

**IMPLEMENTASI BIM, COMMON DATA ENVIRONMENT DAN
VISUALISASI 4D PADA PROYEK PEMBANGUNAN JEMBATAN
PENGHUBUNG PULAU KALIMANTAN – PULAU LAUT DALAM
MENDUKUNG TRANSFORMASI DIGITAL KONSTRUKSI**

LAPORAN TEKNIK

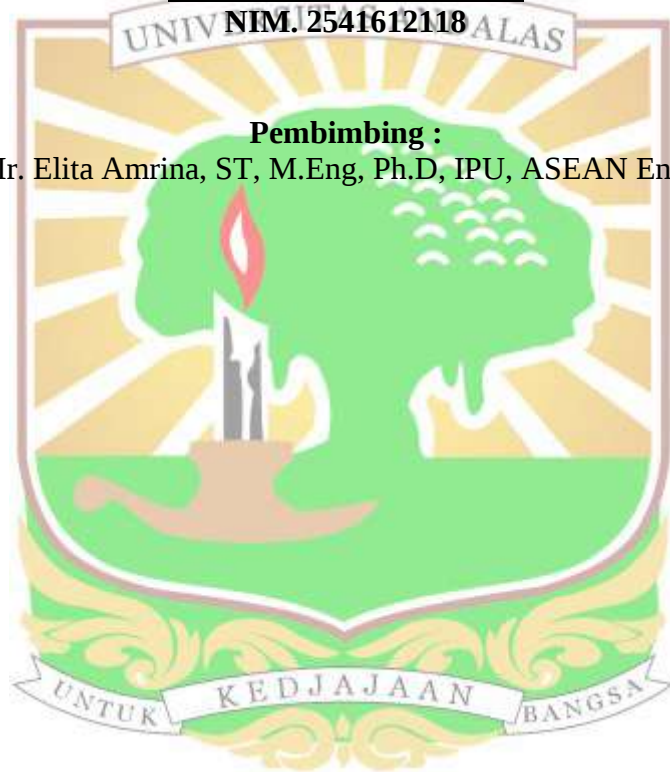
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**PROGRAM STUDI PENDIDIKAN PROFESI INSINYUR
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ABSTRAK

Proyek Pembangunan Jembatan Penghubung Pulau Kalimantan–Pulau Laut merupakan proyek infrastruktur jembatan laut sepanjang ± 1.000 meter dengan nilai investasi sebesar Rp2,9 triliun dan durasi pelaksanaan selama tiga tahun. Struktur utama jembatan dirancang menggunakan sistem cable stayed sepanjang 505,5 meter serta kombinasi box girder dan PCU girder sepanjang 547,25 meter. Kompleksitas teknis proyek semakin meningkat akibat penerapan skema multikontrak yang melibatkan tiga konsorsium kontraktor, yaitu PT PP (Persero) Tbk – PT Waskita Karya (Persero) Tbk – PT Batulicin Beton Aspal KSO, PT Hutama Karya (Persero) – PT Adhi Karya (Persero) Tbk – PT Waskita Karya (Persero) Tbk KSO, serta PT Nindya Karya (Persero) – PT Brantas Abipraya (Persero) KSO. Ketiga paket pekerjaan tersebut harus berkoordinasi secara intensif untuk memastikan keselarasan finish grade pada titik sambungan antar paket pekerjaan. Untuk mendukung proses koordinasi tersebut, proyek menerapkan ekosistem digital konstruksi yang terdiri atas Autodesk Revit untuk pemodelan Building Information Modelling (BIM), Autodesk Navisworks untuk clash detection, CDE PU sebagai platform Common Data Environment milik Kementerian Pekerjaan Umum, serta Synchro 4D untuk visualisasi dan monitoring konstruksi.

Penelitian ini menggunakan pendekatan kualitatif deskriptif-evaluatif dengan strategi studi kasus. Data penelitian dikumpulkan melalui observasi partisipatif, studi dokumen, dan evaluasi model BIM yang diterapkan pada proyek. Hasil penelitian menunjukkan bahwa implementasi BIM menggunakan Autodesk Revit berhasil menghasilkan federated model multidisiplin yang menjadi dasar koordinasi desain terpadu antar pemangku kepentingan proyek. Pemanfaatan Autodesk Navisworks dalam proses clash detection, termasuk koordinasi lintas paket pekerjaan untuk memastikan keselarasan finish grade, mampu mengidentifikasi dan menyelesaikan konflik geometris sebelum tahap konstruksi sehingga mengurangi potensi rework yang bernilai tinggi pada lingkungan konstruksi laut. Selain itu, penerapan CDE PU berhasil mewujudkan prinsip Single Source of Truth (SSOT) melalui digital approval workflow yang mempercepat proses persetujuan dokumen sekaligus mengurangi penggunaan dokumen fisik dan kebutuhan perjalanan untuk proses penandatanganan. Sementara itu, penggunaan Synchro 4D memungkinkan visualisasi progres konstruksi aktual terhadap rencana secara lebih informatif serta mendukung pemantauan status pengadaan material secara real-time.

Analisis Cost Benefit menunjukkan bahwa investasi pada ekosistem digital konstruksi memberikan manfaat ekonomis yang signifikan dalam bentuk cost avoidance, terutama melalui pengurangan rework hasil clash detection, efisiensi administrasi dokumen melalui CDE PU, serta peningkatan akurasi monitoring dan pengendalian proyek melalui Synchro 4D. Penelitian ini memberikan kontribusi terhadap pengembangan literatur implementasi BIM pada proyek infrastruktur jembatan di Indonesia, khususnya terkait koordinasi multikontrak dan pemanfaatan platform Common Data Environment berbasis pemerintah.

Kata Kunci: Building Information Modelling, Common Data Environment, CDE PU, Autodesk Navisworks, Clash Detection, Synchro 4D, Jembatan Cable Stayed, Cost Benefit Analysis, Transformasi Digital Konstruksi, Koordinasi Multikontrak

ABSTRACT

The Kalimantan–Pulau Laut Connecting Bridge Construction Project is a marine bridge infrastructure project with an approximate length of 1,000 meters, an investment value of IDR 2.9 trillion, and a construction duration of three years. The bridge was designed using a cable-stayed system spanning 505.5 meters, combined with box girder and PCU girder structures spanning 547.25 meters. The project's technical complexity was further intensified by a multi-contract scheme involving three contractor consortiums, namely PT PP (Persero) Tbk – PT Waskita Karya (Persero) Tbk – PT Batulicin Beton Aspal Joint Operation, PT Hutama Karya (Persero) – PT Adhi Karya (Persero) Tbk – PT Waskita Karya (Persero) Tbk Joint Operation, and PT Nindya Karya (Persero) – PT Brantas Abipraya (Persero) Joint Operation. These consortiums were required to maintain intensive coordination to ensure finish grade alignment at the interface points between contract packages. To address these challenges, the project implemented a digital construction ecosystem consisting of Autodesk Revit for Building Information Modelling (BIM), Autodesk Navisworks for clash detection, CDE PU as the Common Data Environment platform developed by the Ministry of Public Works of Indonesia, and Synchro 4D for construction visualization and monitoring.

This study employed a qualitative descriptive-evaluative approach using a case study strategy. Research data were collected through participatory observation, document review, and BIM model evaluation conducted throughout the project implementation. The findings indicate that the implementation of BIM using Autodesk Revit successfully produced a multidisciplinary federated model that served as the basis for integrated design coordination among project stakeholders. The utilization of Autodesk Navisworks for clash detection, including cross-package coordination to ensure finish grade alignment, successfully identified and resolved geometric conflicts prior to construction, thereby minimizing the potential for costly rework in the marine construction environment. Furthermore, the implementation of CDE PU successfully established the Single Source of Truth (SSOT) principle through a digital approval workflow that accelerated document approval cycles while reducing paper usage and eliminating the need for physical travel for document signing. Meanwhile, the use of Synchro 4D enabled more informative visualization of actual versus planned construction progress and supported real-time monitoring of material procurement status.

The Cost Benefit Analysis demonstrates that investment in the digital construction ecosystem generated significant economic benefits in the form of cost avoidance, particularly through reduced rework resulting from clash detection, improved document administration efficiency through CDE PU, and enhanced project monitoring and control accuracy through Synchro 4D. This study contributes to the growing body of literature on BIM implementation in bridge infrastructure projects in Indonesia, particularly in relation to multi-contract coordination and the utilization of government-based Common Data Environment platforms.

Keywords: *Building Information Modelling, Common Data Environment, CDE PU, Autodesk Navisworks, Clash Detection, Synchro 4D, Cable-Stayed Bridge, Cost Benefit Analysis, Digital Construction Transformation, Multi-Contract Coordination.*