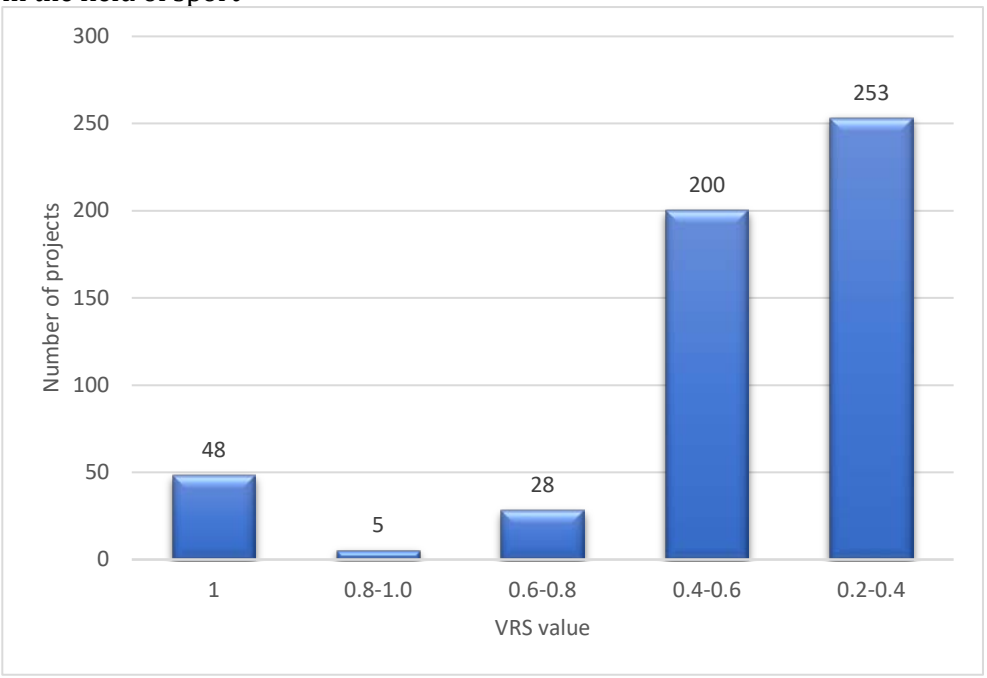


Figure 7 illustrates the distribution of DEA-VRS efficiency scores across the analyzed projects. The horizontal axis represents the DEA efficiency score, while the vertical axis indicates the number of projects within each efficiency interval. The distribution reveals several notable findings:

- **High prevalence of technical inefficiency:** The largest group of projects (more than 120) achieved DEA efficiency scores of approximately 0.30, indicating considerable scope for improving the utilization of available resources in generating project outputs.
- **Concentration around moderate efficiency levels:** Nearly 100 projects achieved DEA scores between 0.45 and 0.50, reflecting moderate levels of technical efficiency while remaining below the efficiency frontier.
- **Fully efficient projects:** Approximately 50 projects achieved the maximum DEA efficiency score (1.0), thereby forming the efficiency frontier and serving as reference examples of good practice.
- **Distribution of efficiency scores:** The number of projects decreases progressively as DEA efficiency scores approach **1.0**, indicating that relatively few projects operate at or near the efficiency frontier.

Basic descriptive statistics for the DEA-VRS analysis of Erasmus+ Cooperation Partnerships projects in the field of sport are presented in Table 1.

Table 1. Descriptive statistics of DEA-VRS efficiency scores for Erasmus+ Cooperation Partnerships projects in the field of sport

Indicator	Value (VRS Score)
Number of projects	534
Mean DEA efficiency score	0.471
Median	0.415
Minimum	0.300
Maximum	1.000
Fully efficient projects (DEA score = 1.0)	48

The descriptive statistics indicate several important characteristics of the analyzed projects:

- **Predominance of moderate and lower efficiency levels:** The mean DEA efficiency score of 0.471 and the median value of 0.415 indicate that most projects operate below the efficiency frontier. The lower median relative to the mean suggests a positively skewed distribution, with a relatively small number of highly efficient projects increasing the average efficiency score.
- **Considerable potential for improvement:** The relatively low average efficiency score, together with the minimum score of 0.300, indicates substantial scope for improving the technical efficiency of many projects.
- **Fully efficient projects:** Only **48 projects** (approximately 9% of the sample) achieved the maximum DEA efficiency score. These projects constitute the efficiency frontier and may serve as reference models for improving the performance of less efficient projects.
- **Variation in technical efficiency:** The difference between the minimum (0.300) and maximum (1.000) DEA efficiency scores demonstrates considerable variation in technical efficiency among projects implemented within the same Erasmus+ programme.

Results for the Three Output Dimensions: Capacity Building Projects

The results obtained from applying the input-oriented DEA-VRS model to Erasmus+ Capacity Building projects in the field of sport are presented in Figure 8.

Figure 8: Technical efficiency of Erasmus+ Capacity Building projects in the field of sport

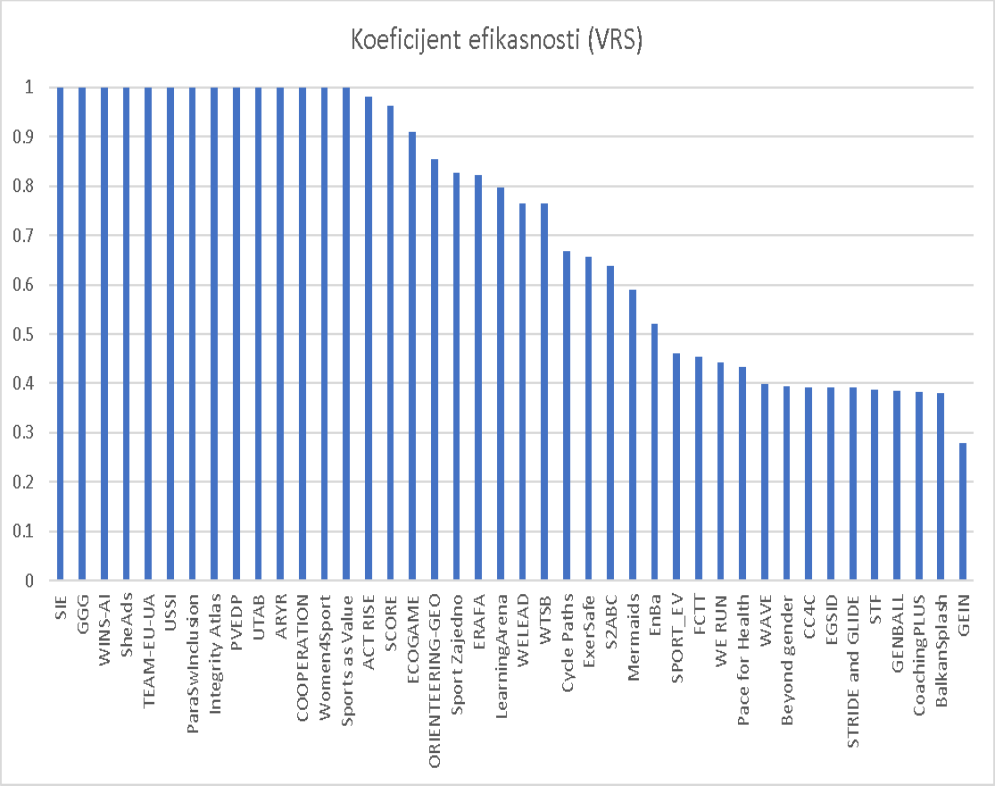


Figure 8 presents the distribution of DEA-VRS efficiency scores across the analyzed projects. Based on their technical efficiency, the projects can be grouped into three categories:

- **Fully efficient projects:** Fourteen projects (from *TEAM-EU-UA* to *Sports as Value*) achieved the maximum DEA efficiency score (1.0), thereby forming the efficiency frontier. These projects represent reference examples of good practice within the analyzed sample.
- **Projects with high technical efficiency:** Projects such as *ACT RISE*, *SCORE*, and *ECOGAME* achieved DEA efficiency scores above 0.80, indicating performance close to the efficiency frontier while still retaining some potential for further improvement.
- **Projects with lower technical efficiency:** DEA efficiency scores decline substantially among the remaining projects. Projects such as *GENBALL*, *BalkanSplash*, and particularly *GEIN* achieved efficiency scores below 0.40, indicating that the resources allocated were translated into project outputs less efficiently than in the reference projects.

Basic descriptive statistics for the DEA-VRS analysis of Erasmus+ Capacity Building projects in the field of sport are presented in Table 2.

Table 2. Descriptive statistics of DEA-VRS efficiency scores for Erasmus+ Capacity Building projects in the field of sport

Indicator	Value (VRS Score)
Number of projects	42
Mean DEA efficiency score	0.697
Median	0.781
Minimum value	0.279
Maximum value	1.000
Fully efficient projects (DEA score = 1.0)	14

The descriptive statistics reveal several important characteristics of the analyzed Capacity Building projects:

- **High proportion of fully efficient projects:** Fourteen of the 42 projects (33.3%) achieved the maximum DEA efficiency score (1.0), thereby forming the efficiency frontier for the analyzed sample.
- **Distribution of efficiency scores:** The median DEA efficiency score (0.781) exceeds the mean (0.697), indicating a negatively skewed distribution. This suggests that most projects achieved relatively high levels of technical efficiency, while a relatively small number of low-efficiency projects reduced the overall mean.
- **Variation in technical efficiency:** The difference between the minimum (0.279) and maximum (1.000) DEA efficiency scores demonstrates substantial variation in technical efficiency across the analyzed projects, reflecting differences in the efficiency with which available resources were transformed into measurable project outputs.

Discussion

The application of the input-oriented DEA-VRS model provides important insights into the technical efficiency of Erasmus+ Cooperation Partnerships and Capacity Building projects in the field of sport. The results demonstrate considerable variation in the efficiency with which projects transform available financial and organizational resources into measurable outputs, including participant reach, training activities, dissemination events, and educational materials.

For Cooperation Partnerships, the findings indicate that projects with comparatively smaller budgets frequently achieved higher levels of technical efficiency than projects supported by substantially larger grants. Several projects, including *Mindful Moves*, *STOP-Radicalization*, *DEDALUS*, and *AGEFORCE*, achieved the maximum DEA efficiency score (1.0) and therefore formed the efficiency frontier. These projects demonstrate that high technical

efficiency is not necessarily associated with greater financial investment but rather with the effective utilization of available resources.

According to the DEA methodology, projects achieving a DEA-VRS efficiency score of 1.0 are considered fully technically efficient, whereas projects with scores below 1.0 are classified as relatively inefficient because they could theoretically produce the same outputs with fewer resources or achieve higher outputs using the same level of inputs.

Among the 534 Cooperation Partnerships projects, 48 projects reached the efficiency frontier, whereas 486 projects operated below the frontier. The total budget allocated to fully efficient projects amounted to €9.34 million, corresponding to an average budget of approximately €194,583 per project. By comparison, the remaining projects received a combined budget of more than €171.4 million, with an average allocation of approximately €352,713 per project. Consequently, the average budget of technically inefficient projects was approximately 81% higher than that of fully efficient projects. These findings suggest that larger financial allocations alone do not guarantee higher technical efficiency and that many lower-budget projects achieved comparable or superior outputs through more efficient resource utilization.

Projects with DEA scores close to the minimum value (approximately 0.30) were frequently among those receiving the highest levels of financial support. Despite larger budgets, these projects did not generate proportionally higher numbers of participants, training activities, or dissemination outputs than projects operating with substantially fewer resources. This finding indicates diminishing returns associated with increasing project size, supporting the appropriateness of the Variable Returns to Scale assumption adopted in this study.

A similar pattern emerged for Capacity Building projects, although their overall level of technical efficiency was higher. Fourteen of the forty-two analyzed projects achieved the maximum DEA efficiency score and formed the efficiency frontier. The mean DEA efficiency score for the sample was 0.697, indicating that, on average, projects could theoretically achieve the same level of outputs while using approximately 30% fewer resources if they operated as efficiently as the reference projects. At the opposite end of the distribution, projects such as *GEIN* (0.279) and *BalkanSplash* (0.381) exhibited considerably lower technical efficiency despite relatively substantial financial support, suggesting that available resources were not transformed into project outputs as efficiently as in the benchmark projects.

The use of the DEA-VRS model is particularly appropriate in the evaluation of Erasmus+ sport projects because these initiatives differ substantially in scale, organizational complexity, and financial resources. Unlike constant returns to scale models, the VRS specification evaluates projects relative to other projects operating under similar production conditions, thereby avoiding systematic bias against smaller initiatives. Consequently, the results provide a more

realistic assessment of technical efficiency across heterogeneous project portfolios.

It should also be emphasized that DEA measures relative technical efficiency rather than the intrinsic quality or societal value of a project. A project identified as fully efficient is not necessarily the most innovative or socially impactful; rather, it represents the project that most efficiently transformed available inputs into measurable outputs within the analyzed sample. Therefore, DEA should be regarded as a complementary decision-support tool that evaluates resource utilization alongside broader qualitative assessments of project outcomes and long-term impact.

Research limitations

Several methodological limitations should be considered when interpreting the findings of this study.

First, the relatively high technical efficiency observed among smaller-budget projects may partially reflect a well-documented characteristic of the DEA-VRS model. Because VRS evaluates decision-making units relative to other units operating at a comparable scale, projects with very small input levels may more easily become fully efficient when suitable reference units are unavailable (Banker, Charnes, & Cooper, 1984).

Second, the discriminating power of DEA decreases as the number of variables increases relative to the sample size. In the case of the Capacity Building projects (N = 42), the relatively high proportion of fully efficient projects (33.3%) may therefore be partly attributable to the limited ability of the model to distinguish between projects when numerous output variables are included simultaneously. This phenomenon is widely recognized in the DEA literature and may result in a larger number of units being classified as fully efficient (Cooper, Seiford, & Tone, 2007).

Third, DEA evaluates relative technical efficiency based exclusively on quantitative input and output indicators. Consequently, the model does not capture qualitative dimensions of project performance, such as the quality of educational content, participant satisfaction, innovation, long-term policy influence, or broader societal impact. These aspects should therefore be assessed using complementary qualitative evaluation methods.

Finally, the results should be interpreted within the context of the analyzed Erasmus+ sport projects and should not be generalized to other funding programmes or policy areas without additional empirical validation. Future research could combine DEA with qualitative assessment methods or dynamic efficiency models to provide a more comprehensive evaluation of project performance over time.

Conclusion

Based on the findings obtained using the input-oriented DEA-VRS model, several conclusions can be drawn regarding the technical efficiency of Erasmus+ projects in the field of sport.

First, the analysis demonstrates that smaller-budget Cooperation Partnerships frequently achieve higher levels of technical efficiency than projects receiving substantially larger financial support. Several projects with comparatively modest budgets reached the efficiency frontier, indicating that the effective organization and allocation of available resources may be more important determinants of technical efficiency than the overall level of funding.

Second, the results reveal no proportional relationship between project budgets and measurable outputs. Projects with higher financial allocations did not consistently generate proportionally greater numbers of participants, training activities, educational modules, or dissemination events. This finding suggests that increasing financial resources alone does not guarantee improved project performance and highlights the importance of efficient resource management.

Third, the findings indicate considerable scope for improving resource utilization, particularly among Capacity Building projects. The mean DEA efficiency score of 0.697 suggests that many projects could theoretically achieve their current outputs using approximately 30% fewer resources if they operated at the level of the most technically efficient projects within the sample.

Fourth, the DEA analysis identified a group of reference projects that form the efficiency frontier. Projects such as *Mindful Moves*, *STOP-Radicalization*, *DEDALUS*, and *AGEFORCE* may serve as valuable examples for future applicants by illustrating effective approaches to resource allocation and project implementation.

Finally, the study confirms that technical efficiency should not be interpreted as a measure of overall project quality. DEA evaluates the relationship between inputs and measurable outputs but does not assess qualitative dimensions such as innovation, educational quality, participant satisfaction, sustainability of outcomes, or broader societal impact. Consequently, DEA should complement rather than replace qualitative evaluation procedures.

The findings have several practical implications for the management and evaluation of Erasmus+ sport projects.

First, future funding calls could place greater emphasis on cost-effectiveness by encouraging applicants to demonstrate how proposed financial resources are expected to generate measurable project outputs. Rather than focusing primarily on the size of the requested budget, evaluation procedures should consider the efficiency with which available resources are expected to be utilized.

Second, projects identified as forming the DEA efficiency frontier could be used as reference examples during project preparation and capacity-building

activities. Systematic dissemination of successful management practices may contribute to improving the technical efficiency of future Erasmus+ projects.
Third, incorporating quantitative efficiency measures alongside existing qualitative assessment criteria could strengthen project evaluation. Rather than replacing expert assessment, DEA could function as a complementary analytical tool that provides objective evidence regarding the efficiency of resource utilization.
Finally, greater emphasis should be placed on continuous monitoring of project efficiency throughout implementation. Periodic assessment of the relationship between financial resources and achieved outputs would enable project managers to identify inefficiencies at an early stage and implement corrective measures before project completion.

Table 3. Practical implications for improving the management and evaluation of Erasmus+ sport projects

Focus Area	Action	Targeted Result
Budget planning	Strengthen cost-effectiveness assessment during project preparation	More efficient allocation of financial resources
Knowledge sharing	Disseminate practices from projects forming the DEA efficiency frontier	Improved project management practices
Project evaluation	Combine quantitative efficiency indicators with qualitative assessment	More comprehensive evaluation of project performance
Project monitoring	Regularly assess resource utilization during implementation	Early identification of inefficiencies and improved project outcomes

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