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Creating a Robust Data Architecture to Support Business Intelligence

(Or, "How we accidentally discovered MDM & SOA")

Matthew March VP Corporate Systems/Business Intelligence Impac Mortgage Holdings



About the Company

Impac Mortgage Holdings, Inc., through its subsidiaries, operates as a mortgage real estate investment trust (REIT) in the United States. The company acquires, originates, sells, and securitizes various mortgages. The company's operations include long-term investment, mortgage, commercial, and warehouse lending.



Impac Mortgage Holdings, Inc. Irvine, California

Key Business Drivers

- SOX Compliance
- The right people did not have access to the right information at the right time
- Company generates a tremendous amount of data
 - 7 Subsidiaries
 - 33 Vendor Internal/External Applications/Systems
 - 4 Internally Developed Applications
 - 40+ Data Sources
- Existing data integration, management and reporting solutions were inadequate
- Time to market for integration of new data and delivery of information was lengthy

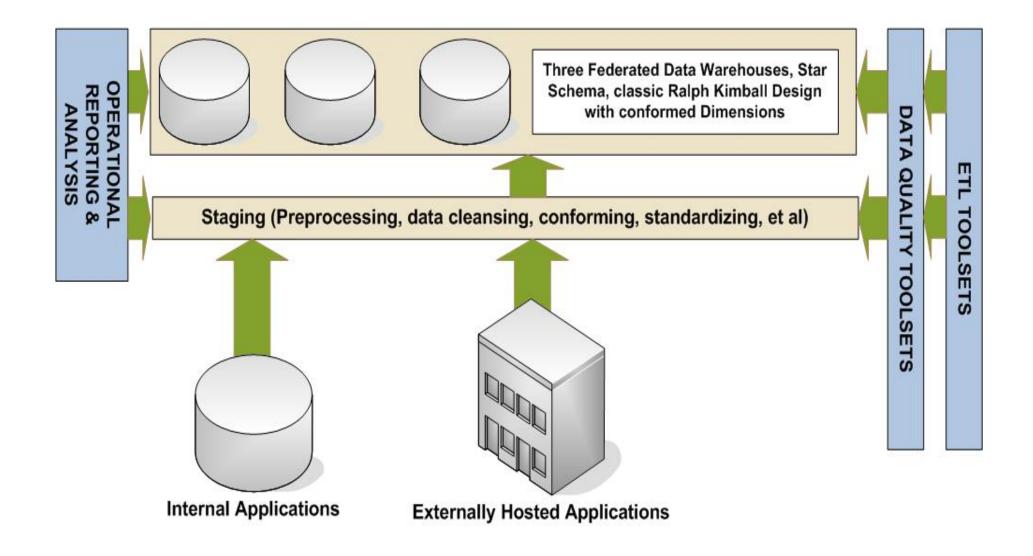


Scope of Initial Solution and 2005 Deliverables

- Focus was on BI, Reporting & ETL
- RFP and selection of technology including:
 - Hardware
 - Database
 - ETL software
 - Statistical Analytics Software
 - BI Software (Reporting, scorecards/dashboards)
- Staffing Mix of vendor resources, existing internal resources and new hires
- Define design methodology, standards and guidelines
- Implementation of hardware, database and software in clustered, failover, redundant solution, including DR
- Rewrite of ETL processes for existing legacy operational data store
- Delivery of three new data warehouses in federated design
- Review, verification, consolidation and migration of existing reports
- Training and deployment program



Logical Architecture – EOY 2005



Benefits

- Satisfied immediate SOX requirements
- No audit findings for 2005
- Improved data quality and process reliability within BI Platform
- Retirement of legacy ETL and Reporting Platforms
- Solid foundation for delivery future enhancements & value

Challenges

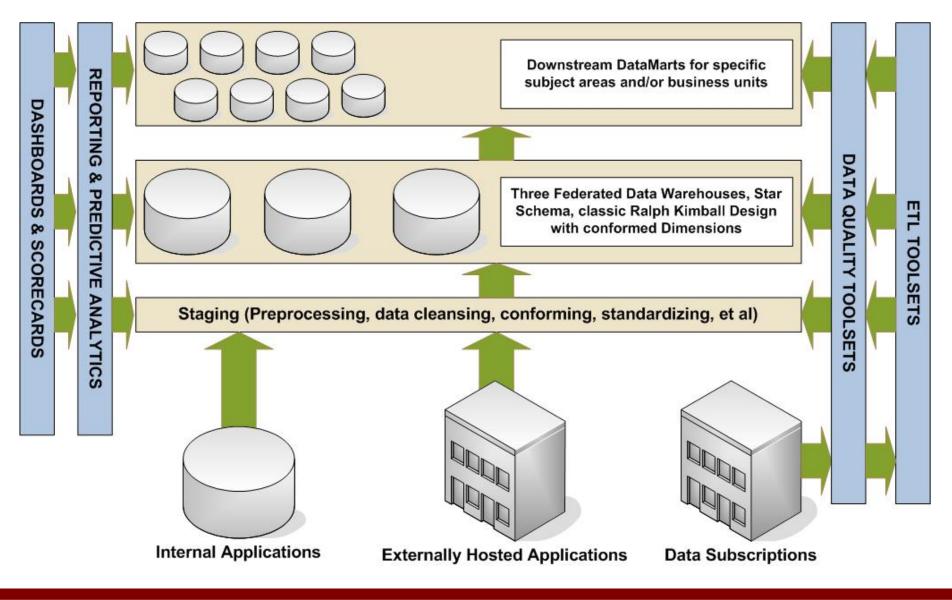
- Vision was very tactical
- Source data quality issues still existed
- System integration issues still existed
- Requests to feed OLTP systems from Data Warehouse Data with critical conformed data, such as Borrower
- Governance & Data Management still at infancy

Key 2006 Deliverables

- Delivery of Dashboards and Scorecards
- Integration of external, third-party data such as
 - Loan Performance
 - Economy.com
 - CoreLogic
 - Fair Isaacs
 - Interthinx
 - Geo-spatial & demographic data
 - Market indices
- Life of a Loan analysis across federated data warehouses
- Introduction of Statistical Models and Forecasting
- Automation of existing manual stove-pipe reporting processes across departments and business units
- Formal launch of Master Data Management



Logical Architecture – EOY 2006



Benefits

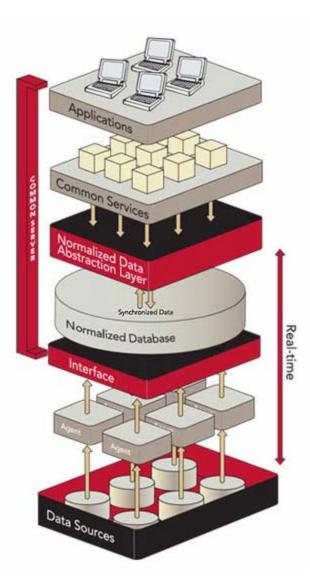
- Introduction of Hub data architecture to support improved system and data integration
- Improved Governance & Data Management
- Faster time to market for information and integration projects
- Integration of external data subscriptions
- Life of a Loan Analysis
- Statistical Analysis & Predictive Analytics

Challenges

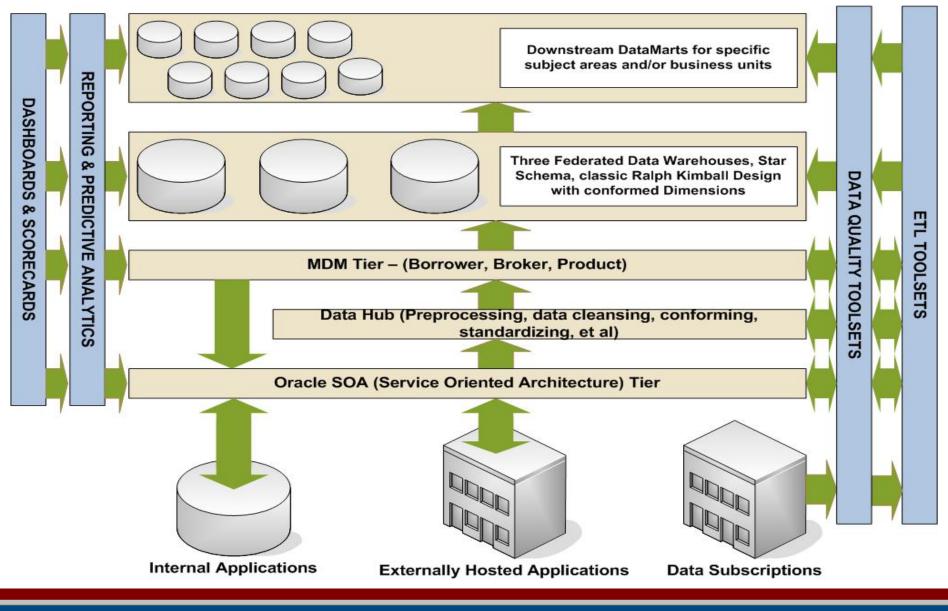
- No consolidated view of a Borrower, Broker or Product (Loan Programs) across disparate applications and external market data
- Data Quality between source systems
- Timely correction of data quality within source systems
- Lack of workflow/messaging platform between systems/processes

Key 2007 Deliverables

- 2007 Delivery of Master Data Management Tier & Service Oriented Architecture framework to retrofit EDI/EII across the enterprise
- Business Activity Monitoring in near real-time between key systems and introduction of decision support workflow, event driven activity and alerting
- Improved data quality between applications and closed-loop processing/data validation between systems
- Successful integration of new systems, applications and data through M&A activities



Logical Architecture – EOY 2007



Benefits

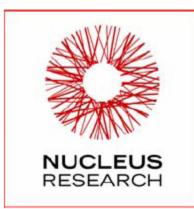
- Mature data-driven organization with effective data management, governance and stewardship
- Single source of Borrower, Broker and Product information in a publish/subscribe model
- Data Quality improved across the enterprise and data quality issues identified and users notified in near-real time
- Major Merger/Acquisition well-executed using new framework

Challenges

- New technology & methodology
- Changes to scope/architecture over three years resulted in re-work and additional time/expense
- Cost Benefit Analysis & Budget/Project Approval

ROI Study Results







FINANCIAL ANALYSIS	Year 1	Year 2	Year 3
Net cash flow before taxes	2,442,970	5,206,670	5,036,670
Net cash flow after taxes	1,335,885	2,717,735	2,632,735
Annual ROI - direct and indirect benefits			165%
Annual ROI - direct benefits only			10%
Net present value (NPV)			3,599,819
Payback (years)			1.00
Average annual cost of ownership			1,187,986
3-year IRR			126%

Architecture - Hardware

- HP Itanium Blade Server Technology for Database and Application Servers
- Operating Systems HP-UX and Windows 2003
- Development, Test, Stage and Production Environments
- Production designed as clustered, fail-over, redundant
- Architecture included "hot" disaster recovery solution



Architecture - Software

- Database Oracle 10g R2
- ETL Software Business Objects Data Integrator
- SOA Platform Oracle Fusion Middleware, BPEL
- Business Intelligence Software Business Objects XI R2 Enterprise
 - Web Intelligence
 - Dashboard Manager
 - Set Analysis
 - XCelsius
 - Knowledge Accelerator
- Statistical Analysis SAS
- Data Cleansing FirstLogic

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Metric Name ALT-A	Q1 06 \$99,700,670	Q2 06 \$101,775,044	\$108,808,349	\$165,991,298	\$180,000,000	ALT-A	
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ALT-A ALT-A Owner Occupied ALT-A 2nd Home ALT-A Non-Owner Occupied ALT-A ARM ALT-A ARM I/O ALT-A FIXED	Q1 06 \$99,700,670 \$84,177,265 \$1,003,769 \$14,519,636 \$8,202,334 \$40,011,911 \$40,860,672	Q2 06 \$101,775,044 \$86,219,613 \$1,053,586 \$14,501,844 \$7,843,446 \$40,474,483 \$41,516,675	\$108,808,349 \$92,519,624 \$1,130,388 \$15,158,337 \$7,827,763 \$43,993,824 \$43,448,661	\$165,991,298 \$141,959,220 \$1,805,912 \$22,226,166 \$11,434,918 \$73,832,905 \$60,646,411	\$160,000,000 \$140,000,000 \$120,000,000 \$100,000,000 \$80,000,000	ALT-A	
ALT-A ALT-A Owner Occupied ALT-A 2nd Home ALT-A Non-Owner Occupied ALT-A ARM IIO ALT-A ARM IIO ALT-A FIXED ALT-A FIXED IIO	Q1 06 \$99,700,670 \$84,177,265 \$1,003,769 \$14,519,636 \$8,202,334 \$40,011,911 \$40,850,672 \$10,625,763	Q2 06 \$101,775,044 \$86,219,613 \$1,053,586 \$14,501,844 \$7,843,446 \$40,474,483 \$41,516,675 \$11,940,439	\$108,808,349 \$92,519,624 \$1,130,388 \$15,158,337 \$7,827,763 \$43,993,624 \$43,448,661 \$13,538,302	\$165,991,298 \$141,959,220 \$1,805,912 \$22,226,166 \$11,434,918 \$73,632,905 \$50,646,411 \$20,277,064	\$160,000,000 \$140,000,000 \$120,000,000 \$100,000,000		
ALT-A ALT-A Owner Occupied ALT-A Dono-Waver Occupied ALT-A Non-Owner Occupied ALT-A ARM I/O ALT-A ARM I/O ALT-A FIXED I/O Sub-Prime Sub-Prime Sub-Prime	Q1 06 \$99,700,670 \$14,177,265 \$1,003,769 \$14,519,636 \$8,202,334 \$40,011,911 \$40,860,672 \$10,625,753 \$141,761,268	Q2 06 \$101,775,044 \$06,219,613 \$1,053,586 \$14,501,844 \$7,843,446 \$40,474,483 \$41,516,675 \$11,940,439 \$132,185,548	\$108,808,349 \$92,519,624 \$1,130,388 \$15,158,337 \$7,827,763 \$43,448,661 \$13,558,302 \$126,099,714	\$165,991,298 \$141,959,220 \$1,805,912 \$22,226,166 \$11,434,918 \$73,632,905 \$60,646,411 \$20,277,064 \$163,344,142	\$160,000,000 \$140,000,000 \$120,000,000 \$100,000,000 \$80,000,000	ALT-A	
ALT-A ALT-A Zowner Occupied ALT-A Znd Home ALT-A ARM ALT-A ARM ALT-A ARM I/O ALT-A FIXED ALT-A FIXED ALT-A FIXED I/O Sub-Prime Owner Occupied Sub-Prime Owner Occupied Sub-Prime Owner Occupied	Q1 06 \$99,700,670 \$84,177,265 \$1,003,769 \$14,519,536 \$8,202,334 \$40,011,911 \$40,060,672 \$10,625,753 \$141,761,208 \$141,761,208 \$145,506,664 \$460,015	Q2 06 \$101,775,044 \$86,219,613 \$1,053,586 \$14,501,844 \$7,843,446 \$40,474,483 \$41,516,675 \$11,940,439 \$132,185,548 \$126,018,224	\$108,808,349 \$92,519,624 \$1,130,388 \$15,158,337 \$7,827,763 \$43,440,661 \$13,538,302 \$126,099,714 \$120,270,520	\$165,991,298 \$141,959,220 \$1,805,912 \$22,226,166 \$11,434,918 \$73,632,905 \$60,646,411 \$20,277,064 \$163,344,142 \$156,069,757	\$160,000,000 \$140,000,000 \$120,000,000 \$100,000,000 \$80,000,000		
ALT-A ALT-A Zowner Occupied ALT-A Zond Home ALT-A Non-Owner Occupied ALT-A RAM I/O ALT-A RAM I/O ALT-A RIXED I/O Sub-Prime Sub-Prime Sub-Prime South-Prime Zond Home Sub-Prime Zond Home	Q1 06 \$99,700,670 \$84,177,265 \$1,003,769 \$14,519,536 \$8,202,334 \$40,011,911 \$40,060,672 \$10,625,753 \$141,761,208 \$141,761,208 \$145,506,664 \$460,015	Q2 06 \$101,775,044 \$06,219,613 \$1,053,586 \$14,501,844 \$7,843,446 \$40,474,463 \$40,474,463 \$41,516,675 \$11,940,439 \$132,185,548 \$126,016,224 \$428,785	\$108,808,349 \$92,519,624 \$1,130,388 \$15,158,337 \$7,827,763 \$43,993,624 \$43,448,661 \$13,538,302 \$126,099,714 \$120,270,520 \$436,210	\$165,991,298 \$141,959,220 \$1,105,912 \$22,226,166 \$11,434,918 \$75,632,905 \$500,464,411 \$20,277,064 \$150,344,142 \$156,669,757 \$566,897	\$160,000,000 \$140,000,000 \$120,000,000 \$100,000,000 \$80,000,000		
ALT-A ALT-A Owner Occupied ALT-A Annee ALT-A Annee ALT-A ARM ALT-A ARM I/O ALT-A FIXED ALT-A FIXED ALT-A FIXED I/O Sub-Prime	Q106 \$99,700,670 \$84,177,265 \$1,003,769 \$14,519,636 \$8,202,314 \$40,060,011,311 \$40,860,672 \$10,625,753 \$141,761,208 \$135,660,664 \$460,015 \$6,240,600	Q2 06 \$101,775,044 \$06,219,613 \$1,055,586 \$14,501,844 \$40,474,483 \$41,516,675 \$11,940,439 \$132,185,548 \$12,6016,224 \$428,785 \$5,738,540	\$108,808,349 \$92,519,624 \$1,130,388 \$15,158,337 \$7,827,763 \$43,993,624 \$43,440,661 \$13,538,302 \$120,270,520 \$430,421,651 \$120,270,520 \$430,210	\$145,091,298 \$141,939,220 \$1,05,912 \$22,226,166 \$11,434,918 \$73,632,905 \$60,646,411 \$20,277,064 \$163,344,142 \$166,069,757 \$566,837 \$566,837	\$160,000,000 \$140,000,000 \$120,000,000 \$100,000,000 \$80,000,000		
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Architecture – Staffing/Resource Model

- 2005 12 Resources (6 FTE, 6 Contract)
- 2006 6 Resources (6 FTE)
- 2007 8 Resources (5 FTE, 3 Offshore)
 - New hires
 - Existing internal FTE's
 - Vendor Resources Oracle, HP, Microsoft and Business Objects
 - Professional Services Oracle, Business Objects
 - Offshore Resources

Architecture – Competency Centers

<u>Technical Design Governance</u>

- IT VP Business Intelligence
- Senior Internal Technical Staff
- Vendor/Industry Experts

Data Governance Committee

- Executive Sponsor
- Co-Chairpersons (Business / IT)
- Legal Department
- Business Experts
- IT Technical Staff



Architecture (40+ Data Sources)

Internal Systems/Applications

- Automated Underwriting System
- Loan Origination Application
- Loan Servicing System
- Warehouse Lending Platform
- Telephony applications
- Financial Applications
- Etc...

Externally hosted Systems/Applications

- Loan Servicing Partners
- CoreLogic
- Interthinx
- MERS
- Salesforce.com
- Etc...

External data subscriptions

- Loan Performance
- Economy.com
- GeoSpatial Data
- Market Indices
- Fair Isaacs
- Etc...

Refresh Frequencies

- Real-Time
- Near Real-Time
- Hourly
- Nightly Batch
- Monthly
- Quarterly
- Annually

Other Key Considerations

- Design Methodology
- Governance
- Program/Project Management
- Data Quality
- Information Security
- Reliability of Solution
- Operational Support
- On-going Life Cycle Management
- Migration Path
- Deployment Strategy and Training
- Documentation
- Marketing



What would we have done different?

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- Implemented MDM/SOA before design, development and implementation of the Enterprise Data Warehouse and Business Intelligence Solutions
- Explored other MDM Software Vendors
- Engaged MDM SME/Consultancy for design, best practice and milestone reviews

Additional Information

Business Objects Case Study

http://www.businessobjects.com/company/customers/spotlight/impac.asp

Nucleus Research ROI Study

http://www.businessobjects.com/pdf/company/h20_business_objects_roi_case_stud y_-_impac_funding.pdf