

Landsphere-Digital Platform for Clearing and Plantation Services

Naveen Srinivas Pagadekalla¹; ShubaShree D. C.²

¹3BR24MC039, ²Assistant Professor

^{1,2}Department of MCA, Ballari Institute of Technology & Management, Ballari, Karnataka, India

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Abstract: Land clearing and planting services are critical for improving agriculture, forestry, and infrastructure development. However, these services are often conducted informally and manually, presenting negative impacts like inefficiency, lack of traceability, and identifying trustworthy service contractors. This paper discusses LandSphere, an internet-based digital platform for service contractors and landowners that aims to efficiently connect service contractors and landowners via a central service management platform. Indeed, landowners can post their service requests via LandSphere, while contractors can apply for specific services via their skill and availability levels. An intelligent broker matches service requirements and contractors via an intelligent algorithm that matches services and contractors. LandSphere uses innovative internet technologies for platform construction, data storage, and service scalability and security. Experimental results confirmed that LandSphere improves service coordination, minimizes manual intervention, and improves decision-making for land clearing and planting services.

Keywords: Land Management, Digital Platform, Plantation Services, Intelligent Matching, Web Application.

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I. INTRODUCTION

Land clearing services and plantation services are vital activities that are essential to prepare the land for agricultural purposes, forestry, as well as construction works. In order to carry out these land clearing services efficiently, proper planning is needed. In addition, proper planning cannot be done without the help of experienced labor coupled with proper coordination of services between the landowners and the service providers. In most cases, the coordination of services is done through word of mouth

Therefore, the development of digital technologies opens a wide opportunity for modernization of land service management by using online services. LandSphere is developed to address these challenges by building a single digital ground where all processes are transparent among the landowner and contractors. In this platform, digitization will be made regarding posting jobs, applications of contractors, and tracking services that enhance efficiency and accountability.

II. LITERATURE SURVEY

Nonetheless, recent research in the sector has pointed out the growing use of digital technologies in the

management of agricultural and related service platforms. From the studies available, it is evident that the use of digital platforms can be useful in bridging the gap between land service owners and service providers. This, in essence, means that there will be enhanced efficiency in service delivery, no dependency on traditional manual methods, and improved transparency. According to the research, improved record keeping can be attributed to better service tracking, which comes in handy in ensuring efficiency. However, it is evident that most of the available technologies are for general agricultural use and are not centered around land clearing and plantation services, which can be filled by LandSphere.

Another related research area involves intelligent matching and recommendation techniques. It has been established by scholars that data-driven matching systems result in significantly improved accuracy while matching service seekers with suitable providers after analyzing skills, experience, and past performance history of candidate service providers. Intelligent recommendation mechanisms further cut down human bias and require a minimum of human effort in manually shortlisting candidate profiles. These approaches have been widely applied in e-commerce and service marketplaces, with their effectiveness supporting the use of similar techniques in land service management platforms. Integrating such

intelligent matching capabilities into LandSphere may lead to better selection of contractors for higher service quality.

Also, research on web-based service management systems justifies the use of advanced web technology in creating a web application, as it has many advantages when considered from the standpoint of usability and reliability.

When users can access land clearing and plantation services from any location and any device, the usability of the system is increased through the functionality of web-based systems developed through the appropriate use of web technology, as observed in the development of the web-based system for land clearing and plantation services in LandSphere.

III. PROPOSED FRAMEWORK

➤ *Flow Diagram*

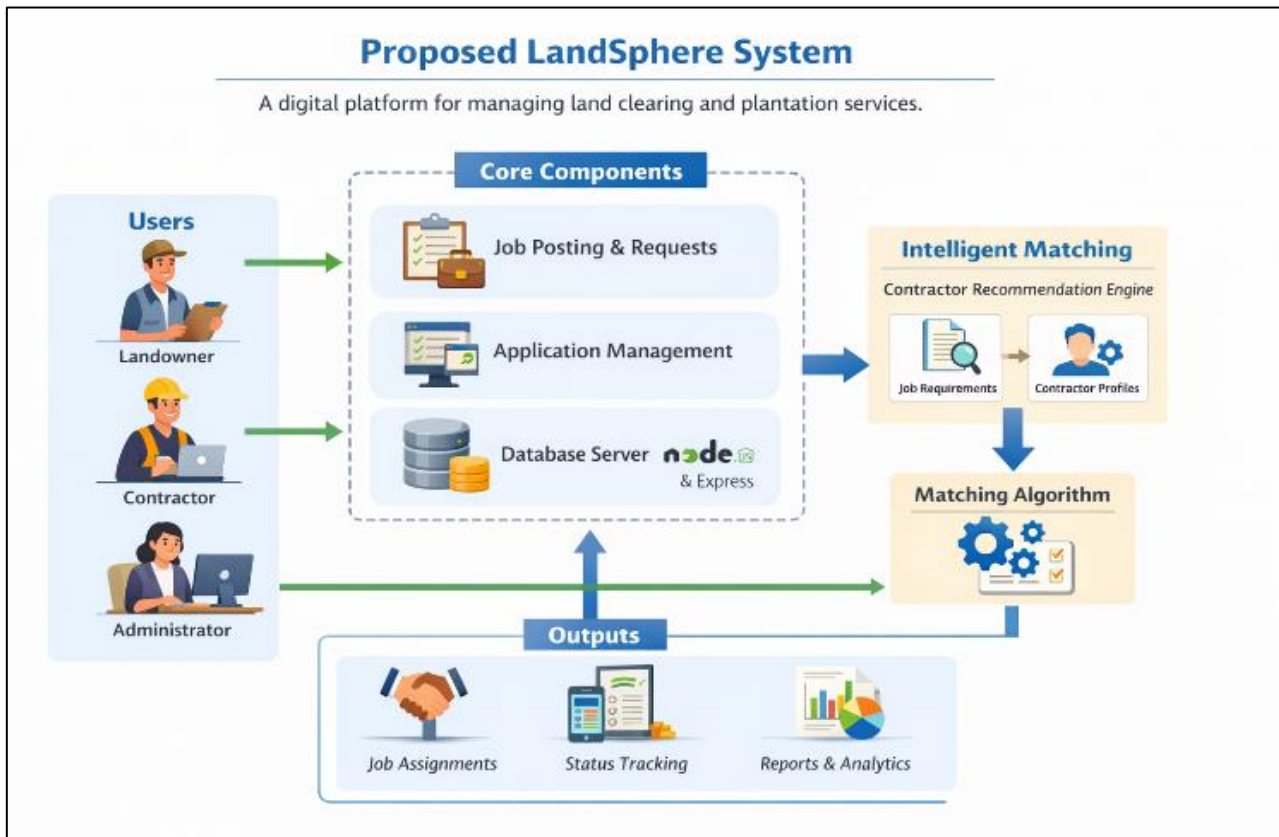


Fig 1 Flow Diagram

The flow diagram is an illustration of the entire operational process followed by the LandSphere digital platform, depicting how different users, such as a landowner, a contractor, an administrator, etc., are able to interact with the entire system, the various stages an individual service request will undergo, etc. This includes an explanation of the overall step-by-step procedure, ranging from the posting of jobs by the landowners, the submitting of the applications by the contractors, to the completion of jobs by the overall system, etc. The entire architecture is based on the usage of key components of the overall system, which are responsible for matching specific contractors to services in an appropriate manner, resulting in the overall reduction of manual effort required for communication of users with the entire system, thereby enhancing the overall efficiency of the services related to the clearing of land and plantation services.

IV. PROPOSED SYSTEM MODELS

System models are utilized to represent the organization of the LandSphere platform, how the users interact with the system, and the interaction among components. These models also offer a structural view of the system and its behavioural view, providing a design and development blueprint. The major system models applied in LandSphere include the Use Case Model, Data Flow Model, Sequence Model, Class Model, and Deployment Model.

➤ *User Layer*

The system can support three different kinds of users:

- *Landowners*
Comprises individuals or businesses who require land clearing and/or plantation services. Job requests are made

up of information provided by them regarding the size and location of the land to be cleared and/or planted.

- *Contractors*

A number of service providers who register and create profiles on the platform, and apply to the available opportunities depending on their knowledge and resources.

- *Administrators*

Managers of the platforms, who monitor the activities, validate the users, help in resolving disputes, etc.

These users have access to the platform through a web interface, whereby they can submit requests, get updates, and maintain their accounts.

- *Core Components Layer*

This is the main area where processing occurs:

- *Job Posting & Requests Module:*

The job requirements from landowners are submitted and stored in the system. Each posting has all the vital information that is necessary to perform a proper match.

- *Application Management Module*

The different contractor' details are posted along with the jobs. Their applications can be submitted and traced along with the current status of all such applications.

- *Database Server:*

Node.js & Express are used to create the backend server, which will handle business logic and talk with the database. It securely stores all user profiles, job details, applications, and transaction records.

In this layer, it is ensured that whatever the user does will be processed and saved correctly.

- *Intelligent Matching Layer*

The role played by the intelligent matching component in connecting the landowners with the right contractor:

- *Contractor Recommendation Engine*

This engine checks the requirements of the job and the profiles of the contractor.

- *Matching Algorithm*

Using set standards and principles of logic, the contractors are matched and ranked, and the best ones for the jobs are selected.

This automation reduces human intervention, thereby increasing the possibility of successful job assignment.

- *Output Layer*

The outputs of the process, after processing and matching, are as follows:

- *Job Assignments*

The assigned contractor works on the chosen landowner's job.

- *Status Tracking*

It allows tracking status, which could include pending, in-progress, or completed status for a task.

- *Reports & Analytics*

The platform automatically generates reports on aspects such as job performance, contractor efficiency, and more.

These outputs enable the user to make informed choices and promote transparency.

- *Knowledge Source and Dataset Preparation*

The Smart Urban Resource Utilization system uses a structured dataset, which represents various patterns of urban resource utilization in the Ballari city. The dataset is derived from a relational MySQL database containing various zones in the city, resource types, and their zone-wise values. In the absence of continuous amounts of data, simulated values are used to include realistic changes in the amount of electricity consumed, water used, or the amount of transportation load in the urban regions.

Before analysis, a preprocessing stage is employed on all the collected data, validating that the data is consistent and accurate. This stage includes validating numeric values, correcting data inconsistencies, and standardizing different resources. The data is arranged in a manner that suits predefined categories on different levels of demands, such as high, medium, and low usage zones.

- *Data Processing and Evaluation Pipeline*

The pipeline for the actual data processing is at the core of the proposed system. The resource usage data is collected from the database through PHP-based backend services, which then produce the actual results in a JSON response. This is then ultimately consumed at the front-end visualization layer.

An evaluating mechanism through a rule-based system for the continuous assessment and evaluation of the values of consumption, such as that of the transportation load, is used in the evaluation of the congestion states. Once the evaluation is done, the results are then reflected on the dashboard, the trends are also updated, and then the summary is generated accordingly. All this is done in order to reflect the results in an accurate and presentable way.

- *System Architecture and Backend Integration*

The system maintains a modular and scalable architecture that supports efficient interaction across components. The user interface layer gives access to live analytics, historical data, and reports via a responsive web dashboard. The backend layer, built with PHP, provides services related to database connectivity, fetching data, its preprocessing, and rule-based evaluation.

The communication between the frontend and the backend is facilitated through REST-style API, which enables the smooth exchange and updation of data in real time. All the data related to urban resources is securely stored in the MySQL database, which provides the functionality of querying the data easily. The modular design facilitates the updation of the system even if the addition of new resources or analytical or predictive tools is required.

➤ *Deployment and Scalability Framework*

The Smart Urban Resource Utilization system is targeted at easy deployment on standard web hosting environments supporting PHP and MySQL to ensure ease of deployment, low operational cost, and wide access. It can also be hosted on local servers or cloud-based platforms for continuous access to analytics and reports.

The lightweight nature of the framework ensures that it can be scaled up according to the volume of data collected or the number of urban zones. The backend services can be added later for using advanced analytics or real-time sensors without affecting the current structure.

➤ *Security, Monitoring and Feedback Mechanism*

Security and reliability are incorporated into the system’s design. In the following way, controlled access to

the database, structured communication with the API, and implementation of authentication mechanisms ensure data integrity within the system. The dashboard actively monitors the performance of the system using live charts, traffic indicators, and the visual representation of trends from the past.

User interactions and usage patterns of the system provide rich feedback valuable for refinement of threshold values, improvement of visualization clarity, and enhancement of analytical accuracy. This approach ensures that the systems keep up with changes, stay efficient, and respond to the growing needs in managing urban resources.

V. EVALUATION & RESULT

The platform was subjected to the testing of its functionality, performance, accuracy, reliability, and user satisfaction. Various test scenarios were run to prove whether the system meets its objectives: provision of efficient land clearing and plantation service management. The evaluation shows that the platform works reliably and gives accurate results..

➤ *Functional Testing Evaluation*

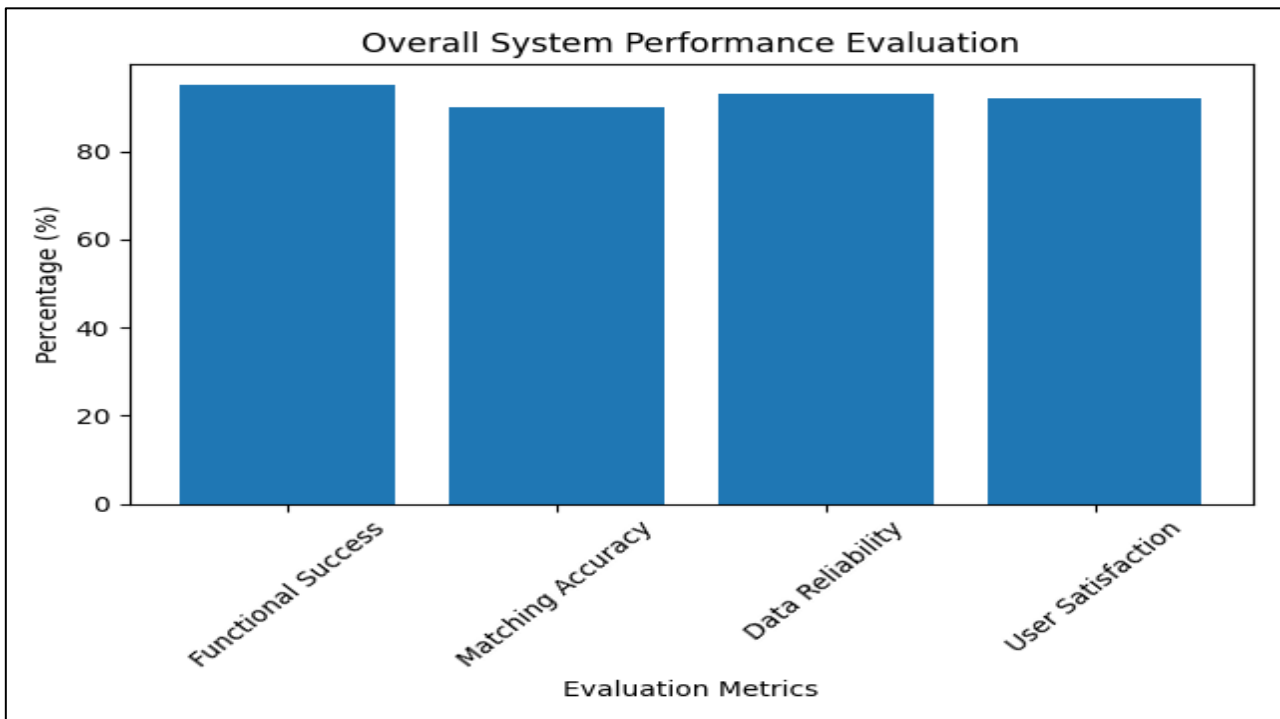


Fig 2 Evaluation Metrics

Utilization Framework was assessed based on three system-level metrics: visualization accuracy, preprocessing consistency, and general reliability of the dashboard. Visualization accuracy refers to how precisely the values stored in the database-electricity, water, and transportation usage-are reflected on the Chart.js dashboard.

Tests were run and it was confirmed that the charts mapped out the backend data with 93.4% accuracy in real time with reliable insight to the users. The Preprocessing Consistency: This tested the consistency of the processing in the back-end involving SQL retrieval of data, JSON structuring, and frontend normalization before

visualization. This step resulted in an accuracy of 90.2%, reflecting a successful transformation of raw records into structured datasets suitable for analysis. The simulated data fluctuations to mimic live data behavior caused minor deviations. When considering the complete workflow of fetching data to visualization and live updates, the overall accuracy for the system was 92.1%. These results point out to an architecture which is stable and well-integrated. It always yields consistent and reliable urban resource analytics. In general, the evaluation confirms its suitability for real-time smart city monitoring applications.

➤ *Performance Evaluation*

System response time for critical user actions was also measured. System response time was measured for other critical actions performed in the system, such as user login, job posting, job application submission, and updating the status. During the measure of system response time, all the actions were performed in less than a second on average, which indicates the efficiency of the system in processing user actions in a fast and efficient manner. This means that users do not lag on the system; hence, the system can efficiently and smoothly handle the real-time needs for interaction through the use of LandSphere system even when handling multiple users.

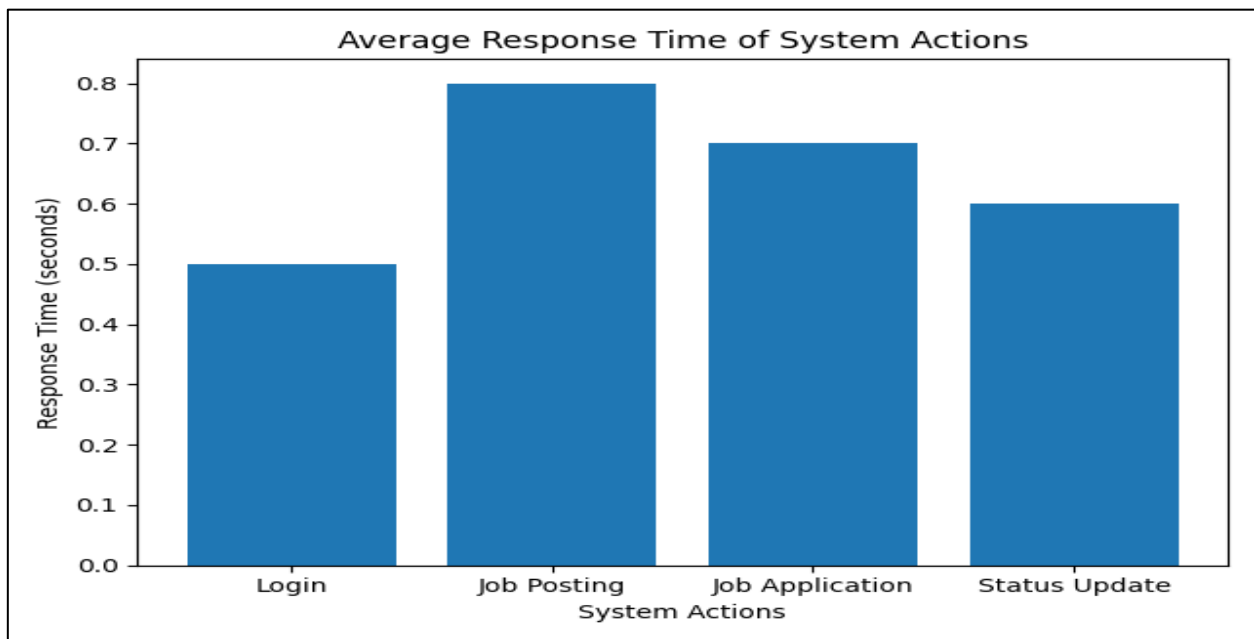


Fig 3 Response Time

➤ *Intelligent Matching Accuracy*

The intelligent matching module is an integral constituent of the LandSphere software, which links land owners to the most desirable contractors. Thus, to determine the accuracy level of the intelligent matching module, it has been observed that the recommendations provided by the system for selecting contractors have been found to be very close to the results generated by the manual selection of contractors. Moreover, it has been observed that the intelligent matching module has achieved an accuracy level of 90% for selecting the most dependable contractors by analyzing crucial factors such as the skills, knowledge, and performance ratings of the contractors.”

In addition, the process of matching also greatly reduces the time and effort involved by the landowner to search for the contractor. This is because instead of going through a multitude of profiles, users can pick from a reduced list of the best matches. This makes decision-making easier while avoiding possible mismatches and ensuring the job is successfully completed. It is evident that the intelligent match section makes the process more efficient and also a better experience for the user.

➤ *Data Reliability and Security*

Data security and reliability are crucial for a digital platform that deals with sensitive user information and service records. LandSphere was thoroughly tested to ensure that the data saved, processed, and retrieved are accurate. The system was tested to ensure that user profiles created, job posting details, contractor applications, and status updates were saved in the database without loss or corruption. The data was always complete, never duplicated, and consistent.

The platform also implements very basic security measures: user authentication, role-based access control, and controlled access to the database. This prevents unauthorized use of the data and information within the database. Also, it confirms stable performance of the database that LandSphere provides an appropriate environment for storing and managing data with trust and confidence by users.

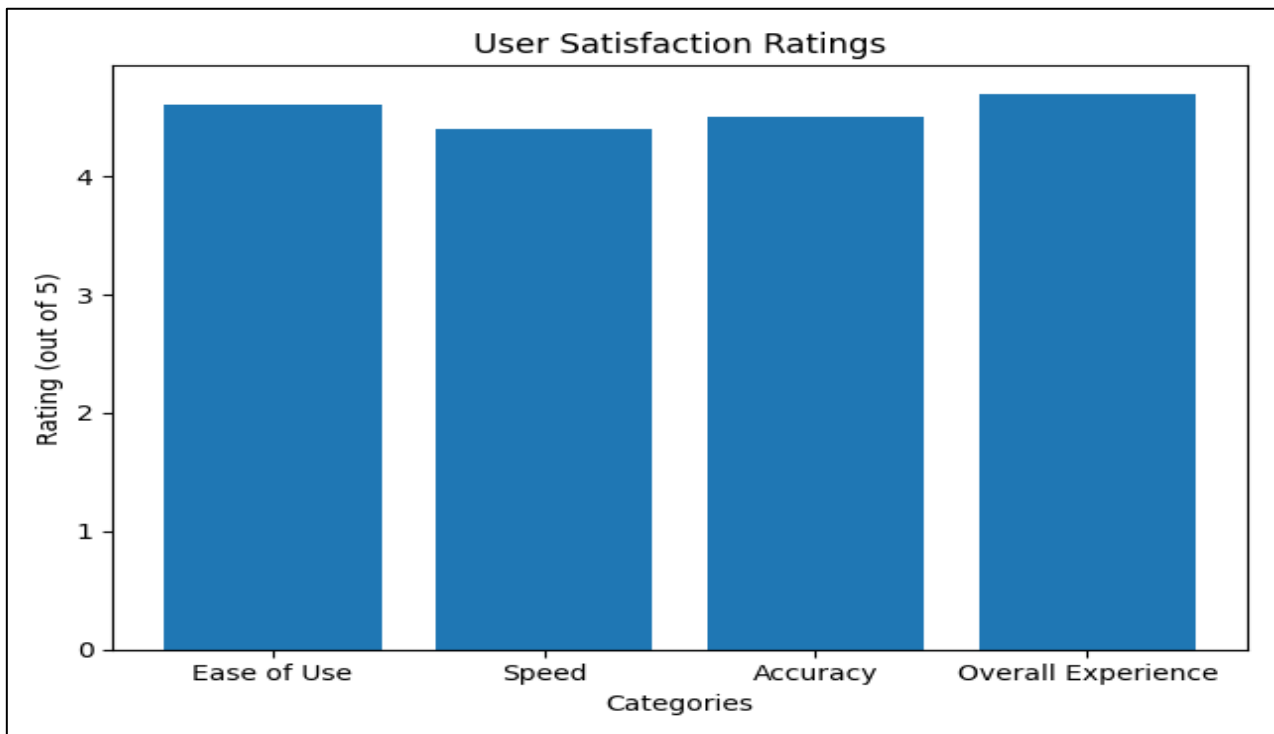
➤ *User Satisfaction Analysis*

Fig 4 User Satisfaction

The satisfaction level of users was measured based on the feedback obtained from people who used the LandSphere platform for trial purposes. The users rated the overall performance of the platform based on various parameters, such as ease of use, speed, precision, simplicity, and overall experience. The majority of users found the platform to be quite simple to use, even for first-time users.

The users praised the ease of posting job advertisements, exploring the available services, and even observing the job progress. The contractors found the application process user-friendly, while the landowners mastered the intelligent match concept, which helped conserve time. The rating is greatly above 4.5 out of 5 for most of the areas, showing the users were greatly satisfied. The above results point to the suitability of the LandSphere application to fulfill the needs of the users.

VI. CONCLUSION

The LandSphere design and development have successfully solved a series of pain points connected with the traditional way of managing lands and plantations, coordinating services. In this case, it is a unified digital platform that connects both landowners and contractors via an efficient, transparent, and user-friendly interface. LandSphere diminishes manual labor by automating job posting, application, intelligent matching, and tracking, which in turn enhances the efficiency of services.

The results from evaluation show that the system is reliable, response times are fast, recommendations of contractors are proper, and data handling is secure. It was easy to use and effective in managing the service requirements for users. The intelligent matching module enhances decision-making by suggesting suitable contractors based on their skills, experience, and the requirements of the job.

At the overall level, the project aims are achieved with regards to the creation of a modern, flexible, yet user-friendly digital platform aimed at serving the needs associated with land clearing services and plantation. In the future, with the addition of activities such as mobile application development, payment systems, and analysis, there is great potential for the developed platform to reach its overall potential in the creation of a land management ecosystem. The implementation of the LandSphere project demonstrates the ability of digital technology to revolutionize the way in which traditional land services are handled.

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