

**PROCEEDING OF
INTERNATIONAL CONFERENCE 2025**

HYBRID EVENT

**INTERNATIONAL CONFERENCE 2025
21st – 22nd January 2025**

Organized By



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**RESEARCH
SOCIETY**

ARF
Conference

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Editorial

We are delighted to extend a warm welcome to all participants attending the International Conference 2025 on 21st – 22nd January 2025. This conference provides a vital platform for researchers, students, academicians, and industry professionals from all over the world to share their latest research results and development activities in multidisciplinary fields. It offers delegates an opportunity to exchange new ideas and experiences, establish business or research relationships, and explore global collaborations.

The proceedings for International Conference 2025 contain the most up-to-date, comprehensive, and globally relevant knowledge across various disciplines. All submitted papers underwent rigorous peer-reviewing by 2-4 expert referees, and the papers included in these proceedings were selected for their quality and relevance to the conference. We are confident that these proceedings will not only provide readers with a broad overview of the latest research results but also serve as a valuable summary and reference for further studies.

We are grateful for the support of many universities and research institutes, whose contributions were vital to the success of this conference. We extend our sincerest gratitude and highest respect to the professors who played an important role in the review process, providing valuable feedback and suggestions to authors to improve their work. We also appreciate the efforts of the technical program committee, reviewers, and authors for their dedication.

Since November 2024, the Organizing Committee has received more than 40 manuscript papers, covering various aspects of multidisciplinary research. After review, approximately 14 papers were selected for inclusion in the proceedings of International Conference 2025.

We thank all participants for their significant contribution to the success of the conference. Our gratitude extends to the keynote speakers, individual speakers, technical program committee, reviewers, and the organizing committee for their efforts in making this conference a reality.

Acknowledgement

The International Conference 2025, was successfully held in 21st – 22nd January 2025. We extend our heartfelt gratitude to our colleagues, staff, professors, reviewers, and members of the organizing committee for their unwavering support in making this conference a success.

We would also like to thank all the participants who traveled far and wide to attend this conference and those who attended the event virtually, making it a truly global event. This conference provided a platform for students, professionals, researchers, and scientists to share their latest research and developments in various disciplines.

The aim of the conference was to promote research and development activities and to encourage scientific information exchange between researchers, developers, professionals, students, and practitioners from all around the world. Once again, we thank everyone who contributed to making this conference a resounding success.



Dr. Mohammad Nasir

Secretary

Association for Scientific and Academic Research (ASAR)

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Evaluating the Environmental Impact of Transparent Wood for Sustainable Design

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Abstract:

Enhancing building energy efficiency is crucial for achieving net-zero targets and addressing climate change. Transparent wood (TW) has emerged as a promising eco-friendly material for light-transmissive structures, reflecting a global shift toward sustainable materials that balance environmental benefits with advanced functionality. TW is derived from various wood biomasses through chemical treatments, such as delignification, and is reinforced with resin to enhance mechanical properties. Recent advances in TW include methods such as solar-assisted bleaching, steam bleaching, NaOH delignification, and polymerization techniques, all aimed at enhancing its transparency, toughness, durability, and lightweight properties. These developments have made TW a multifunctional hybrid material with features like flame retardancy, energy storage, and photoluminescence, enabling its use in energy-efficient windows, solar panels, and electronic devices. While challenges related to scalability and cost-effectiveness persist, this study focuses on evaluating and enhancing the environmental performance of TW. The review offers a detailed analysis of TW's key characteristics, explores its latest applications, and examines critical challenges alongside opportunities for future advancements. Finally, the environmental impact of TW is discussed, emphasizing its transformative potential as a sustainable material and its alignment with global sustainability goals.

Keywords:

Eco-friendly materials, Lignin Modification, Sustainable Design, Transparent wood.

INTRODUCTION

In modern society, there is a growing emphasis on developing bio-based, renewable, and recyclable materials that can partially or fully replace fossil-based counterparts across various application sectors. Wood, a widely recognized sustainable and carbon-sequestering biomass, fulfills these criteria and has long been valued as a renewable source of materials and energy for daily use [1,2]. By chemically and thermally modifying the hierarchical structure of natural wood cell walls, functional wood materials can be engineered with tailored compositions and properties [3]. Among these advancements, transparent wood (TW) has emerged as a

significant innovation in wood nanotechnology, offering a versatile biocomposite material for energy-efficient applications. Combining mechanical strength, low thermal conductivity, and high optical transmittance, TW represents a promising solution for sustainable design and technology [4,5,6].

This innovation leverages wood's intrinsic hierarchical structure, where cellulose fibrils are embedded in a matrix of hemicelluloses and lignin [7,8]. Cellulose contributes to the toughness and strength of wood, while lignin provides hardness and rigidity, and hemicelluloses link the lignin and cellulose components [9]. Lignin contributes to light absorption in wood, accounting for 80–95%, and

imparts a darker color to the biomass [10,11]. By modifying this composition, researchers have transformed natural wood into a transparent material, unlocking its potential for advanced applications. This innovation began with Sigfried Fink's 1992 article, which laid the foundation for further research and advancements in TW technology [12]. Since then, extensive research has focused on improving its production techniques and material performance. The modern process for preparing TW typically involves delignification of the substrate, which removes lignin to reduce light absorption. Following this, a polymer with a compatible refractive index is infused into the wood structure through vacuum impregnation. This process creates a material that combines low light absorption with enhanced optical properties [13,14].

Swedish KTH and Maryland University have been at the forefront of TW production. KTH uses NaClO_2 at 80°C for lignin removal and polymer infusion, while Maryland employs a two-step process with NaOH , Na_2SO_3 , H_2O_2 , and vacuum epoxy infusion [15]. Epoxy resin and PMMA are favored for their low viscosity, transparency, and vacuum compatibility [16,17]. Green chemical modifications are also emerging to improve TW sustainability and performance by minimizing environmental impact while enhancing properties.

This study focuses on advancing sustainable development in the domain of TW biocomposites through environmentally responsible treatment methods. By leveraging eco-friendly approaches, such as reducing the use of hazardous chemicals, green polymerization, life cycle assessments, and diverse usage, this research aims to investigate the environmental performance and versatility of TW for a wide range of applications. Through these advancements, TW is established as a pivotal material for fostering environmental stewardship and driving innovation within fields such as construction, design, and technological development.

LITERATURE REVIEW

A. Wood Species

The properties of TW can vary depending on the wood species, as each type offers distinct characteristics. To optimize its performance for specific applications, different wood species have been studied for their suitability in TW production. The tree species explored include softwoods like Basswood [18] and balsa [18,19]; hardwoods like Poplar [20], Beech [21], Birch [22,23], Canadian white Maple [24], Ash [25], Melia, and Siver Oak [26].

Table I. Properties and Performance Metrics of TW Based on Different Wood Types

Wood species	Reagents	Filling Compunds	Thickness (mm)	Transmittence (%)	Haze (%)	Tensile Strength (Mpa)	Reference
Birch	NaClO_2	PMMA/PEG	1.5	68	77	~70.5	(39)
Balsa	NaClO_2	PMMA	1.2	85	~70	38	(40)
Basswood	NaClO_2	PMMA	1.6	66	~85	~131.6	(41)
Poplar Fibers	NaOH and Na_2SO_3	PMMA	1	92	56		(42)

The properties of transparent wood materials are shaped by factors like wood structure, treatment processes, and material composition,

which influence transparency, haze, and mechanical strength. Numerous reviews explore these variations across wood types [10, 27,28]

however Table 1 specifically compares delignified wood (DW) samples of similar thickness filled with poly (methyl methacrylate) (PMMA), offering insights into their performance differences.

Poplar fibers exhibit the highest transmittance (92%) and lowest haze (56%), ideal for clear visibility. Balsa has a lower haze (~70%) than Basswood (~85%). Basswood offers the highest tensile strength (~131.6 MPa), suitable for strength-critical applications.

B. Comparison of TW to Conventional Materials

The unique structure and morphology of TW position it as a functional material with the potential to replace conventional materials. Its superior optical transmittance across a wide wavelength range, coupled with its customizable haze, makes TW an attractive alternative to traditional materials like glass, particularly in architectural applications [29]. TW also addresses common issues such as glare, shadowing effects, and safety concerns, while providing the necessary light scattering and high transparency for efficient and uniform artificial lighting [30]. Glass and polyethylene have traditionally been the most used materials for developing transparent products; however, they face challenges concerning biodegradability [31]. Table 2 compares TW with other conventional materials based on key attributes, highlighting its unique structure and morphology as a functional material with the potential to replace traditional options.

C. Research Trends

This study employs VOSviewer, a robust tool for visualizing and analyzing scientific literature, to map trends, collaborations, and advancements in TW research. VOSviewer facilitates keyword co-occurrence, publication trends, and citation pattern analysis, offering a visual overview of TW research across domains. Using this tool, we aim to identify focus areas, research gaps, and future directions.

On January 11, 2025, a comprehensive search using the keyword "transparent wood" across all

fields yielded 2,054 results. These included 1,747 articles, 185 proceeding papers, 125 review articles, and 11 book chapters, spanning various disciplines. The search results covered publications from the earliest in 1997 to the most recent in 2025. The data was analyzed based on keyword usage and abstract content, focusing on materials indexed in the Web of Science database. This analysis aims to provide insights into the scope and volume of research conducted on the topic.

In this network visualization as shown in Fig.1, nodes represent terms or concepts, with their distances indicating relationships, while each color signifies a distinct cluster [32]. Terms such as "sustainability," "biomass," and "life cycle assessment" highlight the increasing focus on TW as a sustainable material, emphasizing eco-friendly approaches and its potential for energy-efficient and sustainable architectural applications. Additionally, the inclusion of terms like "climate change," "forestry," and "ecosystem services" reflects the broader environmental significance of TW research.

SUSTAINABLE FABRICATION

TW exemplifies sustainable materials with innovative functionality. Its preparation involves two main stages: delignification, where lignin is selectively removed to create a porous structure, and resin impregnation, enhancing optical and mechanical properties. This process produces sustainable, versatile material applicable to energy-efficient windows and advanced construction elements.

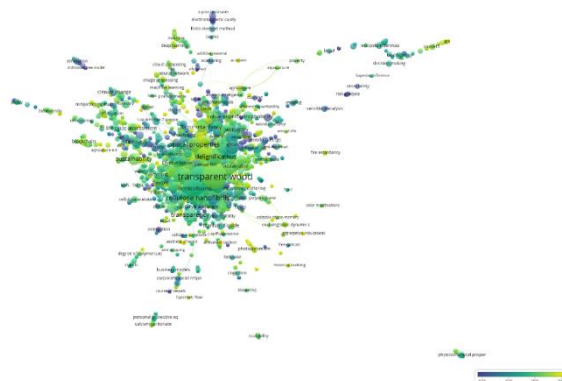
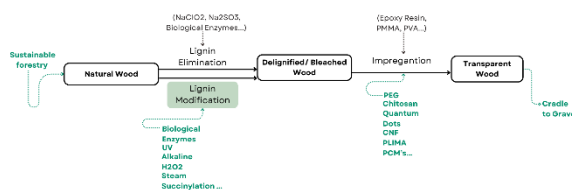


Fig.1 VOSviewer Network Visualization of TW Keywords

Table II. Comparison of TW Attributes

Compared Material	Main Attributes of TW					
	Lightweight	Sustainability	Thermal Isolation	Impact Resistance	Clarity	Transmittance
Glass	Higher	Higher	Higher	Higher	Lower	Lower
Natural Wood	Lower	Lower	Lower	Higher	Higher	Higher
Fossil Based Plastics	Lower (compared to acrylic)	Higher	Higher	Lower compared to polycarbonate)	Lower	Lower

The diagram below highlights sustainable fabrication options (in green), including sustainable forestry, eco-friendly lignin modification methods, and bio-based impregnation materials such as chitosan, bio-PMMA, and cellulose nanofibers. These aspects will be detailed in the following sections.


Fig.2 TW Production Flowchart Highlighting Green Steps

A. Sustainable Forestry

Sustainable forestry balances conservation with resource use, ensuring forests provide ecological, economic, and social benefits. It maintains biodiversity, protects soil and water quality, and supplies resources sustainably [33]. High-growth biomass, such as bamboo, supports these practices by efficiently sequestering CO₂ and offering alternatives to deforestation. However, research focusing on how these processes can directly contribute to the sustainability of TW is still lacking.

B. Ligning Modification

The production of TW typically entails a discoloration step, which involves either delignification or lignin modification of a conventional wood substrate, followed by polymer infusion or compression. The extent of lignin removal from the wood skeleton

significantly influences its properties: lower lignin levels result in reduced visible light absorbance, increased porosity, and more space for polymer backfilling, which helps eliminate the interface debonding gap between cell walls and the filled polymer. However, excessively low lignin levels can compromise the wood's structural integrity, as lignin serves as a critical binder for cellulose fibrils within the cell walls, providing the material with essential mechanical strength.

Delignification agents like NaClO₂ and NaOH + Na₂SO₃ + H₂O₂ are commonly used for TW composites (TWC) due to their effectiveness in removing lignin while preserving wood's structure [31]. However, chemicals such as H₂O₂ and CH₃CO₃H pose environmental risks, producing harmful byproducts and hazardous waste [31, 25]. This highlights the need for more sustainable delignification techniques for large-scale TWC production.

Recent research has shifted from completely removing lignin to modifying or partially removing it to enhance material properties and reduce environmental impact. Biological enzymes like laccase [34] and peroxidase [35, 36], along with eco-friendly methods like steam bleaching with H₂O₂ or H₂O₂/HAc solutions, offer sustainable solutions for TWC fabrication [37]. These methods ensure high transmittance, mechanical strength, and UV shielding while retaining lignin or incorporating lignin nanoparticles further improves TWC performance [38].

C. Green Chemistry in Polymerization

TW is fabricated using polymers like epoxy resin [37], PMMA [25], PVA [39,40], PG [41], PVP [42,43], and n-butyl methacrylate [5]. Among these, bio-based polymers have gained prominence due to their ability to utilize renewable resources, and achieve carbon neutrality, making them a sustainable alternative to traditional fossil fuel-derived polymers. Furthermore, the selection of resin for TW production is driven not only by the need for a high degree of refractive index compatibility with the wood template but also by an increasing emphasis on functionality, environmental sustainability, and biodegradability.

C. Montanari et al. [44] developed bio-based polymers, such as poly (limonene acrylate) (PLIMA), which were impregnated into DW to create transparent, strong biocomposites. The wood's structure was modified through succinylation, improving the interaction with PLIMA, enhancing impregnation, bonding, and covalently linking them, resulting in better mechanical and optical properties. Montanari et al. [22] further advanced this by incorporating polyethylene glycol (PEG) and PMMA into DW to produce TW with heat storage capabilities. This material displayed a unique optical behavior, appearing white in its solid state and transparent in its liquid state, enabling temperature-dependent transparency. Zhou et al. [45] demonstrated the creation of yellow and red luminescent transparent woods by embedding carbon quantum dots (CQDs) from chitosan or o-phenylenediamine into DW frameworks combined with epoxy resin. These luminescent woods block significant amounts of UV light while maintaining high visible transmission, offering excellent water resistance, thermal stability, and insulation. Le Van Hai et al. [46] developed multilayer transparent wood (M-TW) by self-bonding and hot-pressing single-layer transparent wood (S-TW), with chitosan and cellulose nanofibers infiltrated into bleached wood. The resulting M-TW exhibited enhanced mechanical strength,

highlight transmittance, and improved optical properties.

D. Lifecycle Assessment

The study *Life Cycle Assessment of Transparent Wood Production Using Emerging Technologies and Strategic Scale-Up Framework* by Rohit Rai et al. evaluates TW production's environmental impacts and end-of-life (EOL) decomposition using life cycle analysis (LCA). LCA assesses ecological impacts across a product's lifecycle, from raw material extraction to disposal. The study examines four delignification and infiltration routes, identifying Route 4 (NaOH and Na₂SO₃) as the most environmentally friendly and Route 1(b) (NaClO₂ and vacuum drying) as the least sustainable due to high greenhouse gas emissions. Industrial-scale production proves more sustainable than laboratory-scale processes, with reduced energy use and emissions. This study underscores TW's potential as an eco-friendly, sustainable alternative to materials like polyethylene [31].

FUNCTIONALITY: EMERGING INNOVATIONS IN ARCHITECTURE

TW's sustainable nature and unique properties drive rapid advancements, enabling features like fluorescence, UV shielding [46], heat shielding [47], and thermal insulation. These innovations expand its applications to construction, solar cells [48], windows [49], smart windows [50], and structural elements [51], supporting sustainability. As TW evolves, it adapts to diverse design needs, offering versatility for industrial use.

TW combines exceptional optical and mechanical properties, such as strength, toughness, and impact resistance, making it suitable for the building sector. This research introduces a taxonomy categorizing materials into four architectural usage clusters: Sustainable and Energy-Related Materials (eco-friendliness and efficiency), Structural and Building Envelope Materials (stability and protection), Interior and Aesthetic Materials

(design and comfort), and Specialized and Protective Materials (safety and adaptability).

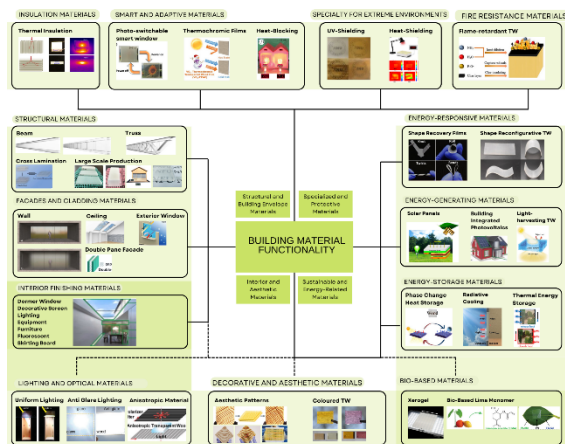


Fig.3 Usage-Based Building Material Taxonomy

A. Structural and Building Envelope Materials

Katunský, D. [51] proposed structural designs using TW, including "I" beams, box beams, and Vierendeel trusses. However, current TW sizes limit its use in large-scale applications. To address this, Mi et al. [52] developed a green steam-modified delignification method for processing various wood species, while Wang et al. [53] introduced a high-efficiency method for large-scale TW with improved light transmittance and thermal insulation.

A comparative study [54] highlighted TW's potential in energy-efficient applications, such as replacing glass ceilings. Yang et al. [27] improved scalability with cross-laminated transparent wood, enhancing both mechanical properties and performance. For façades, two methods are proposed: thick structural units and thinner panels mimicking glass façades, with Ruiyu Mi et al. [49] developing a double-pane TW window system for better insulation.

B. Interior and Aesthetic Materials

TW offers versatile applications in interiors, such as dormer windows, decorative screens, lighting, and furniture, combining functionality with aesthetics [27]. Unlike glass, which can cause glare, TW provides a more uniform lighting experience, as shown by a TW rooftop

in a house model that ensures consistent light distribution [55]. Its anisotropic nature also allows TW to manipulate light in unique ways, depending on light polarization, further enhancing its use in lighting and architecture [49].

Mi et al. developed TW with visually appealing preserved wood patterns, influenced by variations in density, pore distribution, and lignin content [54]. Additionally, Martin Höglund et al. introduced a microwave-assisted process that transforms white wood substrates into brilliant colors, such as yellow silver and pinkish-purple gold, using nanoparticle synthesis to create wood with structural color [56].

C. Sustainable and Energy-Related Materials

TW, as a biomass-based building material, offers excellent insulation and optical properties that address growing energy demands. Research by Rongqi Xia et al. [57] incorporated the phase change heat storage into TW, enhancing energy efficiency through effective sunlight harnessing and thermal energy storage. Xin Hu et al. [58] developed a ZnO-coated TWC with high emissivity for radiative cooling, while Céline Montanari et al. combined delignified wood with phase change materials (PCMs), creating a thermal energy storage system that outperforms glass in heat storage and energy regulation.

Exploration into TW's use in energy-saving applications, such as solar cells, is expanding. Yuanyuan Li et al. [48] identified high optical transmittance TW as a promising solar substrate, and Hong Yang et al. proposed utilizing TW in solar cells for guiding sunlight along wood cell growth directions [59]. The transparent wood film also shows flexibility, enabling it to be knotted, rolled, and bent without damage [60], offering potential for dynamic, energy-efficient architectural designs. Additionally, Kaili Wang et al. [61] proposed reconfigurable shape-memory TW for applications like fire alarm systems.

Further developments, such as the creation of wood xerogel by Wang, S. et al. [62], and the

impregnation of bio-based PLIMA polymers into DW [44], highlight the diverse applications of TW composites, demonstrating both strength and transparency.

D. Specialized and Protective Materials

Various studies have advanced TW to address challenges like heat shielding and UV protection. For instance, Hua et al. [47] developed a TW composite with enhanced heat-shielding and flame-retardant properties by incorporating Cs₃ for NIR blocking and BPDP for fire resistance. Similarly, Tiantian Wu et al. [63] created a dual-functional TW by combining DW with epoxy resin and in situ-generated TiO₂ nanoparticles, resulting in high optical transparency, excellent UV shielding, and effective thermal insulation with low thermal conductivity. Le Van Hai et al. (46) demonstrated NaOH delignification transparent wood (Na-TW) with excellent light transmittance, tensile strength, UV-shielding capabilities, and comparable thermal stability. Additionally, Yu et al. [64] showed that NIR-absorbing Cs_xWO₃ nanoparticles in TW effectively shield heat in building/window applications.

Lang et al. [65] developed electrochromic devices (ECD) using TW as a substrate, enabling smart windows that change color for energy savings. Similarly, Sai Liu et al. [66] proposed a thermochromic TW film (TTWF) with VO₂ nanoparticles, providing thermal switching of transmittance, ideal for window applications. TW's potential in insulation is further explored by Li et al. [67], who describe two heat conduction modes in wood: axial heat transfer along cell walls and transverse heat transfer across the walls, lumen, and nanosized pores.

CONCLUSION AND FUTURE PERSPECTIVES

The future of sustainable development depends on how humans will transfer their dependability from finite fossil-based materials to sustainable and renewable materials. Wood, a sustainable biomass, plays a key role in this shift due to its renewable and carbon-sequestering properties. Through chemical and thermal modifications,

wood can be engineered into functional materials. TW, a versatile biocomposite, stands out for its potential in energy-efficient applications.

TW combines wood's mechanical strength with low thermal conductivity and high optical transmittance, making it a strong candidate for sustainable design. Its versatility spans from thermal insulation and flame-retardant properties to innovative applications such as photo-switchable smart windows and thermochromic features, addressing challenges like glare and shading. Moreover, as a bio-based material, TW supports eco-friendly, energy-efficient solutions in construction.

The exploration of bio-based and sustainable resins in the production of TW can further reduce its ecological footprint, enhancing its role in green architecture. However, further research is needed to improve the long-term stability of TW, particularly for outdoor applications where weather exposure may affect its properties, ensuring its durability and performance in various environmental conditions.

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Reactive Transport Modeling of Geochemical Systems by Peridynamics Theory

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Abstract:

Heterogeneities and discontinuities like fractures and vugs in porous systems significantly impact subsurface reactive flows. High-permeability fractures create preferential pathways for flow, while low-permeability fractures act as barriers. Studying reactive transport in such systems is vital for applications like groundwater remediation, hydraulic fracturing, CO₂ storage, nuclear waste disposal, and oil and gas production. Traditional local modeling methods, such as finite difference and finite volume methods, often face challenges with the complexities of heterogeneous and discontinuous media. Compared with the local methods, the alternative non-local reactive flow model based on Peridynamics transforms the classical continuity equations into integral formulations, and no spatial derivatives are needed. This special property enables it to model extremely discontinuous and heterogeneous problems. In this study, Bond-based peridynamic formulations for coupled fluid flow and chemical transport are developed to address transport processes in the saturated porous medium. The sequential noniterative approach is introduced to address the coupling between the transport of chemical species (solved by Peridynamics) and geochemical reactions (solved by PHREEQC). A series of cases are studied to show the model's capabilities in the prediction of reactive transport in porous media with fractures and heterogeneities (e.g., permeable and impermeable inclusions). The results indicate that the multi-physics peridynamics based formulations are suitable for reactive transport issues.

Keywords:

Reactive transport modeling, Geochemical, Peridynamics, Numerical model.

Marketing Strategies and Company Performance a Case Study of Pfunda Tea Company

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Abstract:

The study topic was about marketing strategies and company performance. Case study of Pfunda tea company. The general objective of the study was to find out the role of marketing strategies to company performance on Pfunda tea company, to examine the challenges facing company marketing strategies and performance on Pfunda tea company, to find out strategies for effective marketing strategies and company performance on Pfunda tea company. Literature review was guided by research objectives and the study variables. The research design was descriptive. The total population was 150 but the study settled for 108 as sample size using the Krejcie and Morgan table of 1970. Tools for collecting data were questionnaires and Documentation. Data was analyzed using tables, frequencies and percentages. Findings were in line with objectives, objective one was looking at the role of marketing strategies to company performance and the roles were high sales, market communications, company reputation, helps determine optimal price and brings about healthy competition, objective two was looking at the challenges facing company marketing strategies and performance and these challenges included poor strategy, d labor, poor technology, high taxes and internal coordination of marketing activities and objective three was looking at strategies for effective performance of marketing strategies and these included well defined targets, clear conversion goals, skilled labour, advanced technology and quality goods and services . The study recommends that, recommends that, there should be often trainings of marketers so as to raise the level of their skills, knowledge and attitudes in serving their clients very well and this should be aimed to the provision of effective marketing strategies and attracting large numbers of customers. The study also recommends that the marketing department should adopt the use of advanced technology to foster quick marketing services and improved service delivery in the industry since with advanced technology more can be achieved in the shortest time possible in regard to marketing. The study concluded that marketing strategies are very important in company performance and that good marketing strategies bring about customer base and company growth and profitability.

Keywords:

Marketing Strategies, Company Performance.

Quality Services and Customer Retention in the Hotel Industry Case Study of Lake Kivu Lake Kivu Serena Hotel

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Abstract:

The study topic was about the role of quality services to customer retention. Case study of Lake Kivu Lake Kivu Serena hotel. The general objective of the study was to assess the impact of quality service to customer retention. Specific objectives were to find out the role of quality service to customer retention, to examine the challenges facing the hotel industry in Rwanda and to find out strategies hotels can use for effective quality service and customer retention. Literature review was guided by research objectives and the study variables. The research design was descriptive. The total population was 100 but the study settled for 80 as sample size using the Krejcie and Morgan table of 1970. Tools for collecting data were questionnaires and Documentation. Data was analyzed using tables, frequencies and percentages. Findings were in line with objectives, objective one was looking at the role of quality service to customer retention and these were to be customer satisfaction, reputation, repeat business, hotel development and growth and employee motivation, objective two was looking at the challenges and challenges were, low market with, unskilled labor, high competition, high taxes and inadequate equipment's and other tools and objective three was looking at strategies and strategies were using skilled labor with quality services, advanced technology,, training and awareness and charging fair prices. The study recommends that, there should be often trainings of workers/employees of hotel so as to raise the level of their skills, knowledge and attitudes in serving their clients very well and this should be aimed to the provision of quality services to guests and clients. The study also recommends that the hotel industry should adopt the use of advanced technology to foster quick service and improved service delivery in the industry since with advanced technology more can be achieved in the shortest time possible. It the study found out that quality services is key for customer retention.

Keywords:

Quality Service and Customer Retention.

Improving Medication Administration for Dysphagic Geriatric Patients

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Abstract:

Introduction: Dysphagia, a geriatric syndrome, affects 10% to 33% of older adults. The causes can be neurological, such as stroke, dementia, and delirium, or mechanical. For dysphagic patients, nasogastric (NG) and gastrostomy tubes are essential for delivering enteral nutrition and medications. Administering medications through feeding tubes is challenging and requires careful consideration by the medical team to maintain therapeutic efficacy, avoid toxicity and prevent complications, such as tubes blockage. There is limited global information on the manipulation of tablets and capsules for administration via feeding tubes, with even less local data available.

Purpose: To create a comprehensive local language guide about crushing medications for administration through feeding tubes, as well as for dividing medications.

Methods: Data was collected from drug information files, personal communication with pharmaceutical companies, textbooks, drug databases, and literature publications, including case reports. An Excel-based table organized by the active ingredient of each medication, listing all the local available commercial formulations, was created. The table served as a basis for creating a printed guide.

Results: A user-friendly, up-to-date, local language pocket guide for medical personnel has been developed. It provides comprehensive information on the enteral administration of medications for patients with swallowing difficulties, and for those requiring tailored dosing. The guide details delivery options, including the possibility and adequacy of crushing or dividing the medication. It notes limitations and explanations why some medications cannot be crushed or sliced and offers possible alternatives. References are also noted. A search option is available. Supplementary content includes a guide on handling and administering medications via enteral feeding tubes and examples of formulations that cannot be crushed. The guide has been distributed to the hospital departments, and the most extensive use is in the Geriatric Department.

Conclusion: The pocket guide offers essential information for the safe and effective administration of local medications through feeding tubes for dysphagic patients. By detailing medication manipulation and offering alternatives, it enhances patient care, improves safety and saves time for the medical team. The extensive use of the guide in hospital departments, particularly in the Geriatric Department, underscores its value in clinical practice.

Keywords:

Dysphagic patients, crushing and dividing tablets, Nasogastric (NG) tubes.

Reliability of Wind Integrated Power Systems Using Compressed Air Energy Storage

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Abstract:

Bulk-scale energy storage systems (ESS) such as compressed air energy storage (CAES) are considered as viable options to alleviate the problems associated with the variability and uncertainty of wind power that is expected to meet a large share of global energy demand. The operation strategy of an ESS is dictated by the existing market and regulatory structure, which in turn impacts the overall system performance in terms of quality, reliability, efficiency and environmental commitments. A CAES can either be operated independently to maximize the profit in the existing market or can be operated in coordination with wind power resources to collectively benefit from the markets while maximizing the usage of renewable energy. This work explores feasible applications and benefits of CAES in a transmission constrained wind integrated power system. Comprehensive models for wind and CAES operating strategies are developed and the potential values of CAES to the systems are quantified in terms of their contributions to system reliability, efficiency, and environmental objectives. The results presented show the tradeoff among different aspects of the potential benefits obtained from CAES. The method presented, and the results analyzed can provide valuable input to the utilities and policymakers for formulating effective policies and regulatory structures to integrate bulk-scale storage to efficiently support the imminent growth of renewable energy while maintaining reliable supply to electricity consumers. Index Terms-- Compressed Air Energy Storage, Wind Power, Transmission Line, Energy Arbitrage, Reliability, Monte Carlo Simulation.

The Philosophy of Solid Waste Management from the Perspective of Islamic Developmental Worldview

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Abstract:

The conventional philosophy of solid waste management prioritizes technical and operational aspects as the primary focus in its implementation. There are at least four main issues within the current solid waste management system: firstly, the public's lack of emphasis on environmental cleanliness; secondly, inefficient human development management; thirdly, inadequate waste storage and transportation facilities; and fourthly, conflicts in the waste disposal process. These issues present significant challenges that must be addressed to achieve sustainable solid waste management. If left unchecked, these problems may have negative impacts on both the environment and human life. Thus, this paper has two main objectives. First, to identify the philosophy behind solid waste management. Second, to analyse this philosophy from the perspective of the Islamic developmental worldview. This study employs a document analysis approach, utilizing qualitative content analysis methods. The findings indicate that the philosophy of solid waste management from an Islamic developmental perspective can be understood through four main components: the component of tawhid (oneness of God), the actors involved, the inherent values, and the ultimate objectives. In conclusion, these four components must be integrated and emphasized to develop a more effective and sustainable philosophy of solid waste management.

Keywords:

Solid waste management, Islamic worldview, Islamic-based development.

Proteomic Analysis of the Skin Samples from Wild Brown Trout with UDN Syndrom Caught in the Rivers of Northern Poland

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Abstract:

Background / Objectives: Ulcerative dermal necrosis (UDN), a disease of unclear pathogenesis, has been repeatedly reported in recent years in brown trout migrating from the Baltic Sea into Polish fresh water. Although the disease has been known for many decades, its etiology is still not clearly explained. The aim of the study was to provide insight in to the pathogenesis and mechanism of the UDN using proteomic methods. The studies were performed on samples of pathologically changed skin of diseased sea trout during their migration to spawning.

Methods: Tissue samples were lysed, homogenized, centrifuged and sediments diluted to 5% trifluoroethanol concentration. Samples were purified with FASP method (JR Wiśniewski, 2018). Peptide concentrations were measured with Pierce™ Quantitative Peptide Assay (Fisher Scientific). Samples were purified with FASP method (JR Wiśniewski, 2018). Then TMT labelled peptides were fractionated using high-pH reverse-phase chromatography. Then Fractions were analysed using LC-MS system composed of Evosep One (Evosep Biosystems, Denmark) directly coupled to a Orbitrap Exploris 480 mass spectrometer (Thermo Fisher Scientific, Germany). Peptides and proteins identification, was performed in the MaxQuant/Andromeda software suite using *Salmo Trutta* full Uniprot database. The functional enrichment analysis of DAPs was performed using Ingenuity Pathway Analysis (IPA) software (Qiagen, CA, USA).

Results: In total, 2906 proteins were quantified and 1089 differentially abundant proteins (DAPs) were identified between the control and UDN-treated group (q value > 0.05). Among them, 377 proteins were significantly up-regulated and 712 were significantly down-regulated following infection.

Conclusion: Our study showed a complex etiology of the disease. Not one but many pathogens, both bacterial and fungal, have been identified. Additionally, predisposing factors i.e. hormonal changes, change in the environment from salt- to freshwater, the effort associated with long migration to spawning and probably the lack of food play a role.

A Study on the Relative Importance of Digital Twin Technology in Daegu Smart City

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Abstract:

This study applied Analytic Hierarchy Process (AHP) to select and evaluate digital twin technology necessary for efficient construction and operation of a smart city in Daegu, a major city in South Korea. Through this, five main criteria and related sub-criteria were established, including “Internet of Things (IoT) and cloud-based technology,” “3D modeling and visualization technology,” “big data analysis and AI-based prediction technology,” “simulation and realistic technology,” and “citizen participation and collaboration platform technology,” and the importance of technology according to each criterion was evaluated. Based on the five main criteria presented in this study, the optimal combination of digital twin technologies that meet the various requirements of a smart city project can be determined by evaluating how well each technology meets each sub-criteria. The importance of each criterion is quantified through the AHP methodology procedure, and based on this, a method for applying digital twin technologies is proposed.

Keywords:

Analytic Hierarchy Process (AHP), Daegu Smart City, Digital Twin, Internet of Things (IoT).

The Synthesis of Zirconium Oxide Nanofibers and their Role in Strength Properties of Unreinforced Concrete

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Abstract:

The improvement in the strength properties of concrete in the presence of nanomaterials has attracted the attention of engineers to the Nano-concrete industry. Due to the unique properties such as high modulus of elasticity and splitting tensile strength, and unique chemical and physical features, nanofibers are considered one of the major nanotechnology options for improving the mechanical properties of concrete. In this study, the nanofibers of zirconium oxide were synthesized with zirconium propoxide / polyvinyl alcohol precursor by the electrospinning method. The fabricated nanofibers were characterized by X-ray diffraction (XRD), energy-dispersive X-ray spectroscopy (EDS), and scanning electron microscopy (SEM). Different percentages of fabricated nanofibers were added to concrete (0, 0.005, 0.01, 0.03, 0.06, and 0.09%wt) as cement replacement and the strength properties including the compressive, splitting tensile and flexural strengths at the ages of 7, 28, and 90 days and also total water absorption and capillary water penetrability at the age of 28 days were evaluated. The results indicated improved compressive, tensile, and flexural strengths in the presence of the zirconium oxide nanofibers, as compared to the control sample. The findings further showed that the compressive strength was significantly correlated to both the splitting tensile and flexural strengths so that one could estimate other strength properties given the compressive strength of the concrete sample. Observations further showed lower total water absorption and capillary water absorption for all samples containing the nanofibers, as compared to the nanofiber-free control sample.

Keywords:

Nanofibers, zirconium oxide, electrospinning, strength properties, unreinforced concrete.

Analyzing Drivers of Green Transformation in Taiwan: A Study Using Decision Trees, Random Forests, and Linear Discriminant Analysis

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Abstract:

As climate change and environmental crises escalate, corporate green transformation has emerged as a critical issue for sustainable development. This study investigates the driving factors influencing green transformation among Taiwanese publicly listed companies, analyzing data from 2016 to 2024 from the Green Securities Information Platform and Taiwan Economic Journal. By integrating corporate attributes, financial indicators, and Environmental, Social, and Governance (ESG) scores, the research applies decision tree, random forest, and linear discriminant analysis (LDA) models to predict the likelihood of firms obtaining green certifications and evaluate the models' performance. Empirical findings reveal that firm size, R&D expenditure ratio, and energy management play significant roles in determining green certification attainment. Among the models, the random forest demonstrates superior accuracy and robustness, excelling in handling high-dimensional data and complex interactions. Decision tree models offer high interpretability, effectively identifying key factors driving green transformation. LDA, in contrast, performs well in linear data contexts, providing a simpler predictive framework. These results highlight the strengths and limitations of machine learning techniques in addressing corporate sustainability challenges. The study underscores the importance of innovation, resource allocation, and sustainability efforts in corporate strategies. By leveraging these approaches, companies can enhance their environmental performance and competitiveness while aligning with broader sustainable development goals. This research not only provides actionable insights for businesses and policymakers but also emphasizes the critical role of advanced predictive tools in supporting green transformation initiatives.

Keywords:

Green transformation, Corporate sustainability, Machine learning.

Key Determinants of Corporate Bankruptcy in Taiwan via Decision Trees

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Abstract:

This study investigates the key financial and non-financial factors influencing corporate bankruptcy among Taiwanese publicly listed companies, considering increasing global economic volatility and shifting international trade policies. Using the Taiwan Corporate Credit Risk Index (TCRI) as a proxy for bankruptcy, it compares decision tree models, including classification and regression trees, with traditional Probit and Logit regression models. The classification tree model identifies net worth per share, directors & officers (D&O) liability insurance, and the shareholding ratios of domestic financial institutions as primary determinants, achieving an 82.82% classification accuracy. Regression tree analysis highlights the pre-tax profit to paid-in capital ratio and borrowing dependence as critical factors while reaffirming the importance of net worth per share and the shareholding ratios of domestic financial institutions. The regression tree model demonstrates high precision in continuous credit risk scoring, with root mean square error (RMSE) values between 115.37 and 117.94. In contrast, traditional regression models reveal significant negative correlations between bankruptcy risk, D&O insurance, and the shareholding ratios of domestic financial institutions. The findings underscore the superior predictive accuracy and interpretability of classification trees, the effectiveness of regression trees for continuous risk assessment, and the explanatory depth of traditional regression models. This study offers investors, corporate managers, and policymakers valuable insights into early bankruptcy risk detection and strategic intervention.

Keywords:

Decision trees, Corporate bankruptcy, Non-financial factors.

Population Aging and Individual Tax Burden: An Empirical Analysis of Japan, South Korea, and Taiwan

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Abstract:

This study investigates the impact of population aging on individual tax burdens in Japan, South Korea, and Taiwan. Using panel data from 1998 to 2022, it analyzes how demographic changes and related variables influence tax burdens. The results indicate significant quantile heterogeneity: population aging strongly affects medium-to-high quantiles, where higher tax burdens make countries more vulnerable to aging populations due to increased social welfare expenditures. In contrast, lower quantiles show limited sensitivity. Economic growth rates and the Corruption Perceptions Index also significantly affect tax burdens, while variables like unemployment and fertility rates highlight differences in national demographic and economic structures. This study enhances the literature by providing a cross-national analysis of population aging and tax burdens, offering evidence for policymakers to balance taxation and social welfare while ensuring fiscal sustainability.

Keywords:

Population aging, Tax burden, Japan, South Korea, Taiwan.

A Cross-National Comparative Study of Business Tax and Economic Growth: A Multilevel Model Analysis of Taiwan and OECD Countries

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Abstract:

This study examines the impact of business tax revenue on economic growth from 2011 to 2022 across Taiwan and 38 OECD member countries, using Hierarchical Linear Models (HLM) to analyze the relationships between variables at different levels. The analysis is conducted at two levels: the first level includes country-specific variables such as business tax revenue, unemployment rate, export growth rate, consumer price index, total fertility rate, household consumption, and public expenditure. The second level encompasses national characteristics, including the Corruption Perception Index, Gini Index, Democracy Index, and global governance indicators. The results indicate that the impact of business tax revenue on economic growth is significantly positive. Additionally, national characteristics moderate this relationship in different ways: countries with higher levels of corruption perception and political instability show a weaker positive effect of business tax revenue on economic growth, while countries with stronger governance effectiveness, regulatory quality, and the rule of law exhibit a stronger positive relationship.

Keywords:

Business tax revenue, Economic growth, Multilevel model.

