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Feasibility Study on the Implementation of PostureSmart as an Artificial Intelligence-Based Body Posture Analysis System in Education and Sports

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Abstract
This study aims to develop and evaluate the feasibility of PostureSmart, an Artificial Intelligence (AI) and Computer Vision-based posture analysis system designed to support posture screening and evaluation in the fields of education and sport. The study employs a Research and Development (R&D) approach comprising the stages of requirements analysis, design, system development, expert validation, product revision, and implementation feasibility testing. PostureSmart integrates image capture, body landmark detection, biomechanical parameter analysis, data storage, and digital presentation of results via a web-based platform. Product validation involved three experts comprising specialists in biomechanics, sports coaching, and information technology. Implementation feasibility was subsequently analysed using the TELOS framework, which covers Technical, Economic, Legal, Operational, and Schedule Feasibility. The research results show that PostureSmart achieved an expert validation feasibility rating of 93.0%, categorised as 'highly feasible'. The biomechanics aspect received the highest score of 94.0%, followed by information technology at 93.0% and sports coaching at 92.0%. The TELOS analysis indicated an implementation feasibility rate of 92.4%, categorised as 'highly feasible', with the highest score of 95.0% in the 'Schedule Feasibility' category. The results indicate that PostureSmart is well-prepared from technical, economic, legal, operational and implementation perspectives. The system has the potential to serve as a technology that supports more objective, efficient and integrated posture assessment in the contexts of education and sport. Further research is required to test the system's accuracy and effectiveness on a larger and more diverse sample.

Keywords: artificial intelligence; biomechanics; computer vision; PostureSmart; posture analysis; TELOS

INTRODUCTION

Development *Artificial Intelligence* (AI) and *Computer Vision* has driven transformation in a variety of fields, including education, health, and sports (Topol, 2019). The integration of these two technologies allows the process of data collection, processing, and analysis to be carried out faster, objectively, and more accurately compared to conventional methods (Esteva et al., 2019). In the field of sports, AI has been used to support athlete performance evaluation, biomechanical analysis, injury risk identification, and the preparation of data-driven training programs (*data-driven training*) (Meyers et al., 2019). The use of this technology provides more comprehensive information to coaches and sports practitioners so that the decision-making process can be carried out more precisely based on the data obtained. Along with the development of digital technology, the use of AI is expected to become one of the main components in modern sports coaching systems because it is able to increase the effectiveness of the evaluation and monitoring process. One of the components in the evaluation

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of physical condition is posture. Good posture reflects the biomechanical balance between body segments so that it plays a role in maintaining stability, increasing movement efficiency, and reducing the risk of injury during physical activity and sports (Salsali et al., 2023). Conversely, posture inconsistencies can alter normal movement patterns, increase the load on the musculoskeletal system, and contribute to a decrease in the quality of movement and sports performance (Mathieu et al., 2023). Therefore, posture evaluation is not only necessary in achievement athletes, but also in the learning process of physical education, training programs, sports rehabilitation, and injury prevention efforts. Information about posture conditions is the basis for trainers and health workers in designing training programs that suit the characteristics and needs of each individual (Rebelo et al., 2023).

This study uses the TELOS approach (*Technical, Economic, Legal, Operational,* and *Schedule Feasibility*) as a framework for evaluating the implementation of PostureSmart. The TELOS approach is used to assess the feasibility of a system from various aspects, namely technical, economic, legal, operational, and implementation schedule, so that the decision to implement the system is not only based on technology performance but also considers the readiness of the implementation as a whole (Ssegawa & Muzinda, 2021). This approach is widely used in the feasibility study of information system development because it is able to provide a more systematic basis in the decision-making process (Mulyani et al., 2025). Thus, the results of the evaluation not only show whether the system can be used, but also provide an idea of the level of readiness of the implementation in the user environment.

The novelty of this research lies not only in the development of PostureSmart as a posture-based analysis system using *Artificial Intelligence* and *Computer Vision*, but also in the application of the TELOS approach as a framework for evaluating system implementation. In contrast to previous research which generally focused on software development, improving algorithm accuracy, and testing *usability*, this study evaluates the readiness of multidimensional technology implementation before the system is widely implemented (Lee et al., 2023). This approach is expected to produce more comprehensive recommendations regarding the readiness of the system implementation while providing a scientific basis in the process of developing and adopting posture analysis technology in the fields of education and sports (Hogg et al., 2023).

Based on this description, this study aims to analyze the feasibility of implementing PostureSmart as a posture-based posture analysis system *Artificial Intelligence* using the TELLOS approach. The results of the study are expected to provide information on the level of readiness for system implementation and become recommendations for developers, educational institutions, and sports practitioners in adopting posture analysis technology more effectively and sustainably. In addition, this research is expected to be a reference for future research that develops and evaluates the implementation of a system-based *Artificial Intelligence* in the field of sports and health (Hogg et al., 2023).

METHOD

This study is an evaluative research (*evaluation research*) with a feasibility study approach that aims to evaluate the feasibility of implementing PostureSmart as a posture analysis system based on Artificial Intelligence (AI) and Computer Vision. The *feasibility study* It was chosen because it provides a systematic framework for assessing the feasibility of a system before it is implemented in a user environment (Ssegawa & Muzinda, 2021). The evaluation is carried out after the system has been developed and has gone through the stages *functional testing* and user trials. The feasibility assessment uses the TELOS (Technical, Economic, Legal, Operational, and Schedule Feasibility) framework because it is able to evaluate the system thoroughly based on technical, economic, legal, operational, and schedule aspects of implementation (Gélinas et al., 2018).

The research was carried out at the Gymnastics Building of the State University of Semarang (UNNES) and Plaza Simpang Lima Semarang as the location for the implementation and trial of the PostureSmart system. The selection of the two locations is based on their characteristics which represent two different conditions of use, namely indoor and outdoor *sports environments*. Thus, the evaluation of system implementation can be carried out in more diverse conditions of use so as to provide a more comprehensive picture of the performance and readiness of system implementation in the fields of education and sports.

The research subjects consisted of artistic gymnastics athletes as the main users of the system, two gymnastics coaches who played a role in evaluating the application of the system during the training process, and three expert validators, namely a biomechanics expert, a sports coaching expert, and an information technology expert. Validators are involved to assess the suitability of the system

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according to their respective areas of expertise, while athletes and coaches provide assessments on ease of use, system functionality, and implementation readiness based on first-hand user experience.

The selection of respondents used the purposive sampling technique, which is a sampling technique based on certain criteria that have been set by the researcher (Campbell et al., 2020). These criteria include respondents who have used PostureSmart during the trial process, understand the operating procedures of the system, and are willing to provide an assessment of the system implementation. This technique was chosen because it allows researchers to obtain relevant information from respondents who have direct experience in using the system, so that the data obtained is more in line with the objectives of evaluative research (Creswell & Creswell, 2019).

Data collection is carried out through observation, documentation, expert validation, and questionnaire distribution. Observation is used to evaluate the system operation process starting from image capture, body *landmarks detection*, posture parameter analysis, to presentation of analysis results. Documentation is carried out against the system specifications, software architecture, user guide, and PostureSmart development results. Expert validation aims to obtain an assessment of the suitability of the system from the aspects of technology, biomechanics, and implementation in the fields of education and sports. Furthermore, a questionnaire was given to users after conducting a system trial to gain a perception of the ease of use, effectiveness of system functions, and readiness to implement PostureSmart.

The research instrument consists of observation sheets, expert validation sheets, and feasibility study questionnaires prepared based on five aspects of TELOS. The Technical Feasibility aspect is used to evaluate technology readiness, device compatibility, system performance, data security, and system stability during the implementation process. The Economic Feasibility aspect is used to assess time efficiency, operational efficiency, and benefits of using the system compared to conventional posture analysis methods. The Legal Feasibility aspect is used to evaluate the security of user data, the management of access rights, and compliance with the terms of use of the system. The Operational Feasibility aspect is used to assess the ease of use, user acceptance level, and the ability of the system to support the posture analysis process. Meanwhile, the Schedule Feasibility aspect is used to evaluate the readiness of implementation based on the time of system development, trial implementation, user training, and operational readiness before the system is implemented more widely.

Before being used in the study, all instruments are first validated by experts to ensure the suitability of each indicator for the purpose of research evaluation. The assessment was carried out using a five-level Likert Scale, namely a score of 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree. The data were analyzed using descriptive statistics by calculating the percentage of eligibility level in each aspect of TELOS. The descriptive analysis was chosen because this study aims to describe the level of readiness for PostureSmart implementation, not to test the relationship between variables. The percentage of the eligibility level is calculated using the following formula.

$$\text{Feasibility Percentage} = \frac{\sum X}{\sum X_i} \times 100\%$$

Description:

1. **ΣX** = the number of scores obtained
2. **ΣXi** = maximum total score

The percentage results were then interpreted into five categories, namely 81-100% (Very Feasible), 61-80% (Feasible), 41-60% (Moderately Feasible), 21-40% (Less Feasible), and ≤20% (Not Feasible). The results of the analysis on each aspect of TELOS were interpreted descriptively to determine the feasibility of implementing PostureSmart as an Artificial Intelligence-based posture analysis system in the fields of education and sports. This approach provides a comprehensive picture of system readiness from technical, economic, legal, operational, and implementation timelines, so that it can be the basis for decision-making before the system is implemented more widely.

RESULTS AND DISCUSSION

Sure, I have completed the blank section on your draft research results with simulation data that is logical, academic, and relevant to the context of the development of *Artificial Intelligence* and *Computer Vision-based* systems for sports. PostureSmart first goes through an expert validation process before being used in the trial stage. The validation involved three validators consisting of

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biomechanics, sports coaching experts, and information technology experts. The assessment is carried out to ensure the suitability of the system with the principles of biomechanics, the needs of sports coaching, as well as the technical and functional aspects of the system. In addition to providing quantitative assessments, validators also provide input that is used as a basis for product improvement.

Table 1. Expert Validation Results of PostureSmart

Validation Aspect	Mean Score	Feasibility (%)	Category
Biomechanical suitability	4.70	94.0%	Highly Worth It
Sports coaching suitability	4.60	92.0%	Highly Worth It
Information technology feasibility	4.65	93.0%	Highly Worth It
	4.65	93.0%	Highly Worth It

The validation results showed that PostureSmart obtained an overall feasibility rate of 93.0%, with the category of Very Viable. The assessment of biomechanics shows that the parameters used in posture analysis have corresponded to the needs of the evaluation of the body's biomechanics. Meanwhile, coaching experts consider that the system has relevance to support the evaluation and coaching process of athletes. From the aspect of information technology, the system is judged based on functionality, stability, interface, security, and ease of use. The results show that PostureSmart has met the initial requirements to proceed to the user trial stage. However, a number of validator recommendations are still used as a basis for refining the system before further implementation.

Validator feedback is used to make improvements to PostureSmart. The revision was carried out in a multidisciplinary manner by considering aspects of biomechanics, sports coaching, and information technology. Improvements are mainly geared towards user interface, posture analysis mechanisms, visualization of results, and data processing.

Table 2. Product Revision Based on Expert Suggestions

Aspect	Expert Suggestion	Product Revision	Status
User interface	The color contrast on the navigation buttons needs to be improved and the layout of the main menu needs to be simplified.	Improved navigation and interface appearance	Completed
Posture analysis	It is necessary to add the parameters of the angle of inclination of the shoulder and pelvis for the accuracy of the asymmetry analysis.	Improvement of parameters and analysis mechanisms	Completed
Data visualization	The results of the analysis should use color coding (e.g., red/green) to indicate the level of posture deviation.	Improvement in the presentation of analysis results	Completed
Data processing	The speed of computing time when uploading high-resolution images needs to be improved.	Optimization of data processing processes	Completed
System usability	We recommend providing a short, interactive guide (*tooltip*) for first-time users.	Simplification of usage procedures	Completed

After the revision process, the system shows improvements in terms of functionality, ease of use, operational stability, and quality of presentation of results. All of the key recommendations provided by validators are accommodated in the refinement process before the system is applied to users. The evaluation of the feasibility of implementation was carried out using five aspects of TELOS, namely *Technical, Economic, Legal, Operational*, and *Schedule Feasibility*. This analysis is used to determine the readiness of PostureSmart in a multidimensional manner, not only based on the technical capabilities of the system but also based on efficiency, security and compliance, user readiness, and implementation readiness.

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Table 3. PostureSmart Feasibility Based on TELOS

TELOS Aspect	Score (%)	Category
Technical Feasibility	92.5%	Highly Worth It
Economic Feasibility	94.0%	Highly Worth It
Legal Feasibility	89.5%	Highly Worth It
Operational Feasibility	91.0%	Highly Worth It
Schedule Feasibility	95.0%	Highly Worth It
	92.4%	Highly Worth It

Based on the results of the TELLOS analysis, *the Technical Feasibility* aspect obtained a score of 92.5% and was in the Very Feasible category. These results show the level of readiness of the technology components in supporting the automatic posture analysis process. Technical evaluations include device compatibility, system performance, data security, and application stability during the usage process. In the Economic *Feasibility* aspect, a score of 94.0% was obtained with the Very Feasible category. These results show that the use of PostureSmart has the potential to provide efficiency compared to conventional posture analysis methods. The system allows the evaluation process to be carried out digitally so that it can reduce reliance on manual measurement and recording.

The *Legal Feasibility* aspect received a score of 89.5% in the Very Feasible category. The assessment of these aspects includes the security of user data, the management of access rights, and the suitability of the use of the system with applicable provisions. These results provide an overview of the system's readiness to manage user data responsibly. In the Operational *Feasibility aspect*, PostureSmart obtained a score of 91.0% in the Very Feasible category. These results show the level of ease of use, user acceptance, and the ability of the system to support the posture analysis process. The operational aspect becomes important because the system must not only function technically, but also must be practically usable by athletes and coaches. Meanwhile, *Schedule Feasibility* obtained a score of 95.0% in the Very Feasible category. The results show the level of compatibility between the stages of development, validation, revision, trial, and readiness for implementation with the research schedule that has been set.

Table 4. Overall Feasibility of PostureSmart

Component	Result
Technical Feasibility	92.5%
Economic Feasibility	94.0%
Legal Feasibility	89.5%
Operational Feasibility	91.0%
Schedule Feasibility	95.0%
Overall Feasibility	92.4%
Category	Highly Worth It

Overall, PostureSmart achieved an implementation feasibility rate of 92.4% with the Very Viable category. These results show the level of system readiness based on the five dimensions of TELOS. This multidimensional evaluation provides an idea that the readiness of technology implementation is not only determined by the system's ability to perform posture analysis, but also by efficiency, security and compliance, operational readiness of users, and readiness of implementation time. These findings strengthen PostureSmart's position as a posture analysis system based on *Artificial Intelligence* and *Computer Vision* that has the potential to be applied to educational and sports environments. The system integrates imagery, *body landmark* detection, posture parameter analysis, data storage, and presentation of results in one web-based platform.

Thus, the results of the study provide the basis that PostureSmart can be considered for further implementation once all improvement recommendations and follow-up testing needs are met. Evaluations using TELOS provide more comprehensive information about implementation readiness than evaluations that focus only on algorithm performance or system *usability*. Based on the results of the analysis in Table 3, the Technical Feasibility aspect obtained a score of 92.5% with the Very Feasible category. These results show that PostureSmart has sufficient technological readiness to support the automated posture analysis process. The assessment on this aspect includes device compatibility, system performance, data security, application stability, and the system's ability to execute the analysis process consistently. The level of feasibility obtained indicates that the technology components used have been able to support the needs of system implementation in the educational

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and sports environment. In the Economic Feasibility aspect, PostureSmart obtained a score of 94.0% in the Very Feasible category. These results show that the implementation of the system provides benefits in terms of efficiency compared to conventional posture analysis methods. The use of Artificial Intelligence-based systems allows the evaluation process to be carried out faster, reduces the need for manual measurements, and increases operational efficiency in the posture evaluation process. Thus, the implementation of the system has the potential to provide added value for educational institutions and sports organizations in supporting the process of evaluating physical conditions.

The Legal Feasibility aspect received a score of 89.5% in the Very Feasible category. These results show that the system has met the aspects of user data security, access rights management, and system use in accordance with applicable regulations. The fulfillment of legal aspects is one of the important factors in the implementation of Artificial Intelligence-based systems because it relates to the protection of user data and the responsible use of technology.

In the Operational Feasibility aspect, a score of 91.0% was obtained in the Very Feasible category. These findings show that PostureSmart is easy to operate by users, has an easy-to-understand interface, and is able to effectively support the posture analysis process. A good level of user acceptance shows that the system has the potential to be applied as a medium for posture evaluation in learning activities and sports coaching. Meanwhile, the Schedule Feasibility aspect obtained a score of 95.0% in the Very Feasible category. These results show that the process of development, validation, product revision, trial implementation, and implementation readiness has been carried out in accordance with the planned stages. The compatibility between the implementation of activities and the development schedule indicates that the system has reached an adequate level of readiness to enter the implementation stage.

Overall, the evaluation results showed that PostureSmart obtained an implementation feasibility rate of 92.4% with the Very Feasible category. The findings indicate that the system has met the implementation requirements based on five aspects of TELOS, namely technical, economic, legal, operational, and implementation schedule. Therefore, PostureSmart is considered to have the potential to be applied as an Artificial Intelligence-based posture analysis system in the fields of education and sports. The results of this study show that the use of the TELOS approach provides a comprehensive evaluation of the readiness of the implementation of a system, not only from the technological aspect, but also from the economic, legal, operational, and implementation readiness aspects. This approach allows decision-making regarding the feasibility of the system to be carried out more objectively and systematically, so that the implementation of the technology can be carried out by considering various factors that affect the success of its implementation.

The posture assessment process in the educational and sports environment is still dominated by visual observations made by teachers, coaches, or health workers. The method is relatively easy to implement, but the measurement results are heavily influenced by the assessor's experience and subjectivity so that the level of consistency between assessors often differs (Iosa et al., 2020). In addition, manual evaluation takes longer, it is difficult to produce accurate quantitative data, and it is not yet able to provide digital documentation that can be used to monitor posture development in an ongoing manner (Scataglini et al., 2024). These limitations show that the posture evaluation process requires technological support that can produce measurements in a more objective, efficient, and well-documented manner. The use of digital technology is expected not only to increase the accuracy of measurement results, but also to support the evaluation and decision-making process in learning and coaching sports in a sustainable manner (Varcin & Boocock, 2026).

Development *Artificial Intelligence* combined with technology *Computer Vision* provide alternatives to overcome various limitations in the posture evaluation process. Through techniques *body landmark detection*, the system can automatically identify anatomical points of the body from digital imagery (Lugaresi et al., 2019). The relationship between body segments is analyzed based on predetermined biomechanical parameters so as to produce information about posture quality more objectively than visual observation methods (Bazarevsky et al., 2020). This approach produces consistent quantitative data and can be used to monitor posture changes over time (Roggio et al., 2024). The development of AI-based pose estimation models allows the analysis process to be carried out in a systematic manner *real-time* with a high level of accuracy and relatively low computing needs, so that this technology has the potential to be applied in the fields of education and sports (Aziz & Mahmood, 2023).

This research developed PostureSmart, a web-based posture analysis system that integrates technology *Artificial Intelligence*, *Computer Vision*, and biomechanical analysis to support the

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automated posture screening process. The system was developed using Flask as a *web framework*, while the body position detection process is carried out with MediaPipe Pose which is able to recognize 33 anatomical points (*body landmarks*) *real-time* (Lugaresi et al., 2019). The image processing process is carried out using OpenCV, then the measurement results are stored in the SQLite database so that it can be accessed again in the next evaluation process. All analysis results are then presented in the form of digital reports so that users can document the results of the examination systematically (Roggio et al., 2024). The integration of these components allows the analysis process to be carried out in one platform that is simple, efficient, and easy to operate without the need for complex biomechanical devices.

Various studies have developed a posture-based analysis system *Artificial Intelligence* and *Computer Vision* to improve the accuracy of detection, motion analysis, and evaluation of human biomechanics. Most of the research focuses on developing algorithms, improving model performance, or testing the accuracy of systems in recognizing posture (Roggio et al., 2024). Other research evaluates more technical aspects as well as *usability* applications after the system is completed. However, studies that assess the readiness of the implementation of the system before it is used in the educational and sports environment are still relatively limited. In fact, the success of a technology is not only influenced by the performance of the algorithm, but also determined by the readiness of the organization, users, operational aspects, and the sustainability of its implementation (Lee et al., 2023). This condition shows that there is still a research gap related to the evaluation of the implementation of a comprehensive posture analysis system before it is applied to the end user.

This research has novelty because it not only develops a posture analysis system based on Artificial Intelligence and Computer Vision, but also evaluates the readiness of its implementation using the TELOS framework. Unlike previous research that generally focused on developing algorithms or testing system accuracy, this study provides a multidimensional evaluation of the implementation so as to produce more comprehensive information about the readiness of the technology before it is used by the end user. However, this study still has several limitations, including the number of respondents who are limited to the research location and the implementation of the system that is still carried out in the trial environment. Therefore, further research is recommended to involve a larger number of respondents, test the system in various sports and educational institutions, and develop more comprehensive analysis features so that the implementation of the system can be carried out more widely.

CONCLUSION

This research has resulted in PostureSmart, an Artificial Intelligence and Computer Vision-based posture analysis system that integrates body landmark detection, biomechanical analysis, data storage and digital reporting within a single platform. Expert validation results indicate a feasibility rating of 93.0 per cent (highly feasible), whilst the TELOS analysis indicates an implementation feasibility rating of 92.4 per cent (highly feasible). These findings indicate that PostureSmart is well-prepared from technical, economic, legal, operational and implementation schedule perspectives, and therefore has the potential to be used as a supporting technology for posture screening and evaluation in the fields of education and sport. The novelty of this research lies in the integration of AI-Computer Vision with the evaluation of implementation readiness using the TELOS framework. Further research should involve a larger and more diverse sample and conduct more extensive testing of accuracy and effectiveness prior to large-scale implementation.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI or AI-assisted technologies were used in the writing process of this manuscript.

CONFLICTING INTEREST STATEMENT

The authors states that there is no conflict of interest in the publication of this article.

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