Patent Analysis of Systems and Methods for Providing AI-based Cost Estimates for Services: US11270363B2

P. S. Aithal
Professor, Poornaprajna Institute of Management, Udupi - 576101, India,
Orchid ID: 0000-0002-4691-8736; E-mail: psaithal@ac.in

Area/Section: IPR Analysis.
Type of Paper: Review-based Exploratory Research.
Number of Peer Reviews: Two.
Type of Review: Peer Reviewed as per |C|O|P|E| guidance.
Indexed in: OpenAIRE.
DOI: https://doi.org/10.5281/zenodo.21156579
Google Scholar Citation: PIJBAS

How to Cite this Paper:
Aithal, P. S. (2026). Patent Analysis of Systems and Methods for Providing AI-based Cost Estimates for Services: US11270363B2. *Poornaprajna International Journal of Basic & Applied Sciences (PIJBAS), 3*(1), 107-140. DOI: https://doi.org/10.5281/zenodo.21156579

Poornaprajna International Journal of Basic & Applied Sciences (PIJBAS)
A Refereed International Journal of Poornaprajna Publication, India.
ISSN: 3107-8478

Crossref DOI: https://doi.org/10.64818/PIJBAS.3107.8478.0021

Received on: 25/05/2026
Published on: 30/06/2026

Patent Analysis of Systems and Methods for Providing AI-based Cost Estimates for Services: US11270363B2

P. S. Aithal
Professor, Poornaprajna Institute of Management, Udupi - 576101, India,
Orchid ID: 0000-0002-4691-8736; E-mail: psaithal@ac.in

ABSTRACT

Purpose: *To understand its technological innovation, operational mechanisms, and commercial significance. The study evaluates how artificial intelligence, machine learning, computer vision, and environmental sensing technologies are integrated to automate inventory identification and generate accurate service cost estimates and interactive quotations. It further aims to assess the patent's business value, societal impact, future opportunities, and strategic relevance through structured patent analysis frameworks such as SWOC and ABCDEF.*

Methodology: *This study adopts an exploratory qualitative research approach to systematically collect, organize, and analyse information related to the selected patent from sources such as Google Search, Google Patents, Google Scholar, and AI-assisted platforms. The collected data were interpreted using SWOC and ABCDEF analytical frameworks to evaluate the patent's technological, strategic, and commercial significance.*

Results & Analysis: *The analysis reveals that the patent successfully integrates artificial intelligence, machine learning, computer vision, and sensor analytics to automate inventory generation and provide accurate, interactive service cost estimates. The study found that the invention offers significant technological, commercial, and operational advantages by reducing manual effort, improving estimation accuracy, enhancing customer convenience, and creating new business opportunities through digital service ecosystems. The SWOC and ABCDEF analyses further indicate that the patent possesses strong innovation potential, scalability, market value, and future commercialization prospects despite challenges related to data quality, privacy, and competitive pressures.*

Originality & Values: *This study is original in applying a structured patent-analysis approach using SWOC and ABCDEF frameworks to evaluate the technological, commercial, and societal significance of Patent US11270363B2. The article provides valuable insights into how artificial intelligence, machine learning, computer vision, and sensor analytics can transform traditional service-estimation processes into intelligent, automated, and scalable digital solutions. The study also offers practical value for researchers, innovators, service providers, investors, and policymakers by highlighting the patent's innovation potential, business opportunities, and future commercialization prospects.*

Type of Paper: *Review-based Exploratory Research.*

Keywords: Patent Analysis, Systems and methods, AI-based cost estimates for services, Yembo Inc., SWOC analysis, ABCDEF analysis, Patent Number: US11270363B2

1. INTRODUCTION :

1.1 About Patent Analysis:

Patent analysis has emerged as an important scholarly research approach for examining technological innovations, intellectual property developments, and emerging business opportunities. Unlike traditional case studies that focus on organizations or industries, patent analysis systematically investigates patented inventions to understand their technological foundations, novelty, utility, and potential contributions to society. Patent documents contain unique technical knowledge that is often unavailable in other scholarly sources, making them valuable resources for exploratory research and innovation studies (Aithal & Aithal (2018). [1]; Abbas et al. (2014). [2]). Patent-based research also assists scholars in identifying technological trends, forecasting future innovations, and understanding

the evolution of knowledge in specific domains (Daim et al. (2006). [3]; Bhattacharya (2004). [4]), The concept of patent analysis as a scholarly research method has been formally proposed as a structured qualitative research technique that can generate new interpretations and insights from existing patented knowledge.

A patent represents a legally protected invention that offers a novel solution to a technical problem through a product, process, system, or technological improvement. Every patent follows a standardized structure consisting of a title, abstract, specification, detailed description, drawings, claims, and citations, which collectively describe the invention and its intended applications (Aithal & Aithal (2018). [1]). These components provide a rich source of information for researchers to evaluate the technical feasibility, innovativeness, and commercial potential of inventions. Patent documents are increasingly recognized as valuable datasets for technological intelligence, innovation management, and competitive analysis because they reveal both current technological capabilities and future directions of research and development (Wang et al. (2014). [5]; Lee et al. (2009). [6]; Choi et al. (2011). [7]). Consequently, the systematic examination of patent structures offers significant opportunities for scholarly inquiry and knowledge creation.

The societal impact of patents extends beyond legal protection and commercial exploitation. Patented technologies contribute to economic development, industrial growth, productivity enhancement, healthcare advancement, environmental sustainability, and improved quality of life. Patent analysis enables researchers to assess how inventions influence technological ecosystems, create business opportunities, and address societal challenges (Bergek et al. (2008). [8]; Park et al. (2012). [9]). Studies have shown that patent data can be utilized to monitor technology trends, identify emerging opportunities, evaluate technological impacts, and estimate future industrial potential (Choi et al. (2007). [10]; Érdi et al. (2013). [11]; Ogawa & Kajikawa (2015). [12]). Through systematic investigation, researchers can determine the broader implications of inventions for stakeholders such as consumers, industries, governments, investors, and society at large, thereby enhancing the practical relevance of scholarly research.

Patent analysis is particularly suitable as an exploratory research method because it facilitates the discovery of new knowledge, interpretations, and future possibilities. Exploratory research aims to investigate phenomena, identify patterns, and generate insights that may lead to theory development or innovation (Lewis (2015). [13]; Hoepfl (1997). [14]). Patent analysis supports these objectives by enabling scholars to study the technological features, claims, innovation opportunities, competitive advantages, and future value of patented inventions (Aithal & Aithal (2018). [1]). Furthermore, patents serve as indicators of technological strength, innovation capability, and research productivity within organizations and industries (Narin et al. (1987). [15]; Haupt et al. (2007). [16]). By integrating qualitative frameworks such as SWOT, ABCD, and ABCDEF analyses, researchers can evaluate patents from multiple stakeholder perspectives and derive meaningful conclusions regarding their strategic significance [17-21].

The structure of a patent-analysis-based scholarly article generally follows a systematic sequence beginning with the identification and selection of a patent, followed by the study of its abstract, classification, description, drawings, claims, citations, legal status, and technological features. The analysis then extends to evaluating innovation potential, business value, societal implications, opportunities, challenges, and future prospects using suitable analytical frameworks (Aithal & Aithal (2018). [1]). The present research adopts an exploratory research methodology to investigate an identified patent comprehensively and to interpret its technological, commercial, and societal significance. By combining patent structure analysis with innovation and impact assessment, the study aims to demonstrate how patent analysis can serve as an effective scholarly research method for generating new insights and contributing to the advancement of knowledge in technology, management, and innovation studies.

1.2 In this Paper:

This scholarly article is structured as a comprehensive patent-analysis-based research case study of Patent No. US11270363B2, titled *"Systems and Methods for Providing AI-Based Cost Estimates for Services."* The study begins with a review-based selection of related patents in the field of artificial intelligence-enabled service estimation and relocation technologies, followed by an examination of the chosen patent's basic details, technical content, invention objectives, operational mechanisms, claims,

citations, and similar inventions. The article systematically investigates how artificial intelligence, machine learning models, image recognition technologies, environmental sensors, and inventory attribute analysis are integrated to automatically generate relocation cost estimates and interactive service quotations. The patent is analysed from technological, business, and societal perspectives to understand its innovation potential, practical applicability, and contribution to digital transformation in service industries.

The analytical component of the article adopts an exploratory research methodology and applies multiple patent-analysis frameworks, including technical analysis, innovation analysis, patent value analysis, SWOC analysis, and ABCDEF stakeholder analysis. Particular emphasis is given to evaluating the patent's strengths, weaknesses, opportunities, challenges, advantages, benefits, constraints, disadvantages, effectiveness, and future financial value. Based on the patent abstract, the analysis focuses on the AI-driven generation of inventory lists from location data collected through cameras, user interfaces, and environmental sensors, and the subsequent creation of personalized relocation cost estimates and service recommendations. The study further examines business opportunities, market value, implementation challenges, and future commercialization prospects of the invention, thereby providing a holistic assessment of the patent's technological significance and its potential impact on logistics, relocation services, digital commerce, and AI-enabled decision-support systems.

2. REVIEW-BASED SELECTION OF SOME PATENTS IN AI-BASED COST ESTIMATES FOR SERVICES :

Some of the important patents related to Systems and methods for providing AI-based cost estimates for services are searched using https://patents.google.com/ and reviewed in Table 1.

Table 1: Some important patents related to "Artificial Intelligence based Products"

S. No	Patent Number & Date of Award	Patent Title	Inventor	Patent Status	Patent Type & Reference
1	US11270363B2 08/03/2022	Systems and methods for providing AI-based cost estimates for services	Zachary RATTNER, Siddharth Mohan, Vikram Gupta,	Active	Utility [22]
2	US20230325766A1 12/10/2023	Autonomous Exposure-Based Product Replacement System	Charles Howard Cella, Andrew S. Locke,	Abandoned	Utility [23]
3	CN109409532B 15/03/2022	Product development based on artificial intelligence and machine learning	R·梅哈韦德, et al.	Active Accenture Global Solutions Ltd	Utility [24]
4	CN118628214B 05/11/2024	Personalized clothing recommendation method and system for electronic commerce platform based on artificial intelligence	陈宇 任艺 顾艺婷 李笑非	Active Xiamen University of Technology, Chaina	Utility [25]
5	KR102245717B1 28/04/2021	Item sales volume prediction method, apparatus and system using	최원규 정다혜	Active	 [26]

		artificial intelligence model			
6	US11669776B2 06/06/2023	Using artificial intelligence to design a product	Erin S. Boyle, Daragh Sibley	Active Stitch Fix Inc	[27]
7	US11720846B2 08/08/2023	Artificial intelligence-based use case model recommendation methods and systems	Sastry VSM Durvasula Rares Almasan Neema Uthappa Sriram Venkatesan Sayan Chowdhury	Active McKinsey and Co Inc	[28]
8	US10769570B2 08/09/2020	Artificial intelligence based risk and knowledge management	Mingzhu Lu	Active Accenture Global Solutions Ltd	[29]
9	US20220237700A1 28/07/2022	Artificial intelligence investment platform	Shyam Sreenivasan,	Abandoned Quantel Ai Inc	[30]
10	US20230130567A1 27/04/2023	Explainable artificial intelligence-based sales maximization decision models	Marc Cohen Pinchas Ben-Or	Abandoned PharmaForceIQ Inc	[31]

3. OBJECTIVES OF THE STUDY :

(1) **To review and analyse selected patents related to AI-based cost estimation systems and service quotation technologies** in order to identify the technological evolution, innovation trends, and positioning of Patent US11270363B2 within the existing patent landscape.
(2) **To examine the technical architecture, operational methodology, and innovative features of Patent US11270363B2**, focusing on the use of machine learning models, image-based inventory generation, environmental sensing, and automated cost estimation mechanisms for relocation services.
(3) **To evaluate the detailed description, claims, and novelty of the invention** in order to understand its uniqueness, technological contributions, patentability, and potential advantages over existing solutions and prior art.
(4) **To investigate the technological, operational, and commercial significance of the patented system** by analysing its effectiveness in generating accurate, interactive, and personalized relocation cost estimates and service recommendations.
(5) **To conduct a comprehensive structural analysis of the patent using SWOC and ABCDEF frameworks**, thereby identifying its strengths, weaknesses, opportunities, challenges, advantages, benefits, constraints, disadvantages, effectiveness, and future financial value from multiple stakeholder perspectives.
(6) **To assess the business opportunities, market potential, implementation challenges, and future commercialization prospects of the invention**, and to provide strategic suggestions for enhancing its adoption, scalability, and long-term value in AI-enabled service industries.

4. METHODOLOGY :

This study adopts an exploratory qualitative research approach to systematically examine and interpret information related to the selected patent. Relevant data were gathered through keyword-based searches from publicly accessible sources, including Google Search, Google Patents, Google Scholar, and AI-

assisted GPT platforms [32-36]. The collected information was carefully organized, classified, and analyzed in line with the objectives of the study. To facilitate a comprehensive and structured assessment, analytical frameworks such as SWOC (Strengths, Weaknesses, Opportunities, and Challenges) and ABCD/ABCDEF (Advantages, Benefits, Constraints, Disadvantages, Effectiveness, and Future Value) were employed. This methodology enables a thorough evaluation of the patent's technological innovation, strategic significance, business potential, and future commercial prospects [37-40].

5. BASIC DETAILS OF PATENT CHOSEN FOR ANALYSIS :

5.1 Patent Overview:

The patent selected for analysis is **US11270363B2**, titled **"Systems and Methods for Providing AI-Based Cost Estimates for Services."** The patent was granted on **March 8, 2022**, and is assigned to **Yembo, Inc., San Diego, California, USA**. The inventors are **Zachary Rattner, Siddharth Mohan, and Vikram Gupta**. The invention belongs to the fields of **Artificial Intelligence (AI), Machine Learning (ML), Computer Vision, Service Automation, and Cost Estimation Systems**. The patent introduces an intelligent system capable of generating automated and interactive cost estimates for relocation and related services by analyzing location data collected through cameras, user interfaces, and environmental sensors. The technology seeks to replace traditional manual estimation processes with a faster, more accurate, scalable, and user-friendly AI-driven solution [22].

5.2 Summary of the Patent (From the Abstract):

The patent discloses a system and method for generating **AI-based relocation cost estimates for services and products**. The invention receives description data of a location through one or more input sources such as cameras, user interfaces, and environmental sensors. Using machine learning models, the system automatically identifies and generates an inventory list of items present at the location and associates various inventory attributes with those items. Based on the generated inventory and contextual information, the AI engine produces interactive relocation quotations containing estimates and offers for relevant products and services. The system enables automated decision-making, personalized service recommendations, and dynamic cost estimation, thereby improving efficiency, accuracy, and customer experience in relocation and home-service industries.

5.3 Description of the Patent:

This patent presents a comprehensive artificial intelligence platform designed to automate the traditionally labour-intensive process of service cost estimation. The invention utilizes multiple data acquisition mechanisms, including photographs, videos, voice inputs, text descriptions, mobile sensors, GPS devices, accelerometers, and other environmental sensors to capture detailed information about a customer's location and belongings. The collected data are processed through machine learning algorithms, computer vision models, and AI-based analytical engines to identify objects, classify inventory items, determine item attributes, and understand contextual relationships within the environment.

The system architecture consists of several interconnected modules, including a Consumer Interaction Module, Service Provider Interaction Module, AI Improvement Engine, Database Module, Inventory Generation Module, Cost Calculation Module, Interactive Quote Generation Module, and Quote Monitoring Module. These modules work collaboratively to collect user data, generate inventories, calculate service costs, and provide interactive quotations. The AI framework continuously improves its prediction capability through feedback loops, human verification processes, and machine learning model refinement. Figures 3, 7, and 8B of the patent illustrate the interaction among these modules and the generation of inventory-based cost estimates [22].

A significant feature of the invention is its ability to create an inventory list automatically from visual and sensor data without requiring extensive manual input from users. The AI system identifies objects such as furniture, appliances, household items, and other belongings, determines their attributes, and uses historical cost data, transportation variables, accessibility conditions, and contextual factors to estimate relocation expenses accurately. The system can further generate recommendations for additional services such as packing, unpacking, dismantling, assembly, junk removal, insurance services, and related relocation products.

The patent also incorporates an interactive quotation mechanism that allows users and service providers to review, modify, and refine estimates in real time. Through iterative interactions, the AI engine can request additional information, update inventory records, adjust quotations, and improve estimation accuracy. This capability transforms cost estimation from a static process into a dynamic, intelligent, and customer-centric experience. By combining artificial intelligence, machine learning, computer vision, sensor analytics, and automated quote generation, the invention represents a significant advancement in digital service estimation and relocation technology.

6. TECHNICAL CONTENT ANALYSIS :

6.1 Objective of the Invention:

What Problem Does It Solve?

The primary objective of this invention is to automate and improve the process of generating cost estimates for relocation and home-related services through Artificial Intelligence (AI) and Machine Learning (ML). Traditional estimation methods typically depend on telephone discussions, web forms, or physical site inspections. These methods are often inaccurate, time-consuming, expensive, and require significant human intervention. Service providers must frequently schedule appointments, conduct in-person inspections, and manually prepare quotations, resulting in higher operational costs and inconvenience for customers [22].

The invention addresses these challenges by enabling customers to capture photographs, videos, text descriptions, voice inputs, and sensor data of their premises using mobile devices. The AI system automatically analyzes the collected information, identifies inventory items, evaluates environmental conditions, and generates accurate cost estimates without requiring an on-site visit. This significantly reduces estimation time, lowers operational expenses, improves consistency, and enhances customer experience through a fully digital and automated process.

Furthermore, the invention solves the problem of static quotations by providing dynamic and interactive estimates. The system can ask follow-up questions, request additional information, refine inventory details, and continuously improve quote accuracy through iterative AI-driven analysis. This results in more reliable and personalized service recommendations.

6.2 Key Components / Method:

Describe How It Works (Summarizing Claims and Diagrams)

The patent proposes a multi-layer AI-enabled architecture consisting of several interconnected modules that work together to generate automated service quotations [22].

Step 1: Data Acquisition

The process begins with the collection of description data from a location through:

- Photographs
- Videos
- Voice recordings
- Text inputs
- User interface interactions
- Environmental sensors such as GPS, accelerometers, gyroscopes, microphones, and other mobile-device sensors

These inputs provide comprehensive information about the customer's location and belongings.

Step 2: AI-Based Inventory Generation

The collected data are processed using machine learning and computer vision models trained to recognize objects and environmental features. The AI system identifies inventory items such as furniture, appliances, household goods, and structural elements.

The Inventory Generation Module automatically creates:

- Inventory lists
- Object classifications
- Item attributes
- Location-based information
- Environmental context

The AI model continuously improves through feedback and retraining mechanisms.

Step 3: AI Improvement Engine

A dedicated AI Improvement Engine evaluates the detected inventory and determines whether additional information is required. If necessary, the system generates targeted questions for users or service providers.

Examples include:

- Whether furniture requires dismantling
- Accessibility constraints
- Packaging requirements
- Special handling needs

The iterative feedback loop improves estimation accuracy over time.

Step 4: Cost Calculation Module

After inventory generation, the Cost Calculation Module calculates service costs using:

- Historical pricing databases
- Item characteristics
- Weight and size estimates
- Driving distance
- Traffic conditions
- Building accessibility
- Presence of elevators or stairs
- Environmental and geographic factors

The system can dynamically adjust estimates based on these variables.

Step 5: Interactive Quote Generation

The Interactive Quote Generation Module produces personalized quotations that may include:

- Relocation costs
- Packing and unpacking services
- Dismantling and assembly services
- Junk removal services
- Insurance products
- Additional related services

Users can modify selections similarly to an e-commerce shopping cart.

Step 6: Quote Monitoring and Continuous Learning

The Quote Monitoring Module tracks user interactions, updates inventories, incorporates corrections, and feeds information back into the AI engine. Human verification can also be used to improve model performance and accuracy.

Overall, the method follows the sequence:

Data Collection → Inventory Detection → Attribute Analysis → Cost Calculation → Interactive Quote Generation → Continuous Learning and Refinement

6.3 Innovative Elements:

What Makes It Novel Compared to Prior Art?

The novelty of the invention lies in the integration of Artificial Intelligence, Machine Learning, Computer Vision, Sensor Analytics, and Interactive Quotation Systems into a single automated platform [22].

Major innovative elements include:

(1) AI-Based Automated Inventory Creation:

Unlike conventional estimation systems that depend on manual inspections, the invention automatically generates inventory lists from photographs, videos, and sensor data using AI algorithms.

(2) Context-Aware Cost Estimation:

The system not only identifies objects but also evaluates contextual attributes such as:

- Location of items within buildings
- Accessibility conditions
- Environmental factors
- User demographic information
- Transportation constraints

This enables more accurate and personalized quotations.

(3) Iterative Intelligent Interaction:

The AI engine actively asks targeted follow-up questions when information is incomplete. This interactive learning mechanism continuously improves estimate quality.

(4) Real-Time Dynamic Quotations:

Users can modify inventory items, add services, remove services, and instantly view updated quotations, similar to online shopping platforms.

(5) Multi-Source Data Fusion:

The invention combines:

- Images
- Videos
- Audio inputs
- Text descriptions
- Sensor data
- Geolocation information

into a unified decision-making framework.

(6) Self-Improving AI Architecture:

Human corrections and user feedback are incorporated into the AI Improvement Engine, allowing continuous enhancement of prediction accuracy over time.

(7) Service Recommendation Intelligence:

Beyond generating estimates, the system recommends complementary services and products such as packing materials, insurance, dismantling services, and logistics support, creating a comprehensive service ecosystem.

6.4 Technical Field:

Industry or Domain:

The patent belongs to multiple advanced technological domains [22]:

Artificial Intelligence (AI):

Uses machine learning, deep learning, and intelligent decision-making algorithms for object detection, inventory generation, and quotation prediction.

Computer Vision:

Processes photographs and videos to recognize objects, classify inventory items, and determine contextual attributes.

Relocation and Logistics Technology:

Supports moving companies, transportation providers, and logistics service organizations through automated estimation and planning tools.

Service Technology Platforms:

Provides digital service quotation systems for home services, maintenance services, packing services, and relocation management.

PropTech (Property Technology):

Uses property-related data, environmental information, and building characteristics for service planning and cost optimization.

E-Commerce and Digital Marketplace Systems:

Implements shopping-cart-style interactions, service recommendations, and dynamic pricing mechanisms similar to modern online marketplaces.

Data Analytics and Decision Support Systems:

Utilizes predictive analytics, historical cost databases, and intelligent recommendation engines to support business decision-making and customer engagement.

Thus, the patent is positioned at the intersection of **Artificial Intelligence, Computer Vision, Relocation Technology, Service Automation, Logistics Management, PropTech, and Digital Commerce Platforms**, making it a highly interdisciplinary innovation with significant commercial applicability.

7. DETAILED DESCRIPTION OF THE INVENTION :

The invention presents an Artificial Intelligence (AI)-driven system and method for automatically generating cost estimates and quotations for relocation, moving, packing, home improvement, and related services. The system eliminates the need for traditional manual inspections and estimator visits

by enabling users to provide information about a location through digital media such as photographs, videos, audio recordings, text inputs, and environmental sensor data. The invention utilizes machine learning, computer vision, deep learning, and intelligent analytics to identify inventory items, evaluate contextual factors, and generate accurate cost estimates in an automated manner [22].

The system architecture consists of a deployment server running an AI framework, a consumer interaction module, a service provider interaction module, a database, and an AI improvement engine. Users interact with the system through mobile applications, web applications, messaging platforms, or other digital interfaces. The consumer interaction module receives user-generated content including images, videos, voice recordings, text descriptions, and sensor information collected from smartphones and other digital devices. The environmental sensors may include GPS receivers, accelerometers, gyroscopes, microphones, barometers, and other sensors capable of providing contextual information regarding the user's location and surroundings.

The collected data are processed by machine learning models trained using large datasets of annotated images and inventory objects. The AI framework employs computer vision algorithms to identify and classify objects present within the location. Furniture, appliances, electronic equipment, household goods, decorative items, storage units, and structural elements can be automatically detected and categorized. The system generates a detailed inventory list that includes identified objects and associated attributes such as dimensions, size, quantity, location within the building, accessibility, fragility, and handling requirements.

A significant component of the invention is the AI Improvement Engine, which continuously enhances estimation accuracy through iterative learning and intelligent interaction. When the AI model determines that available information is insufficient, it automatically generates targeted follow-up questions for users or service providers. For example, the system may inquire whether a sofa requires disassembly, whether an elevator is available, whether stairs are present, or whether specialized packaging is needed. The responses are incorporated into the estimation model to improve the quality of the final quotation.

The invention further includes advanced data processing mechanisms that perform spatial and temporal analysis of collected information. Multiple photographs and videos are correlated to eliminate duplicate object detections and improve inventory accuracy. The system filters redundant information, identifies object relationships, generates contextual attributes, and creates a comprehensive representation of the environment. Human verification may optionally be incorporated into the workflow, allowing service providers or experts to validate AI-generated outputs and provide corrections that are subsequently used to retrain and improve the machine learning models.

Once inventory generation is completed, the Cost Calculation Module determines service costs using various parameters and historical datasets. The cost estimation process considers factors such as object size, weight, fragility, quantity, moving distance, traffic conditions, weather conditions, labor requirements, accessibility constraints, building characteristics, elevator availability, staircases, long carrying distances, and regional pricing trends. Historical pricing databases and operational records are analyzed to generate accurate and realistic quotations tailored to specific service requirements.

The invention also introduces an Interactive Quote Generation Module that transforms traditional quotations into dynamic and customizable digital experiences. The system presents users with an inventory list and corresponding service costs. Users can review detected items, modify inventory details, remove unwanted items, add missing items, and select optional services such as packing, unpacking, assembly, dismantling, junk removal, storage, insurance coverage, maintenance plans, and transportation services. The quotation updates automatically in real time whenever modifications are made, providing immediate cost visibility.

An important feature of the invention is its ability to recommend additional products and services based on detected inventory and contextual information. For example, if valuable electronic devices or furniture are detected, the system may recommend insurance services. If fragile items are identified, specialized packaging solutions may be suggested. The invention therefore functions not only as a quotation platform but also as an intelligent recommendation engine capable of enhancing customer service and business opportunities.

The machine learning framework supporting the invention undergoes continuous training and refinement. Training datasets containing annotated images and inventory information are used to develop object recognition models. These trained models are deployed on operational servers where

they process incoming customer data. Feedback obtained from users, service providers, and human validators is incorporated into subsequent training cycles, enabling continuous improvement in object recognition accuracy, inventory generation, and cost prediction performance.

The operational workflow of the invention begins with data acquisition from a user's location. The AI system analyzes the collected information and generates an inventory list with associated attributes. The AI Improvement Engine evaluates the completeness of available information and requests additional data if necessary. Once sufficient information is obtained, the Cost Calculation Module computes service costs and generates personalized interactive quotations. The user may then customize the quotation by selecting services and products, after which the final estimate is produced and delivered electronically.

Overall, the invention provides a comprehensive AI-powered platform that integrates computer vision, machine learning, sensor analytics, inventory management, predictive cost modeling, and interactive quotation technologies. By replacing manual inspections with intelligent automated analysis, the system significantly reduces operational costs, accelerates service delivery, improves estimation accuracy, enhances customer convenience, and creates a scalable solution for relocation, logistics, home services, and related industries.

8. CLAIMS OF THE INVENTION :

The invention claims a novel Artificial Intelligence (AI)-based system and method for automatically generating cost estimates, quotations, and service recommendations based on digital descriptions of a location. The invention primarily protects the use of machine learning, computer vision, sensor analytics, and intelligent data processing to replace traditional manual inspection and estimation procedures [22].

Claim 1: AI-Based Data Acquisition:

The invention claims a method of receiving description data relating to a location through one or more sources, including cameras, user interfaces, mobile devices, videos, photographs, audio recordings, textual inputs, and environmental sensors. The system is capable of collecting information without requiring a physical visit by a service estimator.

Claim 2: Automated Inventory Generation:

The invention claims the automatic generation of an inventory list comprising multiple objects present within the location. Using machine learning and computer vision algorithms, the system identifies, classifies, and categorizes furniture, appliances, household goods, and other relevant items from the received description data.

Claim 3: Inventory Attribute Identification:

The invention claims the determination of inventory attributes associated with detected objects. These attributes include object dimensions, quantity, location within a building, accessibility characteristics, environmental context, object relationships, and other relevant descriptive information used for service estimation.

Claim 4: Context-Aware Analysis:

The invention claims the ability to analyze contextual information associated with inventory items. The system evaluates physical building characteristics, room layouts, staircases, elevators, carrying distances, accessibility constraints, and other environmental factors that influence service costs.

Claim 5: AI-Based Interactive Quote Generation:

The invention claims the generation of one or more interactive quotations using machine learning models. The quotations are automatically calculated based on inventory items, inventory attributes, environmental conditions, and contextual information obtained from the location.

Claim 6: Multi-Modal Data Processing:

The invention claims the processing of multiple forms of input data, including image data, video data, audio data, text data, user interface data, and sensor-generated data. The integration of multiple data sources improves estimation accuracy and inventory completeness.

Claim 7: Environmental Sensor Integration:
The invention claims the utilization of environmental sensors such as GPS receivers, accelerometers, gyroscopes, microphones, barometers, and other sensor devices to collect supplementary information that assists in generating more accurate estimates and quotations.

Claim 8: AI Improvement Engine:
The invention claims an AI Improvement Engine capable of continuously refining inventory analysis and quotation accuracy. The engine identifies missing information, formulates targeted follow-up questions, and requests additional user inputs whenever necessary.

Claim 9: Iterative Learning and Feedback Mechanism:
The invention claims a feedback-driven learning framework in which user responses, service-provider inputs, and human corrections are incorporated into the machine learning models. This enables continuous improvement in object recognition and cost prediction accuracy.

Claim 10: Human Verification Capability:
The invention claims optional human verification of AI-generated outputs. Human reviewers may validate inventory classifications, correct errors, and provide annotations that are subsequently used for retraining and improving the AI system.

Claim 11: Cost Calculation Framework:
The invention claims a cost calculation module that computes service costs using inventory information, historical pricing data, labour requirements, transportation factors, traffic conditions, weather conditions, accessibility constraints, and other operational variables.

Claim 12: Dynamic User Interaction:
The invention claims a system that allows users to review, modify, add, or remove inventory items from the generated quotation. Any modifications automatically update the service estimate in real time, thereby providing a dynamic and interactive quotation experience.

Claim 13: Service and Product Recommendation Engine:
The invention claims the capability to generate recommendations for additional products and services based on detected inventory items and contextual requirements. Such recommendations may include packing services, unpacking services, dismantling and assembly services, insurance products, maintenance plans, storage services, donations, junk removal services, and related offerings.

Claim 14: Demographic and Behavioural Data Utilization:
The invention claims the use of user demographic information, geolocation information, socioeconomic characteristics, and behavioural patterns as additional inputs for improving the accuracy of quotations and recommendations.

Claim 15: Relocation Cost Optimization:
The invention claims automatic adjustment of relocation estimates based on physical item characteristics such as size, fragility, weight, and quantity, together with location-specific factors such as staircases, elevators, distance from roads, accessibility, and handling requirements.

Claim 16: Computer-Implemented AI Estimation Platform:
The invention claims a complete computer-implemented platform comprising a deployment server, consumer interaction module, service provider interaction module, database, AI improvement engine, inventory generation module, cost calculation module, and interactive quotation engine working together to provide automated AI-driven cost estimation services.

Summary of the Claims:

Collectively, the claims protect an integrated AI-powered estimation ecosystem that acquires multi-modal data, generates intelligent inventories, evaluates contextual factors, computes dynamic service costs, provides interactive quotations, continuously learns from feedback, and recommends relevant services and products. The invention establishes a scalable, automated, and highly accurate alternative to conventional manual estimation processes used in relocation, logistics, home services, insurance, and related industries.

9. CITATIONS & SIMILAR INVENTIONS :

9.1 Number of Citations in the Patent:

The patent **US 11,270,363 B2** contains an extensive prior-art reference portfolio. The patent document cites approximately [22]:

- **68 U.S. Granted Patents**
- **44 U.S. Patent Applications**
- **2 Foreign Patent Documents**
- **14 Non-Patent Literature (NPL) References**

Thus, the patent contains **more than 125 prior-art references** in total. These references were used by the inventors and patent examiners to establish novelty, non-obviousness, and technical advancement over existing technologies. The large number of references indicates that the invention is positioned at the intersection of artificial intelligence, computer vision, machine learning, relocation services, home-service estimation, mobile sensing, and automated quotation systems.

The cited references cover technologies such as:

- Object recognition and computer vision.
- Image and video analytics.
- Inventory management systems.
- Cost estimation systems.
- Service marketplace platforms.
- Mobile sensor-based applications.
- Artificial intelligence and machine learning frameworks.
- Automated recommendation engines.
- Human-computer interaction systems.

9.2 Number of Citations for the Patent:

As a relatively recent patent granted on **8 March 2022**, US 11,270,363 B2 has begun influencing subsequent innovations in AI-driven service estimation and intelligent inventory generation [22].

The patent has been cited by:

- Later patent applications related to AI-based relocation management.
- Automated property assessment systems.
- Computer vision-based inventory generation systems.
- Digital inspection and quotation platforms.
- Home-services automation technologies.

The patent family itself is built upon earlier inventions developed by Yembo Inc., including:

(1) **US 10,528,962 B2** – AI-Based Cost Estimation Systems.
(2) **US 10,867,328 B2** – Interactive AI Relocation Estimation Systems.
(3) **US 11,270,363 B2** – Advanced AI-Based Cost Estimation Platform.

These related patents demonstrate the evolution of Yembo's proprietary AI estimation ecosystem and form a significant citation network in the relocation-technology domain. The patent serves as a foundational invention for future developments in automated visual surveying and intelligent service pricing.

9.3 List of Similar Inventions:

Several patents and patent applications exhibit technological similarities with US 11,270,363 B2 because they address automated estimation, object recognition, service quotation, inventory generation, or AI-assisted decision-making [22].

A. Directly Related Yembo Patents:

(1) **US 10,528,962 B2**
- Systems and Methods for Providing AI-Based Cost Estimates for Services.
- Parent patent of the present invention.
- Focuses on computer vision-based inventory recognition and quotation generation.

(2) **US 10,867,328 B2**
- Continuation patent expanding AI-driven relocation estimation.
- Introduces advanced machine learning models and inventory analytics.

(3) **US 2020/0151749 A1**
- AI-based relocation cost estimation platform.
- Uses image recognition and inventory generation technologies.

B. Similar Computer Vision and Inventory Recognition Patents:

(4) **US 2017/0323319 A1 (Rattner et al.)**
- Automated object identification and inventory generation.
- Uses image analysis for relocation-related services.

(5) **US 2019/0244267 A1 (Rattner et al.)**
- AI-assisted inventory recognition and service estimation.
- Employs machine learning to improve quotation accuracy.

(6) **US 2020/0134734 A1 (Aneesh)**
- Automated property inspection and assessment system.
- Utilizes image-based evaluation for service recommendations.

C. Similar Home-Service Estimation Systems:

(7) **US 8,615,450 B1**
- Automated home-service estimation platform.
- Generates service recommendations from user-provided information.

(8) **US 9,767,566 B1**
- Digital quotation generation system.
- Supports automated service pricing.

(9) **US 10,223,750 B1**
- Mobile-based inspection and estimation platform.
- Uses captured visual information to calculate service costs.

D. Similar AI and Machine Learning Systems:

(10) **WO 2017/191525 A2**
- AI-driven visual analysis and object recognition platform.
- Uses machine learning for environmental assessment.

(11) **KR 20170135260 A**
- Intelligent image-processing system for object identification.
- Supports automated decision-making and inventory generation.

(12) **US 10,657,490 B2**
- AI-powered recommendation and prediction system.
- Employs machine learning models for cost optimization.

Overall Similarity Assessment:

The most closely related inventions are the Yembo patent family (US 10,528,962 B2 and US 10,867,328 B2), which provide the technological foundation for US 11,270,363 B2. However, the present patent distinguishes itself through its integration of:

- Multi-modal data acquisition (images, videos, text, audio, and sensors),
- AI-driven inventory generation,
- Context-aware object analysis,
- Dynamic quotation generation,
- Interactive service recommendations,
- Human-in-the-loop verification, and
- Continuous AI learning and improvement mechanisms.

These features collectively make the invention more comprehensive and commercially applicable than earlier estimation and quotation systems.

10. BASIC ANALYSIS :

10.1 Importance of the Invention:

The invention addresses a major challenge in service industries such as relocation, painting, home maintenance, repair, and installation services, where traditional cost estimation methods are often inaccurate, time-consuming, and expensive. The patented system utilizes artificial intelligence, machine learning, computer vision, and sensor technologies to automatically identify objects, generate inventories, and estimate service costs without requiring physical inspection by service providers. This significantly reduces operational costs, improves estimation accuracy, and enhances customer convenience. The invention enables asynchronous interactions between customers and service providers, eliminating the need for scheduling on-site visits and thereby accelerating the quotation process. Furthermore, it supports personalized recommendations, value-added services, and real-time quote adjustments, making it highly relevant in the era of digital transformation and AI-driven service automation [22].

10.2 Description of the Invention:

The invention is an AI-powered intelligent estimation platform designed to generate automated cost estimates for services based on visual and sensor data collected from a customer's location. The system receives information through multiple sources, including photographs, videos, audio recordings, text inputs, user interfaces, GPS data, accelerometers, gyroscopes, and other environmental sensors. Using machine learning and computer vision algorithms, the platform identifies objects, furniture, appliances, room dimensions, and contextual attributes to create a detailed inventory list. The AI engine then analyses the inventory, location conditions, accessibility factors, historical pricing data, traffic conditions, environmental parameters, and service requirements to generate interactive quotations. The system continuously improves through feedback mechanisms, human verification, and AI learning models, ensuring higher accuracy over time. It can also suggest additional services such as packing, dismantling, insurance, maintenance contracts, and related products, thereby creating a comprehensive service ecosystem.

10.3 Design Analysis:

A. Technology:

The patent employs a sophisticated combination of Artificial Intelligence (AI), Machine Learning (ML), Deep Learning, Computer Vision, Natural Language Processing (NLP), Sensor Fusion, Cloud Computing, and Mobile Computing technologies. The architecture includes AI training frameworks, deployment servers, inventory-generation modules, quote-generation engines, databases, consumer interaction modules, service-provider interaction modules, and AI improvement engines. These technologies work together to provide automated object recognition, inventory creation, and dynamic cost estimation.

B. Easiness:

The system is highly user-friendly because customers only need to upload photos, videos, voice recordings, or other basic information using a smartphone or web application. The AI performs most of the complex analysis automatically and asks targeted follow-up questions only when additional clarification is required. This minimizes user effort while maximizing estimation accuracy and convenience.

C. Cost:

The invention substantially reduces the cost of service estimation by eliminating or minimizing physical site visits, manual inspections, and estimator travel expenses. Automation lowers labour costs and enables service providers to process a larger volume of customer requests efficiently. The scalable cloud-based architecture further reduces operational expenditures and improves cost-effectiveness for both customers and service providers.

D. Reliability:

Reliability is enhanced through multiple layers of validation, including AI-based object recognition, contextual analysis, historical pricing databases, human verification options, feedback loops, and

continuous machine learning improvement. The AI improvement engine refines predictions using user corrections and service-provider feedback, thereby improving the consistency and dependability of generated estimates.

E. Resource Availability:

The invention relies on widely available resources such as smartphones, cameras, cloud servers, internet connectivity, mobile sensors, and machine learning frameworks. Since these technologies are already broadly deployed across consumer and enterprise environments, large-scale implementation of the invention is practical and feasible without requiring specialized hardware.

F. Durability:

The system demonstrates strong technological durability because it is software-driven and capable of continuous updates through retraining of AI models, software upgrades, and cloud-based enhancements. Its modular architecture allows integration of future technologies such as advanced computer vision, generative AI, predictive analytics, and Internet of Things (IoT) devices, ensuring long-term relevance and sustainability.

10.4 New Innovations & Value Addition in the Patent:

The patent introduces several novel innovations that differentiate it from conventional estimation systems. First, it combines computer vision and machine learning to automatically create inventories from photos, videos, and sensor inputs without requiring manual data entry. Second, it generates dynamic and interactive quotations rather than static estimates, allowing real-time modifications and personalized recommendations. Third, it integrates contextual information such as object attributes, accessibility factors, weather conditions, traffic data, and user demographics into the pricing process. Fourth, the AI improvement engine continuously learns from human feedback and corrected data, enabling self-improving estimation accuracy. Fifth, the invention supports upselling and cross-selling opportunities by recommending related services such as packing, insurance, dismantling, donations, storage, and maintenance contracts. Sixth, the system enables asynchronous customer-service interactions, allowing users to obtain estimates at their convenience without scheduling appointments. Finally, the integration of inventory generation, service recommendation, predictive pricing, and intelligent customer engagement within a single platform creates substantial commercial value and establishes a new benchmark for AI-enabled service estimation systems.

11. STRUCTURAL ANALYSIS :

11.1 SWOC Analysis:

SWOC (Strengths, Weaknesses, Opportunities, and Challenges) Analysis is a strategic evaluation framework widely used to assess the viability, innovation potential, competitive position, and future prospects of ideas, technologies, and inventions. In innovation and patent studies, SWOC analysis helps researchers systematically identify the internal strengths and weaknesses of an invention while simultaneously examining external opportunities and challenges that may influence its adoption, commercialization, and long-term success (Aithal & Kumar (2015). [41]; Gürel & Tat (2017). [42]). The framework supports decision-making by enabling inventors, entrepreneurs, investors, and policymakers to evaluate technological feasibility, market readiness, competitive advantage, and implementation risks (Pickton & Wright, (1998). [43]; Valentin (2001). [44]). In the context of emerging technologies and patent analysis, SWOC provides a structured mechanism for understanding innovation value, commercialization potential, stakeholder benefits, and future growth opportunities (Phadermrod et al. (2019). [45]; Benzaghta et al. (2021). [46]). Its application has gained increasing importance in technology management, strategic planning, and innovation assessment because it facilitates a holistic examination of inventions from technical, business, societal, and sustainability perspectives (Panagiotou (2003). [47]; Hill & Westbrook (1997). [48]; Aithal & Aithal (2023). [49]).

11.1.1 Strengths of the Patent:

Table 2: Strengths of the Patent

S. No.	Key Strength	Description
1	**AI-Driven Automation**	Automates inventory generation and cost estimation, significantly reducing manual effort and human errors.

2	**Multi-Modal Data Processing**	Utilizes images, videos, text, audio, GPS data, and environmental sensors to improve estimation accuracy.
3	**Interactive Quote Generation**	Provides dynamic and customizable quotations that can be updated in real time based on user inputs.
4	**Continuous Learning Capability**	The AI Improvement Engine continuously enhances prediction accuracy through feedback, corrections, and machine learning updates.
5	**Scalability and Operational Efficiency**	Eliminates the need for most physical inspections, enabling service providers to handle a larger volume of customer requests efficiently.
6	**Integrated Service Recommendation System**	Supports cross-selling and upselling of additional services such as packing, insurance, storage, dismantling, and maintenance contracts.

11.1.2 Weaknesses of the Patent:

Table 3: Weaknesses of the Patent

S. No.	Key Weakness	Description
1	**Dependence on Data Quality**	Estimation accuracy depends heavily on the quality of images, videos, and sensor data provided by users.
2	**High Initial Development Cost**	Developing and training advanced AI and computer vision models requires substantial investment.
3	**Complex System Architecture**	The integration of multiple AI modules, databases, and interaction platforms increases implementation complexity.
4	**Potential Recognition Errors**	Incorrect object detection or inventory classification may lead to inaccurate quotations.
5	**Need for Continuous Model Training**	AI models require regular updates and retraining to maintain performance across diverse environments.
6	**Dependence on Internet and Cloud Infrastructure**	Efficient operation requires reliable connectivity, cloud computing resources, and data-processing capabilities.

11.1.3 Opportunities for the Patent:

Table 4: Opportunities of the Patent

S. No.	Key Opportunity	Description
1	**Expansion into Multiple Service Industries**	The technology can be extended beyond relocation services to painting, renovation, cleaning, insurance assessment, repairs, and maintenance services.
2	**Integration with Smart Homes and IoT**	Future integration with IoT devices can enhance automated inventory detection and contextual analysis.
3	**Global Commercialization Potential**	Growing digital transformation and AI adoption create opportunities for worldwide deployment.
4	**Partnerships with Logistics and E-Commerce Companies**	The platform can support logistics providers, movers, online marketplaces, and service aggregators.
5	**Development of Predictive Service Analytics**	Historical data can be used for demand forecasting, dynamic pricing, and customer behaviour prediction.
6	**Generative AI and Advanced**	Emerging AI technologies can further improve inventory recognition, quotation accuracy, and customer interactions.

	Computer Vision Enhancements	

11.1.4 Challenges of the Patent:

Table 5: Challenges of the Patent

S. No.	Key Challenge	Description
1	**Privacy and Data Security Concerns**	Collection of photos, videos, location information, and household inventories may raise privacy and cybersecurity issues.
2	**Regulatory Compliance Requirements**	Compliance with data protection regulations such as GDPR, CCPA, and similar laws across jurisdictions may be challenging.
3	**Rapid Technological Changes**	Continuous advancements in AI and computer vision may require frequent upgrades to remain competitive.
4	**User Acceptance and Trust**	Some customers and service providers may hesitate to rely entirely on AI-generated quotations.
5	**Competitive Market Environment**	Large technology firms and emerging startups may develop similar AI-driven estimation platforms.
6	**Variability of Real-World Conditions**	Differences in lighting, image quality, object arrangements, building structures, and environmental conditions may affect estimation consistency and accuracy.

This SWOC analysis reflects the patent's technological architecture, machine-learning framework, interactive quotation process, inventory-generation methodology, and commercialization potential described in the patent specification and system diagrams.

11.2 ABCDEF Analysis of the Patent:

Based on the Patent Analysis methodology proposed by Aithal and Aithal, ABCDEF Analysis evaluates a patent from the perspective of various stakeholders by examining its **Advantages, Benefits, Constraints, Disadvantages, Effectiveness, and Future Financial Value** [50-51]; [1]; [17-21]. The framework provides a systematic approach for understanding the technological, operational, commercial, and societal implications of an invention. It enables researchers to assess both the positive and negative aspects of a patented product, process, or system while identifying its practical effectiveness and long-term sustainability. Through stakeholder-oriented evaluation, the analysis captures the perceptions of inventors, users, organizations, investors, regulators, and society regarding the patent's value and impact. ABCDEF Analysis also facilitates the identification of commercialization potential, innovation opportunities, and implementation challenges associated with the patented technology. Consequently, it serves as a comprehensive qualitative framework for patent analysis, supporting scholarly research, strategic decision-making, and future technology forecasting [52- 59].

(i) Advantages of the patent from Stakeholders' Perception:

Table 6: Advantages of the patent from Stakeholders' Perception

S. No.	Key Advantage	Description
1	**Accurate and Data-Driven Cost Estimation**	The patent uses AI, machine learning, image recognition, sensor data, and inventory analysis to generate more accurate service cost estimates than traditional phone-based or manual estimation methods, benefiting both customers and service providers.
2	**Significant Time Savings for Consumers**	Customers can obtain estimates remotely through images, videos, text, and sensor inputs without scheduling physical inspections, reducing waiting time and improving convenience.
3	**Lower Operational Costs for Service Providers**	Service companies can reduce expenses associated with sending staff for onsite surveys and inspections, thereby improving operational efficiency and profitability.

4	**Automated Inventory Generation and Analysis**	The AI system automatically identifies objects, generates inventory lists, determines item attributes, and calculates associated costs, minimizing manual effort and human error.
5	**Interactive and Personalized Quotation System**	The technology provides interactive quotes and allows users to add or remove items, request additional services, and receive updated pricing in real time, enhancing customer engagement and satisfaction.
6	**Continuous Learning and Performance Improvement**	Through the AI Improvement Engine and feedback mechanisms, the system continuously refines object recognition, cost prediction, and service recommendations, increasing accuracy over time.
7	**Enhanced Business Upselling Opportunities**	The platform can intelligently recommend supplementary services such as packing, unpacking, dismantling, insurance, maintenance contracts, and related products, creating additional revenue streams for service providers.
8	**Scalable Multi-Stakeholder Digital Ecosystem**	The patent facilitates seamless interaction among consumers, service providers, AI systems, databases, and third-party service partners, enabling large-scale deployment across relocation, home services, maintenance, and related industries.

These advantages demonstrate that the patent creates value for **customers, service providers, business partners, investors, and technology developers** by improving accuracy, efficiency, scalability, customer experience, and revenue-generation potential.

(ii) Benefits of the patent from Stakeholders' Perception for Realization:

Table 7: Benefits of the patent from the Stakeholders' Perception.

S. No.	Key Benefits	Description
1	**Improved Customer Convenience and Experience**	Customers can obtain service estimates remotely using images, videos, text, audio, and sensor data without arranging physical inspections, resulting in a faster and more user-friendly service experience.
2	**Faster Decision-Making and Service Booking**	AI-generated inventory lists and interactive quotations enable customers to receive immediate pricing information, helping them make quicker purchasing and service-selection decisions.
3	**Greater Transparency in Pricing**	The system generates itemized inventories, cost breakdowns, and interactive quotes, allowing customers to clearly understand how costs are calculated and reducing disputes regarding service charges.
4	**Higher Productivity for Service Providers**	Automated object recognition, inventory creation, and cost estimation reduce manual inspection work, enabling service providers to handle more customers with the same workforce.
5	**Personalized Service Recommendations**	The AI system can recommend additional services such as packing, unpacking, dismantling, insurance, maintenance contracts, and related products based on detected customer requirements, creating greater value for users.
6	**Enhanced Estimation Accuracy and Reliability**	By combining computer vision, machine learning, environmental sensor data, location information, inventory attributes, and historical pricing data, the system improves estimate reliability and reduces pricing errors.
7	**Continuous Service Improvement Through Learning**	The AI Improvement Engine incorporates user feedback, human verification, and additional training data to continuously enhance object detection, inventory generation, and quote accuracy, benefiting all stakeholders over time.

8	**Increased Revenue and Business Growth Opportunities**	Service providers, technology developers, and business partners benefit from scalable digital service delivery, cross-selling opportunities, automated lead generation, and improved customer conversion rates, leading to higher revenues and market expansion.

Thus, from a stakeholder perspective, the patent delivers benefits in terms of **customer satisfaction, operational efficiency, pricing transparency, service personalization, continuous learning, business scalability, revenue enhancement, and overall value creation**, making it a commercially attractive AI-enabled service estimation platform.

(iii) Constraints of the patent from Stakeholders' Perception for Realization:

Table 8: Constraints of the patent from the Stakeholders' Perception.

S. No.	Key Constraints	Description
1	**Dependence on Quality of Input Data**	The effectiveness of the AI system depends heavily on the quality of images, videos, audio, text, and sensor data provided by users. Poor lighting, incomplete scans, blurred images, or inaccurate inputs may reduce the accuracy of inventory generation and cost estimation.
2	**Requirement for Advanced AI Training and Continuous Improvement**	The patent relies on machine learning models, AI training frameworks, human verification, and AI improvement engines. Maintaining and continuously retraining these models requires substantial technical expertise, computational resources, and ongoing investment.
3	**High Infrastructure and Implementation Costs**	Deployment requires AI servers, databases, consumer and service-provider interaction modules, cloud infrastructure, sensors, and data-processing systems. Small service providers may find the implementation and maintenance costs challenging.
4	**Privacy and Data Security Concerns**	The system collects images, videos, voice recordings, location information, demographic data, and environmental sensor data from users. Stakeholders may have concerns regarding data privacy, storage security, consent management, and compliance with data-protection regulations.
5	**Need for Human Verification in Certain Situations**	Although the system automates estimation, the patent includes provisions for human verification and correction of AI-generated inventories and annotations. This indicates that complete automation may not always be achievable, especially in complex or ambiguous cases.
6	**Dependence on External Dynamic Factors**	Cost estimates are influenced by factors such as traffic conditions, weather, historical pricing data, accessibility, stairs, elevators, and service demand. Rapid changes in these variables may affect estimate accuracy and require frequent recalculations.

Thus, from the stakeholders' perspective, the major constraints include **data-quality dependence, infrastructure costs, privacy concerns, AI maintenance requirements, reliance on occasional human intervention, and sensitivity to changing environmental and market conditions**. These constraints may affect the scalability, reliability, and adoption of the patented system.

(iv) Disadvantages of the Patent from Stakeholders' Perception for Realization:

Table 9: Disadvantages of the patent from the Stakeholders' Perception.

S. No.	Key Disadvantages	Description
1	**Possibility of Inaccurate Cost Estimates**	AI-generated estimates are dependent on object recognition, inventory generation, and predictive algorithms. Incorrect identification of items, dimensions, accessibility conditions, or environmental factors may result in underestimation or

		overestimation of service costs, causing dissatisfaction among customers and service providers
2	**Reduced Human Judgment in Complex Situations**	The system attempts to automate activities traditionally performed by experienced estimators. Unique circumstances, unusual items, special handling requirements, or customer-specific needs may not always be fully captured by AI models, potentially reducing estimate reliability.
3	**Risk of Customer Distrust Due to AI Decisions**	Customers may question the fairness and transparency of automatically generated quotations, especially when the system adjusts prices based on demographic data, location attributes, historical demand, weather conditions, or other algorithmic factors that are not fully visible to users.
4	**Potential Job Displacement for Traditional Estimators**	Since the patent aims to replace many manual inspection and quotation activities with automated AI-based assessments, professional estimators and survey personnel may face reduced employment opportunities in service industries that adopt the technology extensively.
5	**Increased Dependence on Technology and Connectivity**	The system relies on mobile devices, cameras, sensors, cloud infrastructure, AI frameworks, databases, and communication networks. Technical failures, software errors, device incompatibility, or network disruptions may interrupt the quotation process and affect service delivery.
6	**Exposure to Data Misuse and Cybersecurity Risks**	The patent requires collection and processing of extensive user information, including images, videos, voice recordings, location data, household inventories, and demographic information. Unauthorized access, data breaches, or misuse of sensitive information could negatively impact users and service providers.

Thus, from stakeholders' perception, the key disadvantages of the patent include **estimation inaccuracies, reduced human oversight, trust issues regarding AI decisions, possible displacement of traditional estimators, technological dependency, and cybersecurity risks**. These disadvantages may affect user acceptance, operational reliability, and long-term adoption of the patented AI-based estimation system.

(v) Effectiveness of the patent from Stakeholders' Perception:

Table 10: Effectiveness's of the patent from the Stakeholders' Perception.

S. No.	Key Effectiveness's	Description
1	**Rapid and Automated Cost Estimation**	The patented system automatically generates itemized service estimates by analyzing images, videos, sensor data, and user inputs, significantly reducing the time required for manual inspections and quotation preparation. This improves efficiency for both customers and service providers.
2	**Improved Accuracy through AI and Machine Learning**	The invention utilizes machine learning models to identify items, determine inventory attributes, assess contextual factors, and calculate service costs. Continuous AI improvement and human verification mechanisms further enhance estimation accuracy over time.
3	**Enhanced Customer Convenience**	Customers can obtain quotations remotely using smartphones, cameras, and other devices without scheduling physical visits. The asynchronous estimation process saves time, effort, and travel costs while providing faster decision-making support.
4	**Interactive and Customizable Quotation System**	The system allows users to review inventories, add or remove items, request additional services, answer follow-up questions, and

		receive dynamically updated quotes. This interactive capability improves transparency and user satisfaction.
5	**Comprehensive Decision Support for Service Providers**	The AI engine considers multiple factors such as item characteristics, accessibility, traffic conditions, weather, stairs, distance, historical pricing data, and service demand. This enables service providers to generate more realistic and data-driven cost estimates.
6	**Continuous Learning and Performance Improvement**	Through feedback loops, human corrections, additional user inputs, and AI improvement engines, the system continuously refines object recognition, inventory generation, and pricing models. This adaptive learning capability increases long-term effectiveness and operational reliability.

From stakeholders' perspective, the patent demonstrates effectiveness through **faster estimation, higher accuracy, customer convenience, interactive quote generation, data-driven decision support, and continuous AI learning**. These capabilities make the system an efficient and scalable solution for modern service-cost estimation processes.

(vi) Future Financial Value of the Patent (Stakeholder Perspective):

Table 11: Future values of the patent from the Stakeholders' Perception.

S. No.	Key Future values	Description
1	**Hyper-Personalized Service Recommendations**	Future versions of the system are likely to provide highly personalized quotations and service bundles by combining AI-generated inventories, customer demographics, behavioral data, and contextual information. Customers may receive customized offers, insurance plans, maintenance contracts, and complementary services tailored to their specific needs.
2	**Fully Autonomous Digital Estimation Ecosystem**	The patent lays the foundation for a future where service estimation becomes completely automated through computer vision, machine learning, sensors, and interactive AI engines. Stakeholders can expect significant reductions in manual inspections, paperwork, and operational delays, resulting in faster service delivery.
3	**Real-Time Dynamic Pricing Intelligence**	Future systems may continuously update quotations based on live variables such as traffic conditions, weather forecasts, labour availability, demand fluctuations, accessibility constraints, and historical pricing data. This will enable more accurate, transparent, and adaptive pricing mechanisms for both customers and service providers.
4	**Integrated Smart-Service Marketplace**	The invention has the potential to evolve into a comprehensive digital marketplace where users can obtain estimates, compare providers, purchase add-on services, buy related products, arrange logistics, and complete transactions through a single AI-driven platform. This creates greater value for customers, service providers, and partner businesses.
5	**Continuous Self-Learning and Predictive Decision Support**	With AI improvement engines, human feedback loops, and machine-learning retraining mechanisms, future versions of the system will become increasingly accurate in object recognition, inventory generation, cost prediction, and service recommendations. Stakeholders benefit from enhanced reliability and decision quality over time.
6	**Expansion into Multiple Service Industries**	Although primarily designed for relocation and home-service estimates, the underlying AI framework can be extended to construction, insurance assessment, property management, renovation, repair services, healthcare facility management, and

		logistics industries. This scalability creates substantial future business and societal value.

The major future values perceived by stakeholders are **hyper-personalization, autonomous estimation, dynamic pricing intelligence, integrated service marketplaces, self-learning AI decision support, and cross-industry scalability**. Together, these values position the patent as a transformative platform for the future of AI-driven service estimation and digital service ecosystems.

11.3 Business Opportunities & Challenges:

11.3.1 Business Opportunities in the Industry Environment:

The patent *"Systems and Methods for Providing AI-Based Cost Estimates for Services"* presents significant business opportunities by transforming traditionally manual, time-consuming, and costly service-estimation processes into AI-driven, automated, and scalable digital solutions. The invention uses computer vision, machine learning, sensor data, user interfaces, and AI algorithms to automatically generate inventory lists and provide interactive service quotations [22].

(1) Digital Transformation of Service Estimation:

The patent creates opportunities for service providers to replace physical site visits and manual inspections with automated virtual assessments. This significantly reduces operational costs, improves efficiency, and enables companies to serve a larger customer base without increasing manpower. The system allows consumers to obtain estimates asynchronously without scheduling appointments, creating a highly scalable business model.

(2) Expansion into Multiple Service Industries:

Although primarily focused on relocation and moving services, the technology can be extended to:

- Home renovation and painting services
- Construction and remodeling projects
- Insurance claim assessments
- Property management services
- Home maintenance and repair services
- Interior design consulting
- Facility management services
- Logistics and warehousing operations

This cross-industry applicability substantially enlarges the market potential of the invention.

(3) Interactive Service Marketplace Creation:

The patent enables the development of a digital marketplace where customers can:

- Receive instant estimates
- Compare service providers
- Purchase additional services
- Complete transactions online

The system effectively acts as an intelligent intermediary connecting consumers and service providers, generating new revenue opportunities through commissions, subscriptions, and transaction fees.

(4) Upselling and Cross-Selling Opportunities:

The invention is specifically designed to generate offers for additional products and services, including:

- Packing and unpacking services
- Dismantling and assembly services
- Insurance products
- Maintenance contracts
- Packaging materials
- Donation and resale services
- Junk removal services

These value-added offerings can significantly increase revenue per customer transaction.

(5) AI-as-a-Service (AIaaS) Commercialization:

The core AI engine can be licensed to:

- Moving companies
- Insurance firms
- Property valuation companies

- Home-service aggregators
- Real-estate platforms

This creates recurring revenue through Software-as-a-Service (SaaS) subscriptions and enterprise licensing models.

(6) Data Monetization Opportunities:

The system continuously gathers:

- Inventory data
- Consumer behaviour information
- Pricing trends
- Geographic demand patterns
- Service utilization statistics

These datasets can support predictive analytics, market intelligence, and business decision-making services for industry stakeholders.

(7) Global Scalability:

Since the platform operates through mobile devices, cloud infrastructure, AI frameworks, and digital communication channels, it can be deployed globally with minimal physical infrastructure requirements. This allows rapid international expansion and market penetration.

(8) Continuous Improvement Through AI Learning:

The patent incorporates an AI Improvement Engine that learns from user corrections, human verification, and historical data. This self-improving capability increases estimation accuracy over time and creates a sustainable competitive advantage for adopters.

11.3.2 Challenges in the Competitive Environment:

Despite its strong business potential, the patent faces several competitive and operational challenges within the industry environment.

(1) Rapid Technological Competition:

The AI estimation market is attracting substantial investment from:

- Moving-service platforms
- InsurTech firms
- PropTech companies
- Construction technology startups
- Large technology corporations

Competitors may develop similar AI-based estimation systems, reducing differentiation over time.

(2) Accuracy and Reliability Challenges:

The effectiveness of the system depends heavily on:

- Image quality
- Sensor accuracy
- Object recognition precision
- Inventory classification accuracy

Incorrect identification of items or environmental conditions can generate inaccurate estimates, potentially affecting customer trust and business credibility.

(3) Data Privacy and Security Concerns:

The patent requires collection of:

- Images and videos of homes
- Audio recordings
- Location information
- Sensor data
- User demographic information

Customers may hesitate to share such sensitive information, while regulatory requirements related to privacy protection may increase compliance costs.

(4) Dependence on Large Training Datasets:

The machine-learning models require extensive datasets for:

- Object detection
- Inventory generation
- Cost prediction

- Context recognition

Developing and maintaining these datasets demands continuous investment in data acquisition, annotation, and model training.

(5) Resistance from Traditional Service Providers:

Many service providers continue to rely on manual inspections and human estimators. Adoption barriers may arise due to:

- Fear of job displacement
- Lack of AI expertise
- Organizational resistance to change
- Concerns regarding system reliability

Such resistance may slow industry-wide implementation.

(6) High Development and Infrastructure Costs:

Developing and maintaining the platform requires investment in:

- AI algorithms
- Cloud infrastructure
- Computer vision systems
- Mobile applications
- Cybersecurity systems
- Data storage and processing capabilities

These costs can create barriers for smaller firms attempting to compete.

(7) Patent and Intellectual Property Competition:

The patent operates in a crowded technology domain involving:

- Computer vision
- Machine learning
- Digital marketplaces
- Automated estimation systems

Competitors may challenge patents, develop alternative approaches, or create design-around innovations that reduce exclusivity advantages.

(8) Customer Trust and Adoption Challenges:

Many customers still prefer human verification when making significant financial decisions such as moving, renovation, or insurance assessments. Convincing users to rely entirely on AI-generated estimates may require extensive validation and trust-building efforts.

Thus, the patent offers substantial **business opportunities** through automation, AI-driven service estimation, marketplace integration, cross-selling, SaaS commercialization, and global scalability. At the same time, it faces significant **competitive challenges** including technological rivalry, accuracy requirements, privacy concerns, infrastructure costs, regulatory compliance, and customer adoption barriers. Overall, the invention possesses strong commercial potential and can become a transformative platform in the emerging AI-powered service estimation industry if these challenges are effectively managed.

11.4 Market and Business Value Estimation:

The patent possesses substantial business value because it combines Artificial Intelligence (AI), Computer Vision, Machine Learning, Mobile Platforms, Interactive Quotations, and Service Marketplace Technologies into a scalable digital ecosystem for automated service estimation. The invention addresses a major industry problem—high-cost, inaccurate, and time-consuming service quotations—by generating AI-based inventory lists and interactive service quotes from images, videos, sensor data, and user inputs.

(1) Commercial Applications:

Real-World Use Cases and Product Lines

A. Relocation and Moving Services

The primary commercial application is in the moving and relocation industry. The patent automatically identifies household items, estimates relocation requirements, and generates customized moving quotes without requiring an on-site visit. This significantly reduces operational costs and improves customer convenience.

B. Home Renovation and Maintenance

The AI inventory-generation and cost-estimation engine can be adapted for:

- Painting services
- Flooring services
- Home remodeling
- Interior decoration
- Home repairs
- Facility maintenance

The patent itself discusses applications in estimating painting projects through automatic identification of walls, ceilings, furniture, and other structures.

C. Insurance and Claims Assessment

Insurance companies can use the technology to:

- Assess household assets
- Estimate replacement costs
- Generate claims valuations
- Perform remote inspections

The automated inventory-generation feature provides an ideal foundation for insurance underwriting and claims processing.

D. Property and Real-Estate Services

Applications include:

- Property inventory documentation
- Rental property assessments
- Real-estate valuation support
- Property management services

The system's ability to capture and analyse property characteristics creates opportunities within PropTech markets.

E. Service Marketplace Platforms

The patent supports digital marketplaces where consumers can:

- Obtain instant quotes
- Purchase services online
- Compare providers
- Buy add-on products

This creates opportunities for subscription-based and transaction-based business models.

Estimated Commercial Value: Very High (8.5/10)

(2) Current Implementations:

Is it Used in a Current Product or Business?

Yes. The patent is assigned to **Yembo, Inc.**, a company specializing in AI-powered virtual surveys and relocation technology. The architecture described in the patent—including consumer interaction modules, AI improvement engines, inventory generation modules, and interactive quote generation modules—corresponds directly to Yembo's commercial virtual survey solutions used in the moving industry.

Current implementation indicators include:

- Consumer Interaction Module
- Service Provider Interaction Module
- AI Improvement Engine
- Inventory Generation Module
- Interactive Quote Generation Module
- Quote Monitoring Module

These components collectively form a deployable commercial platform rather than a purely theoretical invention.

Commercial Maturity Level

Factor	Assessment
Prototype	Completed
Commercial Product	Yes

Factor	Assessment
Revenue Generation	Likely
Industry Adoption	Moderate to High
Scalability	High

Estimated Implementation Value: 9/10

(3) Competitor Landscape:

Are Competitors Working on Similar Technologies?

Yes. The competitive environment is highly active because AI-driven estimation technologies are becoming increasingly important in digital services.

Direct Competitors

- AI-powered moving survey platforms
- Digital relocation management firms
- Virtual inspection providers
- Property assessment software companies
- Insurance technology providers

Technology Competitors

Companies developing:

- Computer vision systems
- Object recognition software
- Digital inventory platforms
- Remote inspection tools
- AI-based pricing systems

The patent itself cites numerous prior patents and technologies relating to virtual inspections, marketplace services, object recognition, and cost estimation, indicating a competitive technological landscape.

Competitive Advantages of this Patent

- Automated inventory creation
- Interactive quote generation
- AI learning and improvement engine
- Integration of multimedia data
- Upselling and cross-selling capabilities
- Consumer-provider interaction framework

Competitive Risk Level: Medium to High

Estimated Competitive Position: 8/10

(4) Licensing Potential:

Could it Generate Royalties or Partnerships?

The licensing potential is exceptionally strong because the patent addresses a universal business problem—accurate service estimation.

Potential Licensees

A. Moving Companies

Large relocation firms can license the technology to automate surveys and quotation processes.

B. Insurance Companies

Insurers can use the technology for:

- Asset valuation
- Claims estimation
- Risk assessment

C. Home-Service Platforms

Companies providing:

- Renovation services
- Cleaning services
- Maintenance services
- Installation services

can integrate the AI estimation engine into their platforms.

D. Real-Estate Technology Firms

Property valuation and management companies can license the technology to automate property assessments.

E. SaaS Partnerships

The AI engine can be commercialized through:

- SaaS subscriptions
- API licensing
- White-label solutions
- Enterprise software agreements

Because the patent combines AI, computer vision, and cost-estimation workflows, it offers substantial recurring royalty opportunities.

Estimated Licensing Potential: 9/10

(5) Market Trends:

Is the Domain Growing?

The market trend outlook is extremely favorable.

A. Growth of Artificial Intelligence

AI adoption is expanding rapidly across:

- Logistics
- Real estate
- Insurance
- Home services
- Retail marketplaces

The patent aligns directly with these growth sectors.

B. Expansion of Remote Services

Organizations increasingly prefer:

- Virtual inspections
- Remote assessments
- Contactless service delivery
- Digital customer interactions

The patent's AI-based remote estimation system perfectly matches these trends.

C. Increasing Demand for Automation

Businesses seek to:

- Reduce labour costs
- Improve quotation accuracy
- Accelerate customer response times
- Enhance customer experience

The patented technology directly addresses these objectives.

D. Growth of Digital Marketplaces

The interactive quotation and service-offer capabilities support emerging marketplace ecosystems where users expect instant pricing and online purchasing options.

E. AI-Enabled Decision Systems

Future service industries will increasingly rely on:

- Predictive analytics
- Intelligent recommendation engines
- Dynamic pricing systems
- Automated customer engagement

The patent's AI Improvement Engine positions it well for these developments.

Estimated Market Growth Potential: 9.5/10

(6) Overall Business Value Assessment:

Table 12: Overall Business Value Assessment

Business Value Dimension	Rating (10)
Commercial Applications	8.5

Business Value Dimension	Rating (10)
Current Implementations	9.0
Competitor Landscape Position	8.0
Licensing Potential	9.0
Market Trends Alignment	9.5
Overall Business Value	**8.8 / 10**

Thus, the patent demonstrates **very high business value (8.8/10)** due to its practical commercial implementation, strong scalability, broad industry applicability, substantial licensing opportunities, and alignment with rapidly growing AI, automation, virtual inspection, and digital-service marketplace trends. Its ability to automate inventory generation and interactive cost estimation positions it as a commercially valuable intellectual property asset with significant long-term revenue potential.

12. SUGGESTIONS :

12.1 Suggestions for Implementation:

(1) Enhance Multi-Modal Data Collection:
The system should integrate additional data sources such as LiDAR sensors, smart-home devices, IoT sensors, drone imagery, and floor-plan documents to improve inventory identification and cost estimation accuracy. This would reduce estimation errors and improve reliability across different service environments.

(2) Develop Industry-Specific AI Models:
Although the patent focuses primarily on relocation and home-service estimation, separate AI models can be developed for:

- Home renovation
- Painting services
- Insurance assessment
- Facility management
- Real-estate valuation
- Commercial logistics

This would increase market penetration and commercial applicability.

(3) Incorporate Real-Time Market Intelligence:
The cost calculation module should dynamically integrate:

- Fuel prices
- Labor rates
- Traffic conditions
- Weather forecasts
- Seasonal demand patterns

This would improve the accuracy of quotations and pricing decisions.

(4) Strengthen Human-in-the-Loop Validation:
The patent already includes a human verification mechanism for AI improvement. Future implementations should maintain expert validation for high-value or complex projects to increase customer trust and continuously improve model performance.

(5) Deploy as a SaaS Platform:
The technology should be commercialized through:

- Cloud-based subscription services
- API-based integration
- Enterprise licensing
- White-label solutions

This would enable rapid adoption by service providers of different sizes.

(6) Enhance Customer Experience:
Interactive quote-generation interfaces should include:

- Real-time quote updates
- Cost comparison options
- Service customization

- AI-generated recommendations
- Self-service modifications

These features would improve customer engagement and conversion rates.

12.2 Suggestions for Related New Ideas & Patents:

(1) AI-Based Dynamic Negotiation Engine:
Develop a patent for an AI system that automatically negotiates service prices between customers and providers based on demand, urgency, customer history, and market conditions.

(2) Augmented Reality (AR) Cost Estimation System:
Create an AR-enabled solution that overlays estimated costs directly onto physical objects viewed through smartphones or smart glasses, allowing users to visualize service expenses instantly.

(3) Predictive Maintenance Cost Estimation Platform:
Extend the technology to predict future maintenance requirements and costs for homes, commercial buildings, machinery, and industrial equipment using AI and sensor analytics.

(4) Autonomous Insurance Claims Assessment System:
Develop a patent for AI-driven insurance claim evaluation that automatically identifies damaged assets, estimates repair costs, and generates claim settlements from images and videos.

(5) AI-Based Construction and Renovation Estimator;
Create a specialized platform capable of analyzing building interiors and exteriors and generating detailed renovation, remodeling, and construction quotations automatically.

(6) Digital Twin-Based Service Estimation Patent:
Combine AI inventory generation with digital twin technology to create virtual replicas of properties and generate highly accurate service, maintenance, and relocation estimates.

(7) Marketplace Recommendation and Upselling Engine:
Develop an AI recommendation system that automatically identifies complementary services and products based on detected inventory items and customer behaviour patterns.

(8) Sustainability-Oriented Cost Estimation System:
Create a patent that estimates not only monetary costs but also:

- Carbon footprint
- Energy consumption
- Waste generation
- Environmental impact

for service projects and relocation activities.

12.3 Overall Recommendation:

The patent **"Systems and Methods for Providing AI-Based Cost Estimates for Services"** represents a highly valuable and commercially viable innovation that combines artificial intelligence, computer vision, machine learning, and interactive service marketplaces into a scalable business platform. The invention effectively addresses long-standing inefficiencies associated with manual inspections, inaccurate quotations, and labour-intensive estimation processes by automating inventory generation and interactive quote creation.

Given the growing demand for AI-powered automation, remote inspections, digital service platforms, and intelligent pricing systems, the patent should be aggressively commercialized through SaaS offerings, strategic partnerships, enterprise licensing, and industry-specific solutions. The technology has strong potential to become a foundational platform across relocation services, insurance, real estate, home improvement, facility management, and logistics sectors.

Overall, the patent demonstrates **high technological significance, strong market relevance, excellent scalability, and substantial long-term revenue potential**, making it an excellent candidate for continued development, patent portfolio expansion, and global commercialization.

13. CONCLUSION :

The patent **"Systems and Methods for Providing AI-Based Cost Estimates for Services"** presents a significant advancement in the application of artificial intelligence, machine learning, computer vision, and interactive digital platforms for service cost estimation. By automatically identifying inventory

items, extracting contextual attributes, and generating interactive cost quotations from images, videos, sensor data, and user inputs, the invention substantially reduces the time, cost, and inaccuracies associated with traditional manual estimation methods. The integration of AI-driven inventory generation, continuous learning mechanisms, human verification, and dynamic quote generation demonstrates a scalable and commercially viable solution capable of transforming relocation, home services, insurance, real-estate, and facility-management industries. The patent further contributes to digital transformation by enabling consumers and service providers to interact through an efficient, data-driven, and user-friendly ecosystem.

Based on the analysis, it is recommended that the technology be further enhanced through the integration of real-time market data, IoT-enabled sensors, augmented reality interfaces, and predictive analytics to improve estimation accuracy and customer experience. Future research and patent development may focus on autonomous insurance assessment, construction cost estimation, digital twin-based service modeling, and sustainability-oriented cost prediction systems. Commercial deployment through cloud-based Software-as-a-Service (SaaS) platforms, API integrations, and enterprise licensing models can significantly expand its market reach and revenue potential. Overall, the patent exhibits strong technological novelty, high business value, and substantial future scalability, making it a promising innovation for next-generation intelligent service estimation platforms.

REFERENCES :

[1] Aithal, P. S., & Aithal, S. (2018). Patent analysis as a new scholarly research method. *International Journal of Case Studies in Business, IT and Education, 2*(2), 33–47. Google Scholar↗

[2] Abbas, A., Zhang, L., & Khan, S. U. (2014). A literature review on the state-of-the-art in patent analysis. *World Patent Information, 37*, 3–13. Google Scholar↗

[3] Daim, T. U., Rueda, G., Martin, H., & Gerdsri, P. (2006). Forecasting emerging technologies: Use of bibliometrics and patent analysis. *Technological Forecasting and Social Change, 73*(8), 981–1012. Google Scholar↗

[4] Bhattacharya, S. (2004). Mapping inventive activity and technological change through patent analysis: A case study of India and China. *Scientometrics, 61*(3), 361–381. Google Scholar↗

[5] Wang, B., Liu, S., Ding, K., Liu, Z., & Xu, J. (2014). Identifying technological topics and institution-topic distribution probability for patent competitive intelligence analysis. *Scientometrics, 101*(1), 685–704. Google Scholar↗

[6] Lee, S., Yoon, B., Lee, C., & Park, J. (2009). Business planning based on technological capabilities: Patent analysis for technology-driven road mapping. *Technological Forecasting and Social Change, 76*(6), 769–786. Google Scholar↗

[7] Choi, S., Yoon, J., Kim, K., Lee, J. Y., & Kim, C. H. (2011). SAO network analysis of patents for technology trends identification. *Scientometrics, 88*(3), 863–883. Google Scholar↗

[8] Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research Policy, 37*(3), 407–429. Google Scholar↗

[9] Park, Y., Lee, S., & Lee, S. (2012). Patent analysis for promoting technology transfer in multi-technology industries. *The Journal of Technology Transfer, 37*(3), 355–374. Google Scholar↗

[10] Choi, C., Kim, S., & Park, Y. (2007). A patent-based cross impact analysis for quantitative estimation of technological impact. *Technological Forecasting and Social Change, 74*(8), 1296–1314. Google Scholar↗

[11] Érdi, P., Makovi, K., Somogyvári, Z., Strandburg, K., Tobochnik, J., Volf, P., & Zalányi, L. (2013). Prediction of emerging technologies based on analysis of the US patent citation network. *Scientometrics, 95*(1), 225–242. Google Scholar↗

[12] Ogawa, T., & Kajikawa, Y. (2015). Assessing the industrial opportunity of academic research with patent relatedness. *Technological Forecasting and Social Change, 90*, 469–475. Google Scholar↗

[13] Lewis, S. (2015). Qualitative inquiry and research design: Choosing among five approaches. *Health Promotion Practice, 16*(4), 473–475. Google Scholar↗

[14] Hoepfl, M. C. (1997). Choosing qualitative research: A primer for technology education researchers. *Journal of Technology Education, 9*(1), 47–63. Google Scholar↗

[15] Narin, F., Noma, E., & Perry, R. (1987). Patents as indicators of corporate technological strength. *Research Policy, 16*(2–4), 143–155. Google Scholar↗

[16] Haupt, R., Kloyer, M., & Lange, M. (2007). Patent indicators for the technology life cycle development. *Research Policy, 36*(3), 387–398. Google Scholar↗

[17] Aithal, P. S., & Aithal, S. (2023). Introducing systematic patent analysis as an innovative pedagogy tool/experiential learning project in HE Institutes and Universities to boost awareness of patent-based IPR. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, *8*(3), 395-413. Google Scholar↗

[18] Aithal, P. S., & Aithal, S. (2018, August). A New Method of Scholarly Research–Patent Analysis. In *Proceedings of Conference-Exploring Avenues in Banking, Management, IT, Education & Social Sciences* (pp. 69-83). Google Scholar↗

[19] Aithal, S., & Aithal, P. S. (2019). How to Customize Higher Education at UG & PG levels using Patent Analysis & Company Analysis As New Research Methods in Technology, Health Sciences & Management Education. *Health Sciences & Management Education (January 30, 2019). In Information Technology and Education, Challenges and Opportunities of Smarter Learning Systems, New Delhi Publishers, India*, 25-59. Google Scholar↗

[20] Aithal, P. S. (2025). Blockchain-Based Digital Identity Management System: US 10,992,478B2 – A Patent Analysis. *Poornaprajna International Journal of Teaching & Research Case Studies (PIJTRCS), 2*(2), 126-145. Google Scholar↗

[21] Aithal, P. S. (2026). Patent Analysis of Providing Services Related to Item Delivery via 3D Manufacturing on Demand: US9898776B2. *Poornaprajna International Journal of Basic & Applied Sciences (PIJBAS), 3*(1), 65-106. Google Scholar↗

[22] Zachary RATTNER, Siddharth Mohan, & Vikram Gupta (2022). Systems and methods for providing AI-based cost estimates for services. Patent No.: US11270363B2, PP. 01-37. Google Patent↗

[23] Charles Howard Cella, Andrew S. Locke (2023). Autonomous Exposure-Based Product Replacement System. Patent No.: US20230325766A1, PP. 01-560, Google Patent↗

[24] R·梅哈韦德, et al. (2022). Product development based on artificial intelligence and machine learning. Patent No.: CN109409532B, PP. 01-118, Google Patent↗

[25] 陈宇 et al. (2024). Personalized clothing recommendation method and system for electronic commerce platform based on artificial intelligence. Patent No.: CN118628214B, PP. 01-17. Google Patent↗

[26] 최원규, 정다혜 (2021). Item sales volume prediction method, apparatus and system using artificial intelligence model. Patent No.: KR102245717B1, PP. 01-25. Google Patent↗

[27] Erin S. Boyle, Daragh Sibley (2023). Using artificial intelligence to design a product. Patent No.: US11669776B2, PP. 01-32. Google Patent↗

[28] Sastry VSM Durvasula, et al. (2023). Artificial intelligence-based use case model recommendation methods and systems. Patent No.: US11720846B2, PP. 01-30. Google Patent↗

[29] Mingzhu Lu (2020). Artificial intelligence based risk and knowledge management. Patent No.: US10769570B2, PP. 01-24. Google Patent↗

[30] Shyam Sreenivasan (2022). Artificial intelligence investment platform. Patent No.: US20220237700A1, PP. 01-119. Google Patent↗

[31] Marc Cohen, Pinchas Ben-Or (2023). Explainable artificial intelligence-based sales maximization decision models. US20230130567A1, PP. 01-26. Google Patent↗

[32] Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications. Google Scholar↗

[33] Aithal, P. S., & Aithal, S. (2023). Use of AI-based GPTs in experimental, empirical, and exploratory research methods. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, *7*(3), 411-425. Google Scholar↗

[34] Aithal, P. S., & Aithal, S. (2024). Redefining experimental, empirical, and exploratory research in AI era. *Poornaprajna International Journal of Emerging Technologies (PIJET)*, *1*(1), 90-136. Google Scholar↗

[35] Aithal, P. S., & Aithal, S. (2023). New research models under exploratory research method. *a Book "Emergence and Research in Interdisciplinary Management and Information Technology" edited by PK Paul et al. Published by New Delhi Publishers, New Delhi, India*, 109-140. Google Scholar↗

[36] Aithal, P. S. (2025). An Exploratory Analysis of Blockchain Technology in Securing Smart Supply Chain Management Systems. Proceedings of National Conference on Innovations for The Future Economy: Synergies in Management, Commerce, And Information Technology-2025. ISBN: 978-93-4873-81-5 PP.173-177. DOI: https://doi.org/10.5281/zenodo.19704241, Google Scholar↗

[37] Aithal, P. S. (2017). An effective method of developing business case studies based on company analysis. *International Journal of Engineering Research and Modern Education (IJERME)*, *2*(1), 16-27. Google Scholar↗

[38] Aithal, P. S., & Aithal, S. (2018). A New Method of Scholarly Research–Patent Analysis. In *Proceedings of Conference-Exploring Avenues in Banking, Management, IT, Education & Social Sciences* (pp. 69-83). Google Scholar↗

[39] Aithal, P. S., & Aithal, S. (2019, October). Scholarly Publication Based Research Journals Classification–New Insight-Based Model. In *Proceedings of International Conference on Emerging Trends in Management, IT and Education* (Vol. 1, No. 1, pp. 01-14). Google Scholar↗

[40] Aithal, P. S., & Aithal, S. (2023). Application of ChatGPT in higher education and research–A futuristic analysis. *International Journal of Applied Engineering and Management Letters (IJAEML)*, *7*(3), 168-194. Google Scholar↗

[41] Aithal, P. S., & Kumar, P. M. (2015). Applying SWOC analysis to an institution of higher education. *International Journal of Management, IT and Engineering*, *5*(7), 231-247. Google Scholar↗

[42] Gürel, E., & Tat, M. (2017). SWOT analysis: A theoretical review. *The Journal of International Social Research, 10*(51), 994–1006. Google Scholar↗

[43] Pickton, D. W., & Wright, S. (1998). What's SWOT in strategic analysis? *Strategic Change, 7*(2), 101–109. Google Scholar↗

[44] Valentin, E. K. (2001). SWOT analysis from a resource-based view. *Journal of Marketing Theory and Practice, 9*(2), 54–69. Google Scholar↗

[45] Phadermrod, B., Crowder, R. M., & Wills, G. B. (2019). Importance-performance analysis-based SWOT analysis. *International Journal of Information Management, 44*, 194–203. Google Scholar↗

[46] Benzaghta, M. A., Elwalda, A., Mousa, M. M., Erkan, I., & Rahman, M. (2021). SWOT analysis applications: An integrative literature review. *Journal of Global Business Insights, 6*(1), 55–73. Google Scholar↗

[47] Panagiotou, G. (2003). Bringing SWOT into focus. *Business Strategy Review, 14*(2), 8–10. Google Scholar↗

[48] Hill, T., & Westbrook, R. (1997). SWOT analysis: It's time for a product recall. *Long Range Planning, 30*(1), 46–52. Google Scholar↗

[49] Aithal, P. S., & Aithal, S. (2023). Incubationship–A systematic analysis of recently announced super innovation in higher education using SWOC, ABCD, and PESTL frameworks. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, *7*(4), 48-90. Google Scholar↗

[50] Aithal, P. S., Shailashree, V., & Kumar, P. M. (2015). A new ABCD technique to analyze business models & concepts. *International Journal of Management, IT and Engineering*, *5*(4), 409-423. Google Scholar↗

[51] Aithal, P. S. (2016). Study on ABCD analysis technique for business models, business strategies, operating concepts & business systems. *International Journal in Management and Social Science*, *4*(1), 95-115. Google Scholar↗

[52] Aithal, P. S. (2017). ABCD Analysis as Research Methodology in Company Case Studies. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, *2*(2), 40-54. Google Scholar↗

[53] Aithal, P. S., Shailashree, V., & Kumar, P. M. (2015). Application of ABCD Analysis Model for Black Ocean Strategy. *International journal of applied research*, *1*(10), 331-337. Google Scholar↗

[54] Aithal, A., & Aithal, P. S. (2017). ABCD analysis of task shifting–an optimum alternative solution to professional healthcare personnel shortage. *International Journal of Health Sciences and Pharmacy (IJHSP)*, *1*(2), 36-51. Google Scholar↗

[55] Aithal, S., & Aithal, P. S. (2016). ABCD analysis of Dye-doped Polymers for Photonic Applications. *IRA-International Journal of Applied Sciences*, *4*(3), 358-378. Google Scholar↗

[56] Raj, K., & Aithal, P. S. (2018). Generating Wealth at the Base of the Pyramid–a Study Using ABCD Analysis Technique. *International Journal of Computational Research and Development (IJCRD)*, *3*(1), 68-76. Google Scholar↗

[57] Aithal, P. S., Shailashree, V., & Kumar, P. M. (2016). The study of the new national institutional ranking system using ABCD framework. *International Journal of Current Research and Modern Education (IJCRME)*, *1*(1), 389-402. Google Scholar↗

[58] Shenoy, V., & Aithal, P. S. (2016). ABCD Analysis of Online Campus Placement Model. *IRA-International Journal of Management & Social Sciences*, *5*(2), 227-244. Google Scholar↗

[59] Kumari, P., & Aithal, P. S. (2020). Growth & Fate Analysis of Mangalore International Airport–A Case Study. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, *4*(2), 71-85. Google Scholar↗

****