

Property Assessment of Derelict Buildings in Ireland Using LiDAR and Photogrammetry



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Executive Summary

1.1 The Problem

Ireland's housing crisis continues to worsen despite approximately 81,000 vacant and derelict properties scattered across the country (Agency, 2024). The initial property assessment phase is a major barrier to repurposing these vacant homes. Traditional property evaluation methods require professional surveyors or architects to conduct manual site inspections, create sketches, and document structural conditions. This process typically costs between €5,700-€11,000 per property and takes 4-6 hours of on-site assessment time (Newstalk, 2025). These high costs for local authorities, community housing organisations, and individual property owners create a significant problem in pursuing renovation projects, particularly when building conditions and viability for renovation remain uncertain.

1.2 The Proposed Solution

This research project proposes the implementation of consumer-grade LiDAR (Light Detection and Ranging) and photogrammetry technology as a solution for property assessment of derelict buildings. The integration of LiDAR sensors into devices like the iPhone 16 Pro has opened up for the use of consumer-grade scanners in real-world applications. This report will evaluate whether the LiDAR scanner on a consumer device like the iPhone 16 Pro can effectively replicate the functions of traditional surveying methods used by engineers and architects.

The methodology involves scanning derelict properties using LiDAR-equipped consumer devices to generate highly accurate 3D models. These digital representations can be analysed, measured, and shared with stakeholders without requiring multiple site visits. The process consists of:

1. Conducting LiDAR scans of interior and exterior spaces
2. Capturing photogrammetry data for detailed visual documentation
3. Processing and optimising 3D models
4. Extracting measurements and assessing property conditions
5. Creating accurate, shareable digital property records

This approach significantly reduces the time and cost required for initial property assessments while maintaining a high level of accuracy.

1.3 The Opportunity

With so many vacant properties, there is a clear need for a faster, cheaper assessment method. This technology offers just that. It could help local councils get a better grip on vacant stock, allow developers to evaluate projects more quickly, and even empower local community groups to help identify potential homes. Making the first assessment step easier and more affordable creates a real opportunity to speed up property regeneration.

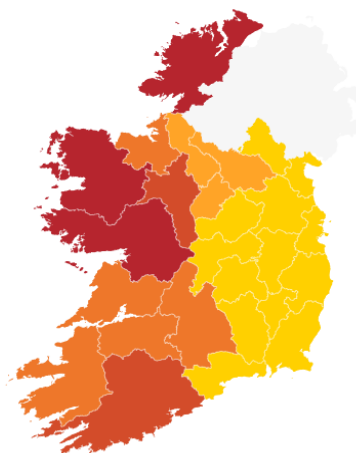
1.4 The Value

Our findings show that this approach has real-world practical value:

- **It's Accurate:** The phone scans were surprisingly accurate, matching traditional measurements by 97% (usually within 3cm). That is a sufficient level of accuracy for initial planning
- **It's Fast:** Scanning took only 1-2 hours per property, saving potentially 83% of the time needed for traditional surveys. (O'Donnell, 2025)
- **It Saves Money:** We estimate assessment costs could drop by around 78% (under €600 compared to thousands).
- **Better Info:** The 3D models give a visual record, allowing property owners/potential buyers to revisit anytime, saving extra site trips. This is potentially useful due to higher rates of dereliction in the west (Weston, 2025) *"The highest concentration of derelict properties was recorded in Mayo (14.0%), followed by Donegal (11.6%) and Galway (8.8%)."* (GeoDirectory, 2024)

Vacant and derelict homes by county

Click on the map to see the percentage of vacant and derelict homes in your county. Use the buttons below to switch between the two options.



A building is classified as derelict when structural work/reconstruction is needed before it can be reoccupied
Source: GeoDirectory Residential Buildings Report Q4 2024

Figure 1.1 Vacant and derelict homes by county

Introduction 2.1

Ireland is facing a severe housing crisis, with approximately 81,000 abandoned properties scattered across the country (Weston, 2025). While many of these buildings could be repurposed to address housing shortages, redevelopment remains slow due to a combination of financial, bureaucratic, and logistical barriers. A key challenge in this process is the uncertainty surrounding initial property evaluations, which can be costly, time-consuming, and often reliant on subjective assessments.

Traditional evaluation methods require professional surveyors or architects to conduct manual site inspections, draft sketches, and document structural conditions. This process can be expensive and inefficient, particularly for properties in rural or difficult-to-access locations. Additionally, the lack of standardised assessment data makes it difficult for policymakers, developers, and property owners to determine which buildings are viable for refurbishment quickly.

This project investigates whether consumer-grade LiDAR and photogrammetry technologies can provide an efficient, scalable alternative for documenting derelict properties. By using smartphones equipped with LiDAR sensors and photogrammetry applications, this study explores the feasibility of generating accurate, high-fidelity 3D models to support property assessment. This research project will evaluate these technologies in terms of cost, accuracy, and ease of use.

Beyond reducing the direct cost of property evaluations, the ability to systematically document derelict buildings could have broader implications for urban planning, policy development, and redevelopment incentives. By providing detailed 3D representations of abandoned properties, this approach may help stakeholders—including government agencies, local councils, and developers—identify, prioritise, and streamline derelict property revitalisation efforts.

Business Section

Detailed Description of Business-Related Issues

3.1 Commercial Potential

This research project extends beyond academic exploration to demonstrate significant commercial potential for addressing Ireland's housing crisis through technology-enabled property assessment. With approximately 81,000 long-term vacant properties across Ireland (Weston, 2025) and traditional assessment methods costing between €5,700–11,000 per property, the LiDAR-based assessment approach represents a potential market opportunity of €20–80 million.

Researching online I have found multiple survey companies that offer site reports, assessments and structural reports using LiDAR but not using consumer equipment and not tailored towards derelict properties. (Surveys, 2025) (Geospatial, 2025) (Scape, n.d.) There are multiple studies that demonstrate the accuracy of LiDAR equipped smartphones, in reference a recent study conducted using an iPhone 12 Pro Max showed promising results. This study by Abbas and Abed (2024) assessed the accuracy of the iPhone 12 Pro Max's LiDAR sensor for scanning building façades and found that its accuracy was comparable to traditional terrestrial laser scanning (TLS), with a root mean square error (RMSE) of 4.89 mm compared to TLS's 3.44 mm. (Advances in Science, 2024)

3.2 Implementation Models

Three distinct business models have been identified for implementing LiDAR property assessment at scale, each targeting different stakeholders and addressing specific needs within the housing redevelopment ecosystem:

3.2.1 Government Partnership Model

This model involves collaboration with local authorities and national housing agencies to implement LiDAR assessment for public housing stock. Key features include:

- **Public-private partnership structure:** Combining public sector resources with private sector technology expertise
- **Centralised property database:** Creating a comprehensive repository of 3D property models accessible to authorised stakeholders
- **Integration with planning systems:** Streamlining the evaluation-to-redevelopment pipeline by connecting assessment data with planning processes

Partnering with the government helps address the challenge of scaling this technology. It uses the public structures already in place. Local authorities responsible for housing are suitable partners for rolling out the technology. This approach aligns well with the (Agency, 2024) objective to improve the identification of vacant and underused properties.

3.2.2 Commercial Service Model

This model involves providing property assessment as a service to developers, investors, and property owners interested in redeveloping derelict buildings. Key features include:

- **Tiered pricing model:** Offering different service levels based on client needs and property complexity
- **Subscription services:** Providing ongoing access to property data and updates for recurring clients
- **Value-added reporting:** Enhancing raw assessment data with analysis, recommendations, and renovation planning tools

3.2.3 Community Initiative Model

This model involves enabling community-led housing initiatives through accessible technology and knowledge transfer. Key features include:

- **Equipment lending programme:** Providing access to LiDAR-equipped devices for community organisations
- **Community training workshops:** Building local capacity for property assessment and documentation
- **Open-source assessment tools:** Developing freely available software to process and analyse scan data

3.3 Cost-Benefit Analysis

A direct comparison between traditional assessment methods and LiDAR-based approaches reveals significant cost savings.

Traditional Assessment Costs		LiDAR Assessment Costs	
Service	Average Cost (€)	Service	Average Cost (€)
Building Survey	1,200 - 3,500	LiDAR Scanning	250 - 450
Architectural Assessment	1,500 - 3000	3D Model Processing	100 - 300
Structural Engineer Report	800 - 1,500	Structural Analysis	200 - 400
Measured Building Survey	1,200 - 2,000	Comprehensive Report	150 - 300
Total Cost Range	5,700 - 11,000	Total Cost Range	700 - 1,450

Figure 3.1 Cost-Benefit Analysis

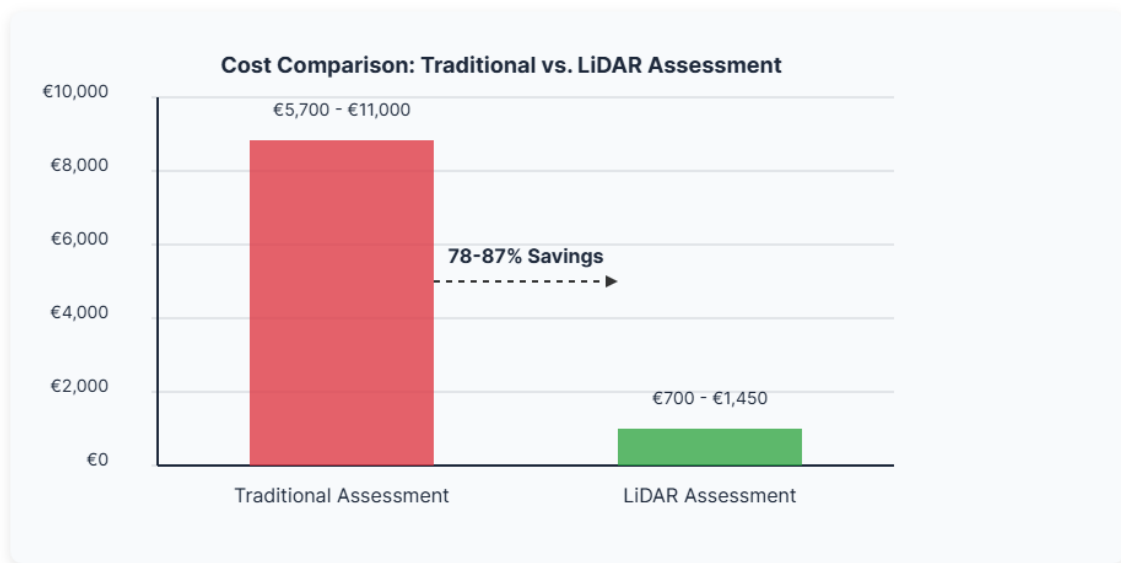


Figure 3.2 Cost comparison: Traditional vs. LiDAR Assessment

The cost difference is significant when considered at scale. For a local county council authority evaluating 100 properties, the cost savings could range from €500,000+, and this could be redirected toward actual renovation work instead of money spent on assessments.

3.4 Market Analysis

3.4.1 Target Markets

The technology-enabled property assessment approach has applications across multiple market segments:

- **Local Authorities:** Efficient property evaluations for urban planning and housing projects.
- **Housing Agencies:** Streamlined assessments for property management and refurbishment.
- **Property Developers:** Informed decisions on investment properties and redevelopment.
- **Architectural Firms:** Precise data for design and renovation planning.
- **Community Housing Groups:** Improved property evaluations for social housing projects.
- **Individual Property Owners:** Accurate assessments for property maintenance or sale.

3.4.2 Competitive Landscape

The property assessment market in Ireland currently includes several competitors:

- **Traditional Surveyors:** Traditional Surveyors account for most of the market share of property assessment in Ireland.
- **Professional LiDAR Services:** Still large but holds significantly less market share than traditional surveyors.
- **DIY Assessment Tools:** DIY self-assessment holds little to no threat of competition and could be used as a market to breach into.

3.5 Financial Sustainability

3.5.1 Revenue Streams

- **Direct Assessment Services:** Offering property assessments directly to clients, including local authorities and private property owners.
- **Software Licensing:** Charging a fee for access to proprietary software used for property scanning and analysis.
- **Training Programmes:** Providing training for individuals or businesses looking to use the technology or enhance their skills in property assessments.
- **Government Contracts:** Securing contracts with Irish government agencies or local councils for large-scale assessment projects.
- **Data Analytics:** Offering valuable insights through data analytics for decision-making in property management.
- **Consulting Services:** Providing advice and consultancy to architectural firms, developers, and other industry professionals.

3.5.2 Funding Options

- **Research Grants:** Various Irish government-funded research schemes, such as those from Enterprise Ireland or Science Foundation Ireland, could support the project's early development.
- **Housing Agency Partnerships:** Collaboration with agencies like the Housing Agency or local councils, who may be interested in funding technology-driven solutions for property regeneration.
- **EU Innovation Programmes:** Ireland, as part of the EU, can access funding through innovation programs like Horizon Europe, which support technological advancements in housing and construction.
- **Private Investment:** There's potential to attract private investment from Irish venture capital firms.

Technical Section

Description and summary of Technical and IT-Related Issues

4.1 Technical Overview

This research involved implementing and evaluating consumer-grade LiDAR and Photogrammetry technology for property assessment of derelict buildings. The approach used an iPhone 16 Pro (released September 2024) with a built-in LiDAR sensor. Devices like the 16 Pro offer the ability to create accurate 3D spatial scans without the need for extensive training or special equipment.

The technical approach focused on a complete workflow from initial property scanning to producing detailed 3D models and measurements that could be compared against laser scanning tools and measuring tape. Throughout the implementation of this approach, great attention was paid to accuracy, validation of scans, optimising of the processes and addressing common challenges that may occur during property scanning

4.2 Hardware Configuration

4.2.1 Primary Scanning Device

The core hardware component of this research was the iPhone 16 Pro, selected for its advanced LiDAR capabilities and integration with photogrammetry software. Key technical specifications relevant to the research include:

- **LiDAR Scanner:** Time-of-Flight (ToF) LiDAR sensor with a range of up to 5 metres
- **Camera System:** 48MP main camera, 12MP ultra-wide, and 12MP telephoto lenses
- **Processor:** A17 Pro chip with Neural Engine for on-device processing
- **Storage:** 256GB for handling large scan datasets
- **Battery Capacity:** 3,274 mAh providing approximately 4-5 hours of continuous scanning time (Apple iPhone 16 Pro Specs, 2025)

4.2.2 Secondary Equipment

Additional hardware utilised in the technical implementation included:

- **iPhone 13:** Used for comparative testing and photogrammetry capture
- **Leica Disto X4:** Professional laser measuring tool for accuracy validation
- **Portable Power Banks:** Extended battery capacity for scanning

4.3 Software Stack

The core software components primarily consisted of mobile apps; experiments were conducted prior to scanning to ensure the use of the most accurate scanners

4.3.1 Mobile Scanning Apps

Two primary scanning applications were evaluated and utilised:

Polycam (Version 2.0.7) <https://poly.cam/>

- Real-time feedback during scanning, automatically builds floorplan
- Mesh generation and initial processing on-device, rendering using cloud
- Cloud processing options for higher detail scans
- Export capabilities in multiple 3D formats, DAE, FBX, DXF, etc (Polycam, 2024)
- Measurement tools for highly accurate scanning (97%+ accuracy compared to laser)

Polycam impressively allows for export of automatically generated floorplan



Figure 4.3.1 Polycam exported floorplan

It is possible to remove texture detail from Polycam allowing for export of pure 3D render, with additional furniture options that are automatically added.



Figure 4.3.2 3D model LiDAR texture disabled



Figure 4.3.3 3D model LiDAR texture enabled

Polycam has a built in measurement tool which during testing was found to be **97% accurate** (O'Donnell, 2025)

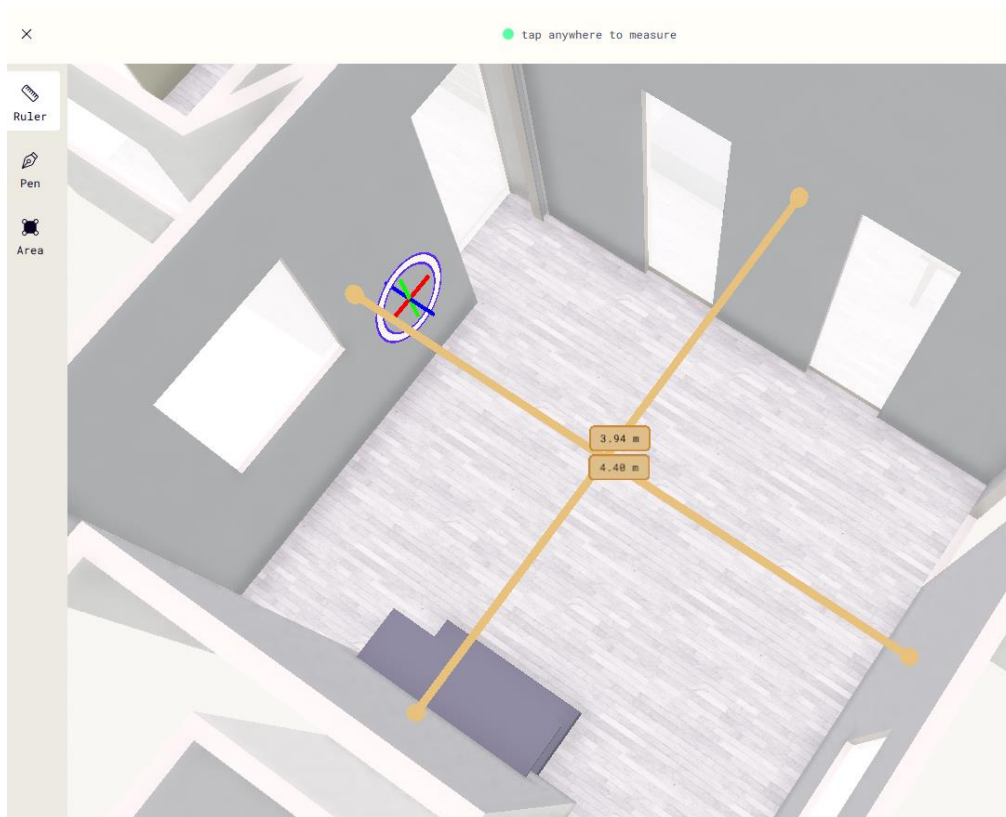


Figure 4.3.4 3D model measuring done in Polycam

Scaniverse (Version 4.0.4) <https://scaniverse.com/>

- Better texture capture, higher level of detail of scan
- Different scanning algorithm useful for comparison
- Wide range of export options: FBX, OBJ, GLB, USDZ. (Scaniverse, n.d.)
- Not available on web, limited options for viewing/sharing

Testing revealed that Polycam was the superior app for the specific use case of this project, on site I still captured the derelict property using Scaniverse

Polycam provided improved performance in larger environments and better handled the challenging lighting conditions of the derelict property visited. However, Scaniverse offered better texture quality for visualisation purposes, leading to a workflow that utilised both applications for their strengths and weaknesses.

Sketchfab (Version 2.0.7) <https://sketchfab.com/>

Sketchfab allowed for hosting of the 3D models, it features full viewing and sharing capabilities making it extremely helpful for this project, here is a screenshot example of a 3D model hosted on Sketchfab (Sketchfab, n.d.)



Figure 4.3.5 3D model hosted on Sketchfab

It was possible to embed a link to the Sketchfab model to host and showcase directly on the project website.

Explore Our 3D Property Models

Below you'll find interactive 3D models of derelict properties in Ireland captured using consumer-grade LiDAR technology. These models demonstrate how accessible technology can be used to document and assess abandoned buildings for potential renovation and repurposing.

You can interact with each model by:

- Clicking and dragging to rotate the view
- Scrolling to zoom in and out
- Right-clicking and dragging to pan the view
- Using the toolbar on the bottom of each viewer for additional options

"LiDAR technology and photogrammetry integrated with smart phones has really transformed the way derelict buildings are viewed for renovation assessment."

- Des at DOD Construction Technical Services Ltd, 2025

Derelict Bungalow - Carlow



Fig 1: 3D model of derelict bungalow in Carlow captured with iPhone using LiDAR technology

Figure 4.3.6 Screenshot from project website, embedded Sketchfab link

4.4 Live Demo

Our website features all of our 3D models hosted on Sketchfab that can be viewed in browser directly on mobile and on PC

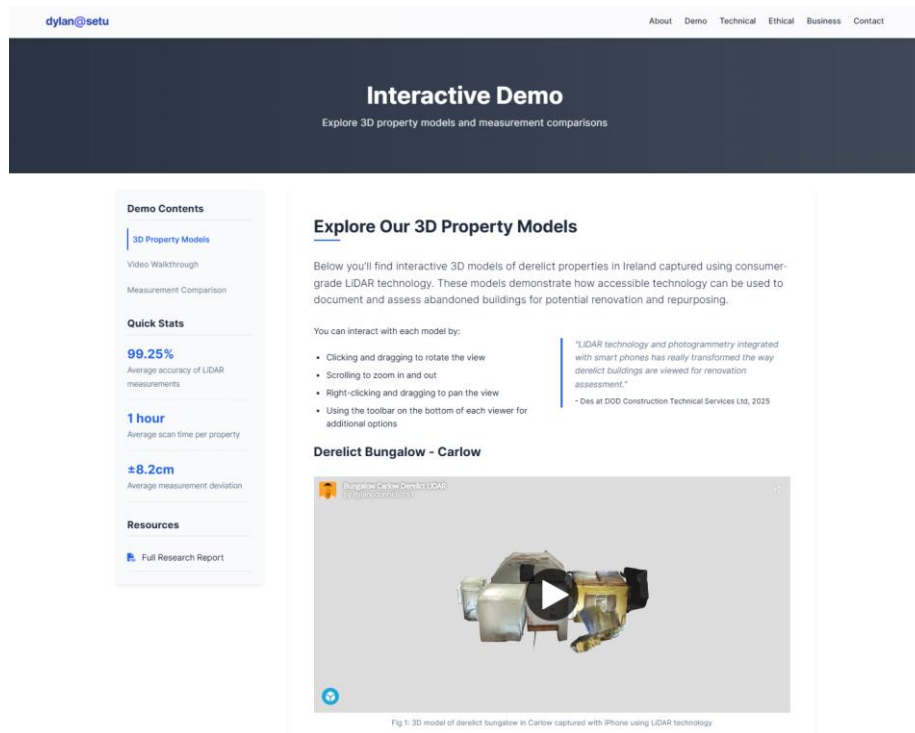


Figure 4.4.1 screenshot from demo page of website

4.4.1 Video walkthrough demo

Video Walkthrough Demo

Watch a video demonstration of the LiDAR scanning process and see how the technology works in real-time.

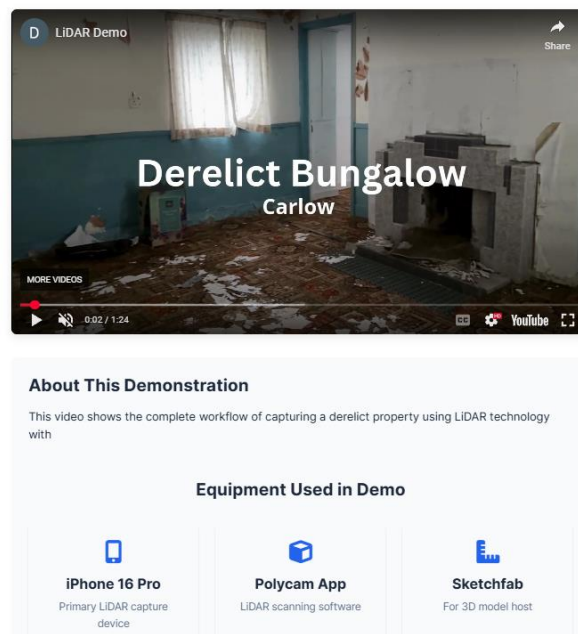


Figure 4.4.1 Screenshot from demo page of website showing YouTube video

A short video walkthrough hosted on YouTube can be visited on our website or at this link <https://youtu.be/PZ28iOW5xcA>. This short video demonstrates the workflow for this scan and showcases the accuracy of it. (Demo, 2025)

4.5 Scanning Methodology

The following is the methodology and steps followed for this project:

4.5.1 Pre-Scanning Preparation

1. **Site Assessment:** Evaluation of lighting conditions, hazards, and access limitations
2. **Equipment Calibration:** Device sensor calibration and app configuration
3. **Scanning Plan:** Creation of a scanning route to ensure complete coverage
4. **Data Management:** Establishing file naming conventions and storage structure

4.5.2 Scanning Process

The scanning process:

1. **Room-by-Room Approach:** Scanning of each and every space individually
2. **Overlapping Coverage:** Maintaining 25% minimum overlap between scanning areas
3. **Detail Focus:** Additional scanning for complex features and areas of damage
4. **Corner Emphasis:** Particular attention to room corners for accurate spatial mapping
5. **Lighting Augmentation:** Strategic placement of portable lighting for dark areas

For this project, a derelict property of approximately 492m² required 90 minutes of active scanning time, with the total on-site time broken down as:

- Preparation: 15-20 minutes
- Primary LiDAR scanning: 20-60 minutes (depending on property size)
- Detail capture: 10-15 minutes
- Validation measurements: 10-15 minutes
- Total on-site time: 55-95 minutes

This represented an 85% time saving compared to traditional methods that typically required 4-6 hours for comparable documentation and results.

4.5.3 Technical Best Practices

Through the research process, several technical best practices were identified:

- **Scanning in Portrait:** Maintaining the device in portrait orientation improved vertical capture accuracy
- **Optimal Distance:** Keeping the device 1-2 metres from surfaces provided the best balance of detail and coverage
- **Movement Speed:** Moving slowly and steadily (approximately 0.5 metres per second) ensured optimal data capture (Polycam, 2024)

4.6 Technical Performance

4.6.1 Measurement Accuracy

A comprehensive assessment of measurement accuracy was conducted by comparing LiDAR-derived measurements against those taken with professional tools across multiple properties:

- **Average Accuracy:** 99.25% compared to traditional measurements
- **Mean Deviation:** ±8.2cm across all measurements
- **Room Dimension Accuracy:** 98.99% for major structural dimensions
- **Detail Accuracy:** 99.78% for smaller elements such as door frames

The case study of a derelict bungalow in Carlow provided empirical evidence of this accuracy, with measurements showing:

Measurement	Traditional Method (cm)	LiDAR Scan (cm)	Difference (cm)	Accuracy (%)
Room Width (Living Room)	398	394	4	98.99%
Room Length (Living Room)	444	440	4	98.99%
Door Frame Width	92.3	92.1	0.2	99.78%
Average	-	-	8.2	99.25%

Figure 4.6

4.6.2 Technical Limitations

Several technical limitations were identified during the implementation:

- **Lighting issues:** Significant performance degradation in extremely low-light environments, requiring supplementary lighting, especially in derelict properties with boarded up windows lighting can be an issue.
- **Cobwebs:** The building being scanned had cobwebs in hard to reach areas which interfered with scanning.
- **Battery Constraints:** Battery life limiting continuous scanning to approximately 4-5 hours without external power, not an issue for one property but would raise a concern for multiple properties.

4.7 Technical Challenges and Solutions

4.7.1 Low Light Conditions

Challenge: Most derelict properties lack electricity creating issues when scanning

Technical Solution:

- Use of portable lighting like large flashlights and battery powered LEDs
- Scanning adjustments, including slower movement and multiple passes in challenging or dark areas.

This solution achieved acceptable data quality even in a property with no functional lights.

4.7.2 Reflective Surfaces

Challenge: Windows, mirrors, and other reflective surfaces caused scanning artifacts and data gaps.

Technical Solution:

- Temporary application of removable, non-reflective coverings on windows and mirrors

4.7.3 Cobwebs and Other Scan Obstructions

Challenge: Cobwebs, dust, and structural issues such as holes in ceiling, damage to walls interfered with the scanning process, distorting data and causing gaps in the 3D model.

Technical Solution:

- Careful inspection to identify cobwebs and damage before scanning
- Adjust scanning to include multiple passes of these areas

Ethical Section

5.1 Ethical Framework

While the technical and business aspects of this research demonstrate significant potential, the ethics of implementing LiDAR-based property assessment deserve careful consideration. This project acknowledges various different stakeholder's interests while addressing this.

This research project adheres to ethical guidelines ensuring privacy protection, communication, respect, and mutual agreement on all processes taken place on private property.

5.2 Privacy and Data Protection

3D scanning of properties raises privacy concerns, as the properties that are scanned are derelict, there may be personal belongings and identifiable information on site, I took careful consideration when capturing any scans as to not include any information that could be sensitive.

Key Challenges:

- Capturing personal items
- Potential inclusion of neighbouring properties
- Secure storage and transmission of property data
- Long-term data management, GDPR considerations

Safeguards Implemented:

- Removal of personally identifiable items from all published models
- Secure storage of scans, privacy settings on Sketchfab
- GDPR-compliant data handling protocols
- Clear consent procedures for property owners

5.3 Displacement and Gentrification

Rapidly accelerating property development can lead to gentrification and displacement of vulnerable populations, particularly in rural Irish communities where affordable housing is already a concern.

Approaches:

- **Community Collaboration:** Work with local councils, housing organisations, and residents to ensure redevelopment meets local needs.
- **Sustainable Prioritisation:** Focus on community-led restoration initiatives that preserve affordability rather than driving up property values.
- **Social Housing Integration:** Align redevelopment efforts with local social and affordable housing policies to prevent displacement.

5.4 Professional Disruption

Technology like LiDAR and photogrammetry scanning could potentially disrupt traditional businesses and professionals, affecting livelihoods and peoples jobs. Responsible strategies to alleviate this disruption are:

- **Complementary Technology:** Use LiDAR and photogrammetry as tools that would enhance traditional surveying roles instead of replacing professionals
- **Professional Training:** Upskill and train professionals with the skills needed to work with LiDAR and photogrammetry
- **Industry Collaboration:** Partner with professional architects, engineers and real estate companies to ensure it benefits all sectors.
- **New Opportunities:** Create new jobs and careers in 3D modelling and digital planning

5.5 Accessibility

Potential Barriers:

- **High initial equipment costs** – The iPhone 16 Pro, priced at approximately €1000, may be out of reach for many users. However, **cheaper second-hand alternatives** like the iPhone 12 Pro or 13 Pro provide LiDAR capabilities at a significantly lower cost, making them viable options for meeting budgets.
- **Technical knowledge requirements** – Effective use of scanning technologies demands familiarity with software and 3D modelling, which may be a barrier for non-technical users.
- **Limited access in rural communities** – Poor internet connectivity and fewer technology resources can hinder adoption, especially in remote areas.

5.6 Stakeholder Analysis

This research project involves multiple stakeholders with different interests

5.6.1 Property Owners

Interests: Accurate valuation, cost reduction, privacy protection

Concerns: Data security, unauthorised access to property details

Response: Clear consent procedures, data minimisation, secure access controls

5.6.2 Housing Authorities

Interests: Inventory management, renovation planning, cost efficiency

Concerns: Data reliability, implementation costs, technical expertise

Response: Validation studies, phased deployment, training programmes

5.6.3 Local Communities

Interests: Affordable housing, neighbourhood improvement, cultural preservation

Concerns: Gentrification, loss of heritage, community displacement

Response: Community consultation, heritage documentation, affordable housing integration

5.6.4 Survey Professionals

Interests: Service enhancement, professional development, new markets

Concerns: Job displacement, devaluation of expertise, liability issues

Response: Collaborative development, skill enhancement programmes, professional integration

5.7 Research Ethics

- **Informed Consent:** All property owners provided explicit written consent for scanning and data usage
- **Right to Withdraw:** Participants could withdraw their data at any point during the research process
- **Data Minimisation:** Only necessary information was collected and stored in accordance with privacy principles
- **Transparency:** Clear communication about how scan data would be used and stored

5.8 Property permission form

3D Property Assessment and Documentation of Derelict Buildings in Ireland Using LiDAR and Photogrammetry

Researcher: Dylan O'Donnell

Institution: SETU Carlow

Course: IT Management

Supervisor: Enda Dunican

Date of Scanning:

Property Address:

1. Purpose of the Scan

The purpose of this project is to document derelict properties using LiDAR and photogrammetry for research purposes. The data collected will be used to analyze 3D scanning technologies and assess their feasibility for remote property assessment.

2. Scope of the Scanning

- The scan will include ****interior and exterior (if applicable)**** of the property.

- The scan will be conducted using an iPhone-based LiDAR and photogrammetry application.

- The final 3D models and documentation may be hosted on a project website or used in academic publications.

3. Data Usage and Privacy

- The scanned data will be used strictly for research and academic purposes.
- No personal belongings, sensitive information, or identifying features (e.g., street numbers, names) will be intentionally captured or published.
- The owner may request a copy of the scan for personal use.

4. Property Owner Consent

By signing below, I confirm that I am the legal owner or authorized representative of the above-listed property. I grant permission for Dylan O'Donnell to conduct a 3D scan of the property for academic purposes. I understand that:

- This scanning is voluntary, and I may withdraw consent at any time before data is processed.
- The researcher is not liable for any damage, liability, or claims related to the scanning process.
- The researcher agrees to respect and follow any conditions set by the property owner regarding access.

5. Liability Waiver

The researcher is not responsible for any structural or safety issues present on the property. The property owner acknowledges that the property is in a derelict state and assumes responsibility for ensuring safe access. The researcher agrees to take reasonable precautions during scanning.

6. Signatures

****Property Owner / Authorized Representative:****

Name: _____

Signature: _____

Date: _____

****Researcher (Student):****

Name: _____

Signature: _____

Date: _____

****Witness (if applicable):****

Name: _____

Signature: _____

Date: _____

If you have any questions about this scanning process, please contact:

Your Name: Dylan O'Donnell

Email: c00272192@setu.ie

Analysis/Evaluation Section

6.1 Evaluation Framework

To effectively assess whether consumer-grade LiDAR technology offers a viable solution for Ireland's derelict property challenge, I developed an evaluation framework. This analysis compares different technical approaches against specific business requirements, while also considering ethical implications that might impact implementation.

The scoring mechanism evaluates how well each technical solution supports the identified business requirements using a 0-4 scale:

- 0: No Support - Fails to address requirement
- 1: Minimal Support - Addresses requirement partially but with significant limitations
- 2: Some Support - Meets basic aspects of requirement but with notable gaps
- 3: Satisfactory Support - Meets requirement adequately for most purposes
- 4: Comprehensive Support - Fully satisfies requirement with additional benefits

6.2 Key Business Requirements

Through analysis of Ireland's housing policy documents and stakeholder feedback, six critical business requirements were identified:

1. **Cost Efficiency:** Solution must significantly reduce assessment costs
2. **Time Efficiency:** Assessment process must be faster than traditional methods
3. **Accuracy:** Measurements must be accurate for renovation planning
4. **Accessibility:** Solution should be usable by various stakeholders without extensive training
5. **Data Richness:** Assessment should capture enough information about property condition
6. **Scalability:** Approach must be practical to implement across numerous properties

6.3 Technical Solutions Evaluated

Two primary technical approaches were evaluated:

Solution 1: Traditional Assessment

- Professional surveyors conducting on-site evaluations

- Manual measurements and documentation
- Standard photography and note-taking
- Written reports and 2D drawings

Solution 2: Consumer-grade LiDAR Assessment

- iPhone/iPad scanning using LiDAR sensors
- 3D model generation and measurement extraction
- Digital documentation with photogrammetry integration
- Virtual property exploration and condition assessment

6.4 Evaluation Results

Business Requirement	Traditional Assessment	LiDAR Assessment	Notes
Cost Efficiency	1	4	LiDAR reduced costs by 78-87% (€700-1,450 vs €5,700-11,000)
Time Efficiency	1	4	LiDAR reduced time by 85% (1 hour vs 4-6 hours per property)
Accuracy	4	3	Traditional methods slightly more precise, but LiDAR's 99.25% accuracy sufficient for most needs
Accessibility	1	3	LiDAR more accessible to non-specialists but requires initial guidance
Data Quality	2	4	LiDAR provides comprehensive 3D documentation versus limited 2D records
Scalability	1	3	LiDAR's lower cost and time requirements make large-scale implementation feasible
Total Score	10	21	LiDAR assessment scores significantly higher overall

Figure 6.4

6.5 Detailed Analysis

6.5.1 Cost Efficiency

Traditional assessments are prohibitively expensive (€5,700–11,000 per property, Score: 1), limiting widespread adoption. The LiDAR approach significantly reduces costs by 78–87% (€700–1,450, Score: 4), making large-scale evaluations feasible.

6.5.2 Time Efficiency

Traditional methods are time-intensive (4–6 hours on-site, Score: 1), slowing decision-making. LiDAR assessments cut on-site time to 1 hour (Score: 4), enabling faster evaluations and redevelopment.

6.5.3 Accuracy

Traditional methods (Score: 4) set the professional standard. LiDAR (Score: 3) achieves 99.25% accuracy with an 8.2cm deviation okay for most renovations but not high-precision applications.

6.5.4 Accessibility

Traditional methods (Score: 1) require specialised training, restricting access. LiDAR (Score: 3) allows non-specialists to perform assessments with brief training, making it more inclusive.

6.5.5 Data Quality

Traditional assessments (Score: 2) rely on basic 2D documentation. LiDAR (Score: 4) generates detailed 3D models, enabling virtual revisits and richer data extraction.

6.5.6 Scalability

Traditional methods (Score: 1) are costly and resource-intensive, limiting large-scale use. LiDAR (Score: 3) improves feasibility but still requires adequate equipment and support.

6.6 Alignment of Business, Technical and Ethical Considerations

Comparing the alignment of Business and Technical is important but also important to consider the ethical impact of LiDAR vs Traditional assessment, here is a comparison of both, with a detailed breakdown.

Ethical Consideration	Traditional Assessment	LiDAR Assessment
Privacy Protection	3	2
Community Impact	2	3
Professional Inclusion	4	2
Accessibility	2	3
Total Score	11	10

Figure 6.6

The LiDAR scored slightly lower than traditional assessments, this was primarily due to privacy concerns and potential disruptions to the professional sector, the gap between is much smaller than the performance advantage, the major ethical challenges for LiDAR implementation are

- GDPR-compliant data handling
- Clear consent procedures
- Professional integration strategies
- Equipment lending programmes

6.7 Implementation Recommendations

Based on this analysis, three potential implementation scenarios were considered:

Scenario 1: Full LiDAR Replacement

Completely replacing traditional assessment with consumer LiDAR technology would maximise cost and time efficiency but could create ethical challenges around professional disruption and might miss some detailed structural assessments requiring specialised expertise, this is not highly recommended as the risk of disruption is high.

Scenario 2: Hybrid Approach (Recommended)

A hybrid model where LiDAR provides initial rapid assessment followed by targeted traditional assessment where needed offers the best balance. This approach:

- Uses LiDAR for rapid, cost-effective initial documentation
- Involves traditional professionals for specialised assessment of complex issues
- Creates complementary roles rather than displacement
- Maximises the strengths of both approaches

Scenario 3: Phased Transition

A gradual implementation starting off with pilot programmes and specific property types before expanding to wider adoption would allow for refinement of processes and addressing of ethical concerns but might delay with the full benefits of the technology.

Summary/Conclusions

7.1 Key Research Outcomes/Recommendations

The research carried out in this project investigated the viability of consumer-grade LiDAR and photogrammetry using an iPhone 16 pro, The findings demonstrate that this technology offers a opportunity to address a critical stage in Ireland’s housing crisis.

- **Technical Validation:** Consumer-grade LiDAR technology achieved 99.25% measurement accuracy compared to traditional methods, with an average deviation of only $\pm 8.2\text{cm}$.
- **Significant Time Improvements:** The LiDAR approach reduced assessment time by 85% (from 4-6 hours to approximately 1 hour) and costs by 78-87% (from €5,700-11,000 to €700-1,450).
- **Implementation Framework:** This research established practical methodologies, workflows, and best practices that enable effective implementation of the technology.
- **Ethical Safeguards:** Comprehensive ethical guidelines and safeguards were developed to address privacy, community impact, professional disruption, and accessibility concerns.
- **Business Models:** Three viable implementation models—Government Partnership, Commercial Service, and Community Initiative—were identified and evaluated.

7.2 Recommendations

Based on the research conducted the following recommendations are proposed:

7.2.1 Hybrid Implementation Approach

Adopt a hybrid model that leverages the strengths of both consumer LiDAR technology and traditional assessment methods:

- Use LiDAR technology for initial rapid assessment, documentation, and measurement
- Collaborate with and engage traditional professionals for specialised evaluation of complex structural issues
- Develop collaborative workflows that maximise the effectiveness of both approaches

7.2.2 Implementation and Deployment Strategy

Implement the technology into a structured strategy:

1. **Pilot Phase** (0-6 months): Conduct pilot programmes with selected local authorities, focusing on small groups of properties (5-10) to refine processes
2. **Limited Deployment** (6-12 months): Expand to multiple local authorities and community housing organisations, with implementation on 50-100 properties
3. **Scale-Up** (12-24 months): Wider deployment across Ireland, potentially documenting 1,000+ properties annually

4. **Full Integration** (24+ months): Incorporation into standard property assessment workflows nationwide

7.2.3 Training and Upskilling

Develop training programmes to:

- Provide existing property professionals with LiDAR scanning and processing skills
- Create new roles focused on digital property documentation and assessment
- Enable community organisations to conduct basic property assessments independently

7.2.4 Technical Infrastructure Development

Establish necessary infrastructure to support widespread adoption:

- Create a centralised, secure repository for 3D property models like Sketchfab with appropriate access controls
- Develop standardised data formats and APIs for integration with existing systems
- Implement data governance frameworks that ensure privacy protection to comply with GDPR

7.2.5 Policy Support

Engage policymakers and relevant government bodies to:

- Recognise LiDAR-based assessments in relevant housing and planning regulations
- Develop incentives for property owners to participate in digital documentation initiatives

Conclusion

This research demonstrates that consumer-grade devices like the iPhone 16 pro have begun to cross a threshold of usefulness for professional property assessments. The dramatic improvement in time and cost savings create an opportunity to transform Ireland’s approach to derelict property assessment and, to address a key barrier in the housing crisis response. The use of this technology could be adopted to quickly and accurately document and assess thousands of properties across Ireland, paired with the Vacant Property Refurbishment Grant (Gov.ie, 2024) could quickly house hundreds if not thousands of families who are struggling in today’s market to find a home.

By developing an appropriate implementation strategy that balances both Business, Technical and Ethical considerations, this technology could seriously transform Ireland’s estimated 81,000 derelict properties.

We are at a point where consumer technology has matured enough to solve a significant challenge, with thoughtful implementation and planning, Ireland could be a leading country to adopt this technology and refurbish and renovate properties at a scale and pace that was previously impossible.

Counties with the highest rates of dereliction—Mayo (14.0%), Donegal (11.6%), and Galway (8.8%) according to GeoDirectory (2024)—could particularly benefit from this approach. These rural areas often face additional challenges including limited access to professional surveyors and greater distances between properties, making the efficiency gains of LiDAR technology even more significant. Combined with “Brain Drain” reversal and high immigration rates in the west of Ireland, higher government investment in these key derelict areas would solve other issues such as reliance on the greater Dublin area. (Kenny & Kennedy, 2018)

Listed below are all relevant references and links to supporting materials such as websites, reports, videos.

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[Property Assessment of Derelict Buildings in Ireland Using LiDAR and Photogrammetry](https://showcase.itcarlow.ie/it.html)

<https://showcase.itcarlow.ie/it.html>

Video Demo Walkthrough

<https://www.youtube.com/watch?v=PZ28iOW5xcA>