

The GE Compliance Checker:

A Generic Tool for Assessing Mortgage Loan Resale Requirements

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Application domain : Mortgage banking

Abstract

This paper describes the GE Compliance Checker [GECCO], a knowledge-based application for use in the home mortgage industry. GECCO is a tool for automating the information-intensive processes of underwriting and reselling mortgage loans. GECCO was initially designed and deployed for one business component of GE Capital Mortgage Corporation [GECMC], and then successfully integrated into three other GECMC businesses. Its first application was for third-party underwriting. This was followed by the use of GECCO in wholesale pricing and registration, and in direct loan origination. Most recently, GECCO has evolved into a commercial product offered for purchase to mortgage lenders.

GECCO has significantly improved the underwriting and resale process: quality control has become much more effective, adding consistency, completeness and robustness to the decision making process; the quantity of loans processed has increased; customer service has been enhanced; and a once "subjective" process has now been standardized. The successful use of AI has also permeated GECMC business application software to the extent that AI has become a requirement rather than a remote technology used in an isolated application.

Background

GE Capital Mortgage Corporation is a leader in the home mortgage banking industry, with substantial market share

in mortgage insurance (ranked #1 in 1994 among private companies with volume of \$37 billion), and mortgage servicing (#2 with \$94 billion 1994 volume) (ref. [SynerGE95]), and is also a leading issuer of mortgage-backed securities. A new GECMC business initiative was launched in 1989 with the creation of GE Mortgage Management Systems [GEMMS], to provide third-party processing and underwriting services to mortgage lenders. The GE Compliance Checker, a knowledge-based application was initially designed for use in GEMMS as a tool for automating the information-intensive process of underwriting mortgage loans according to investor guidelines.

The field of loan underwriting has proven fertile ground for the application of AI technology for mortgage funding and for mortgage insurance. (See, for example, [Golibersuch95] and [Talebzadeh 94]). The GECCO project differs from previous efforts by focusing on checking compliance with the investor and lender guidelines which control *resale of mortgage loans* in the secondary market.

Business Context: Mortgage Banking

It would serve to establish the business context of the GECCO tool by starting with an overview of the mortgage banking business and an itemization of the steps involved in the mortgage loan processing pipeline:

1. *Loan origination* : application by the borrower for a mortgage loan from a lender

2. *Registration*: Creation of a file for the loan in the processing pipeline
3. *Processing* : gathering and validation of loan documents required to complete the loan
4. *Underwriting* : assessment of risk incurred by the lender through evaluation of subject property, and of factors which determine the borrower's ability and willingness to repay.
5. *Mortgage insurance [MI]* : mandatory insurance purchased by the borrower to protect the lender against loss in the event of default by the borrower. *MI* is usually required when the borrower is infusing less than 20% of the loan amount into the transaction.
6. *Closing* : signing and recording of loan documents and transfer of mortgage funds
7. *Servicing* : Collecting the monthly mortgage, along with taxes, insurance and other escrows.
8. *Pricing/Repurchasing* : Sale of the loan from the originating lender to a mortgage investor. The two dominant *agencies* in the secondary market for conventional mortgages are Fannie Mae (Federal National Mortgage Association) and Freddie Mac (Federal Home Loan Mortgage Corporation). Mortgages which fall outside of agency eligibility guidelines may be sold to private investors, who would have their own purchase criteria.
9. *Packaging and Contract Servicing* : Collection of investment-grade loans into pools for issue on Wall Street in the form of mortgage-backed securities.

A discussion of mortgage banking terminology is useful to explain the function served by GECCO. It is necessary to understand the use of terms in this paper for the following: loan underwriting, investor guidelines, and lender compliance. Fannie Mae gives the term *investment-quality* to a mortgage when (1) the borrower's ability and willingness to pay the loan has been established and (2) the market value of the subject property provides sufficient collateral to secure the loan. The borrower's ability to repay the loan is based on income, employment history, assets, liabilities and source of funds. Willingness to repay the loan is based on credit history, separated into examination of mortgage/rent and revolving/installment accounts. The appraisal of the property is based on evaluation of comparable properties, market trends for the neighborhood, and the property size and condition.

Fannie Mae, like other mortgage bankers, provides sets of guidelines which specify the criteria by which a loan can be judged to be investment-quality. A *guideline* may be thought of as a collection of business rules that evaluate the various pieces of applicant and property information. A mortgage loan application which does not violate any aspect of the investor's guideline is said to be *in compliance*, and may be underwritten by the mortgage lender with confidence that the investor (e.g., Fannie Mae, Freddie Mac) will buy the loan.

Investor guidelines are typically extensive and are updated frequently (often quarterly) to adjust to changing housing market conditions. The size and volatility of a guideline is compounded by the fact that many points are open to the underwriter's interpretation. Certain loan application parameters are rigidly set by a guideline, such as dwelling type (single-family, duplex, condo, etc.), LTV (loan-to-value) limit, occupancy type (primary or second home, or investment property), and mortgage type (purchase, refinance, cash out refinance). Consideration of the large remainder of factors however, is flexible. As an example of a soft factor, Fannie Mae's guideline for the applicant's housing debt to income ratio is 28%, yet "we also recognize that some circumstances may justify your exceeding this ratio. If you use a higher ratio, you need to fully document the compensating factors you feel justify your doing so." Several examples of such factors are also provided to the underwriter.¹

The underlying notion of salability of a loan is crucial to the underwriter's determination that the loan is in or out of compliance with the rules set forth in the investor guidelines. A typical mortgage lender relies heavily on investor capital in order to maintain a profitable and sizable portfolio of loans. If the loan does not meet investor guidelines, the lender must decide whether to fit the borrower into another type of loan program, add the loan to the "in-house" portfolio, or turn away the borrower's business. Strict interpretation of a guideline could result in denial to underwrite a loan which the investor would in fact have purchased (and, more importantly, loss of business), while a less cautious interpretation can result in funding a loan that cannot be sold and must remain in the lender's portfolio.

Project Description

GECCO / Third-party underwriting

The original inception of GECCO was within the third-party underwriting and processing facility at GE Mortgage Management Systems [GEMMS], a part of

¹[FNM93, p.27]

GECMC. GEMMS offered a unique business concept in providing the service of loan underwriting to mortgage lenders. Rather than having to maintain a full staff of underwriters to process loans, a lender could contract with GEMMS to process and underwrite the lender-originated loans. This arrangement would permit lenders to handle the resource strain of a peak market. A problem with the feasibility of this concept was that each lender had their own investment guidelines against which loans were to be underwritten. After servicing two or three lenders, it became clear that not even a superhuman underwriter would be able to keep up with the customized, voluminous and often-updated investor guidelines from several lenders at once. Out of necessity came the idea to build an automated compliance checker that could manage the information overload of a large number of investor guidelines for the GEMMS underwriters.

GECCO is embedded in the GEMMS loan registration and processing system, a client/server application which uses a GUI to capture the loan application data elements and stores the information in a relational database [Figure 1]. The underwriter can invoke GECCO at any point in loan processing and may rerun on the same loan at different stages in the pipeline

as new information is entered. GECCO reports a status of either *in compliance* or *out of compliance* and provides explanatory messages when the latter is the case. The messages are divided into two classes - fatals and warnings - to distinguish between hard and soft guideline constraints.

Prior method of operation

Manual compliance checking for loan underwriting is generally a tedious, time-consuming and information-intensive process. Prior to development of GECCO, the compliance checking process was performed manually at GEMMS. The manual process involved checking compliance of a loan application file by thumbing through a bookshelf of documents that specify the details of the investor guideline for the relevant loan program. On average, this process took between thirty minutes to an hour, depending on complexity of the loan.

A rule-based approach was adopted as a natural way of modeling the manual process of guideline compliance checking, based on identifying the specific guideline eligibility constraints which apply to a given loan.

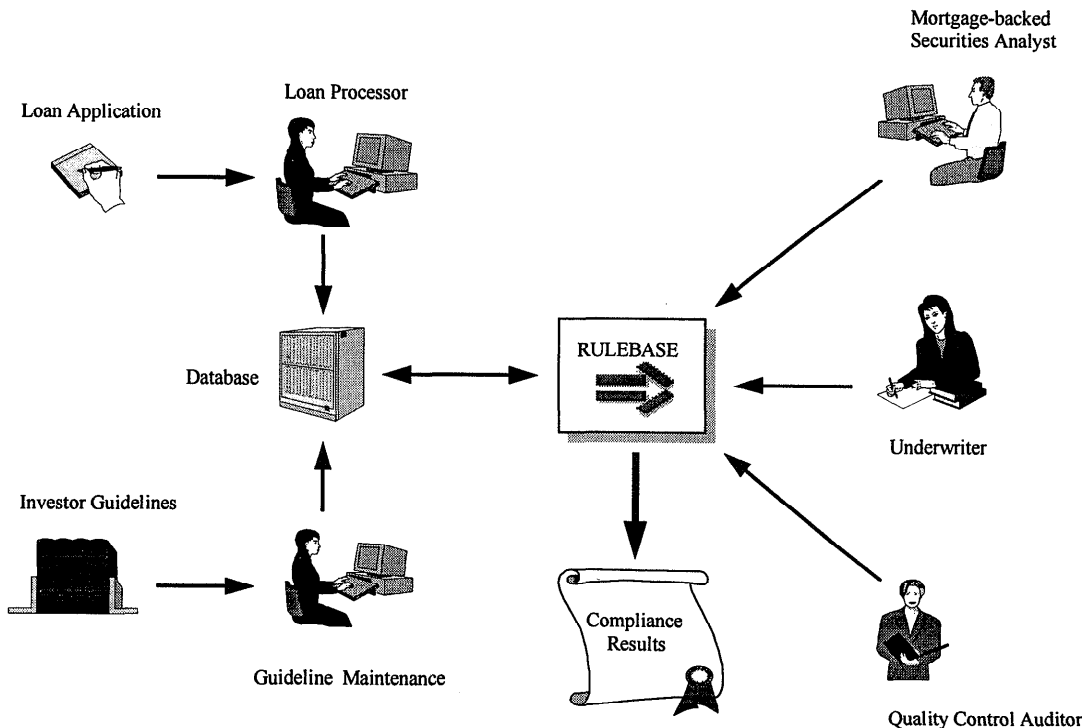


Figure 1 : Compliance Checker Process Overview

Objectives and Benefits of the GE Compliance Checker

Several objectives were identified for the GECCO application within the initial third-party GEMMS application. These included:

- *Provide a flexible investor guideline modeling tool* - The initial objective of GECCO was to make it possible to underwrite a loan for any mortgage lender subject to eligibility criteria of any investor guideline. This was achieved through an architecture for flexible modeling of an unlimited number of guidelines. The third-party underwriter deployment of GECCO contains over 170 investor guidelines for 70 mortgage lenders.
- *Improve quality of the underwriting process* -- Underwriters tend to look for middle ground within the more flexible aspects of an investor guideline, offsetting a potentially unacceptable factor with other mitigating factors. The goal of GECCO was to provide consistency to the underwriting process, by standardizing both the process of applying the guideline constraints to loan applications as well as the content of the compliance warning messages.
- *Gain a performance benefit* -- Raise business volume and shorten turn-around time by reducing the time required to process and underwrite a loan. GECCO runtime of under 30 seconds is a significant time savings compared with the 30-60 minute manual compliance checking process.
- *Provide a remedial course of action* -- GECCO gives an explanation of which guideline rules are being violated, and provides suggestions of what action must be taken to correct a variance.
- *Tracking and monitoring capability* -- GECCO provides an audit trail for underwriting, and keeps track of documents required by lenders for closing the loan. This information management reduces the burden of knowledge placed on the analyst.

Versatility of the Application

The early success of GECCO for third-party underwriting raised awareness of other ways in which the rule-based application could be applied to other GECMC businesses in which the questions "Should we buy these loans?" or "Can we sell this loan?" are central to the process.

Several of the possibilities identified for GECCO reuse were:

- *Secondary market wholesale pricing:* Batch process a pool of loans to filter out non-compliant loans prior to purchase for repackaging in a mortgage-backed security investment instrument. This filtering process determines that each loan that has already been closed does in fact meet the guidelines of an investor to whom the loan is to be sold. Should a loan fail to comply with investor guidelines at this point, the lender must keep the loan until it is seasoned (i.e., hold and service the loan for a period of time until salable under a different guideline). Each lender may have a customized contract with Fannie Mae and/or Freddie Mac. In addition, lenders have their own group of investors who provide the base of working capital for the lender's home mortgage portfolio.
- *Point of sale/prequalification:* At this point in the loan application process, the borrower is volunteering data about employment, assets, liabilities and credit history. Though the information has yet to be verified, it is still useful for a lender at a point-of-sale branch of a mortgage company to run GECCO as an early screening mechanism for fitting the applicant into the best available loan program for which he or she qualifies.
- *Loan processing and closing:* Assist the underwriter to determine and track receipt of the documents required for closing, and to grant conditional approval subject to satisfactory resolution of any pending requirements.
- *Quality assurance:* The quality auditing department can pull a representative sample of loans from the portfolio to measure the underwriter judgments against the known outcome of the loan. Used in this manner, GECCO can alert an underwriting staff to an undesirable trend if for example loans of a particular type (e.g., condominiums in California) are being rejected by a lender's investors, contrary to what the underwriters had interpreted to comply with investor eligibility guidelines.
- *Portfolio generation:* Run GECCO on pools of loans to automatically build custom portfolios directly for GECMC investors, given a description of the eligibility criteria (e.g., want to buy fixed-rate loans for single-family detached homes in North Carolina).

From the above list of candidate applications for GECCO reuse, the following have been implemented:

GECCO / Wholesale Pricing

A partitioning of the existing GECCO knowledge base was made to facilitate a need for integration of compliance checking capability into the Wholesale Pricing and Registration [WHOPR] project at GE Mortgage Services[GECMSI], a subsidiary of GE Capital Mortgage Corporation. The WHOPR project purpose was to build a rule-based system that would conditionally apply a variety of price adjustment factors to loans delivered to GECMSI for purchase from originating lenders. Determination of compliance with GECMSI resale guidelines was a precondition for loan purchase. The pricing rules would determine the purchase price of a loan once it had passed the compliance check.

The GECCO rules were accordingly divided into checks for lender compliance, used by GEMMS third-party processing, checks for wholesale pricing, and a group of core checks used in both businesses.

GECCO / Loan Processing and Closing

The Closing project was the GEMMS follow-on to third-party processing. The primary focus for GECCO in this effort was to expand the processing capabilities with specific functionality needed for delivery of loans to "the closing table." This functionality was achieved with the addition of two new GECCO rule sets: the special conditions rules and the required documents rules.

Often the lender will issue conditional approval for a loan with the understanding that all required documents are forthcoming and that certain special conditions are to be satisfied. Special conditions are extra procedures that may be placed on a loan by the lender guidelines (e.g., self-employed borrowers must complete a Fannie Mae form for self-employed, and must provide proof of income for the past two years). A loan may be in compliance subject to special conditions which have been attached automatically by GECCO.

The required documents rules generate a list of all documents needed for closing as specified by lender and investor guidelines, and keep track of which documents are still outstanding. Examples of these documents are : credit reports, paystubs, proof of flood insurance if the subject property is in a flood zone, or a special form for energy-efficient dwellings in the state of New Mexico. As the required documents are received and entered into the electronic loan file, the GECCO rules are fired to validate the information, and to give notification of discrepancies

between information from the documents and from borrower declarations.

GECCO / GENIUS™

The PC GENIUS™ project combines the compliance checking functionality with a risk evaluation tool which had been previously developed for internal use at GECMC for mortgage insurance underwriting (See [Golibersuch95]). The merged functionality of the rule-based investor guideline eligibility checker with the evidential-reasoning based model of risk assessment is now available as a commercial product to mortgage lenders.

GECCO Functional Description

GECCO is integrated into a loan entry and processing system, which consists of a GUI component for capturing and updating the loan information and a client/server relational database for efficient data storage. When an underwriter or loan processing agent invokes GECCO, the following process takes place:

1. Retrieval of the relevant data elements for the loan application into structured objects.
2. Retrieval of the investor guideline information for the corresponding loan program (e.g., 15-year fixed rate) into structured objects.
3. Activation of the appropriate GECCO rule sets, controlled via command line arguments passed to GECCO from the GUI.
4. Agenda-driven rule processing of the loan and guideline data.
5. Results are posted to the GECCO output screen [Figure 2] and to the database.

The guideline information is input initially by a designated GECMC guidelines administrator whose job is to ensure that the GECCO knowledge base is kept current with new guidelines and guideline updates as they are released by investors. A graphical guideline editor screen facilitates this process of defining and modifying guideline information.

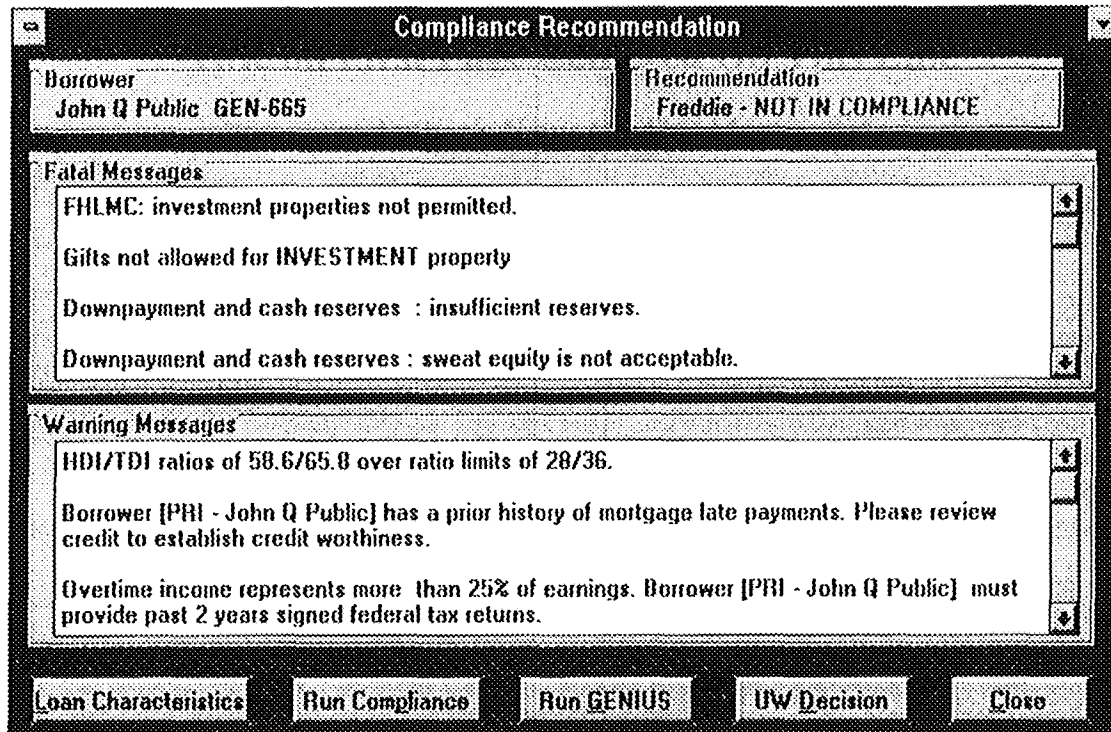


Figure 2 : Compliance Output Screen

The GECCO rulebase contains rules for the following categories of salability checks:

- ARM restrictions
- Bankruptcy / foreclosure procedures
- Downpayment / cash reserve requirements
- Loan amount limits
- Limits on seller contributions
- Cashout refinance restrictions
- Appraisal requirements
- Non-base income limits
- LTV limits
- Employment-related checks
- Limits on gifted funds
- Qualifying ratios
- Second home/investment prop. restrictions
- US Citizenship status

The GECCO output consists of warning messages that relate soft guideline constraints and fatal messages that correspond to violation of strict guideline rules. In addition, GECCO provides processing packets which give the user suggestions on how to correct specific variances. The user always has the option to override a GECCO *out of compliance* overall result on the basis of compensating factors which may not be accounted for in the knowledge base; in this case, the loan is forced into compliance, and the user is encouraged to provide a justification for the override in a notes area.

System Architecture

Software development for GECCO / Third-party underwriting

The GECCO software development process followed an iterative spiral methodology, building on a series of prototypes to produce the first deployed system. The project began with collection and analysis of user requirements, followed by definition of the object model for investor guidelines and for the necessary loan application data. Next the database access layer was designed, followed by high level design of the compliance rules. The database access layer is the underpinning of the knowledge base, encapsulating the

objects and rules from the physical implementation of the database that houses all of the loan application data as well as investor guideline information.

The GECCO knowledge base consists of a collection of objects which hold the relevant data elements referenced in the guideline checks and a collection of discrete rules.

Software development for GECCO / Wholesale Pricing

The project began with an analysis of rules currently enforced by GECCO. These rules were reviewed by business analysts and grouped into distinct sets for third-party underwriting, for wholesale pricing, and for both. The knowledge base was then partitioned accordingly and the GECCO calling interface was modified so that the activation of individual rule sets could be controlled via external command line arguments.

The reorganized GECCO was regression-tested on a database of test loans and then redeployed to both GEMMS for third-party processing and GECMSI for wholesale pricing.

Software development for GECCO / Loan Processing and Closing

The feedback from lenders for enhanced processing capabilities further advanced GECCO functionality. The new development began with analysis of the types of special conditions that lenders wanted to be able to attach to loans and of the types of documents that conceivably could be required. The analysis was followed by a design specification for the new database

Hardware and software environment

The identical hardware and software environment applies to the third-party processing and underwriting, wholesale pricing, and loan origination deployments of GECCO:

GECCO is written in ART-IM and is deployed as a C executable on a client/server architecture.

Operating system : OS/2 2.1
Database : Sybase 4.9.1
Software : ART-IM 2.5, Microsoft C 7.0, Sybase DB Library for C
Hardware : Client : 486 desktop, Server Sun Sparc-20
Network : Local : Token ring/Novell 3.11, Wide-area : T-3 link

For GECCO / GENIUS™ the latest development effort has resulted in redeployment of GECCO for Windows, for both client/server and single-user environments.

Operating system : Windows 3.1
Database : Watcom SQL Server
Software : ART-IM 2.5, MS Visual C++, Watcom libs, MS Visual Basic
Hardware : Client/Server or standalone : 486 desktop
Network : site-specific

and knowledge base structures required for storing and modeling both special condition and required document information. Business analysts then gathered all of the specific business rules for both from each GEMMS lender. The rules were then implemented in separate rule sets, one for special conditions and one for required documents, and these new rule sets were then added to the GECCO knowledge base, bringing the number of rules up to 230 in four distinct rule sets.

Software development for GECCO / GENIUS™

The business requirement to deliver a basic Fannie Mae / Freddie Mac guidelines checker in a short time made reuse of the GECCO knowledge base especially important. Current investor guidelines for Fannie Mae and Freddie Mac were analyzed and updated in the GECCO knowledge base.

Two new rule sets were then built into the GECCO knowledge base, one each for Fannie Mae and Freddie Mac guidelines. The database access layer was rewritten for Watcom SQL Server; this required implementation of a library (Windows DLL) of embedded SQL accessor functions in place of Sybase stored procedures. This development of GECCO was integrated with the Windows port of the GENIUS™ risk assessment tool into the PC GENIUS™ product. The required data elements are captured via a GUI interface developed in Visual Basic.

PC GENIUS™ concluded a two-month Beta test phase and was released for production on Friday the 13th of January, 1995.

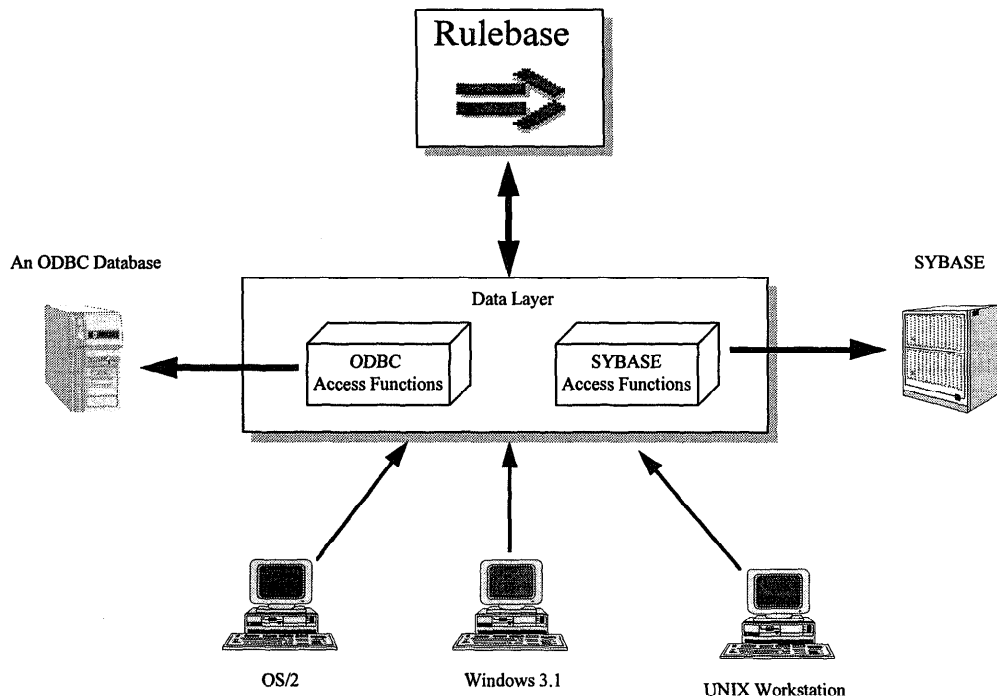


Figure 3: Platform - Independent Architecture

Description and significance of AI techniques used

The GE Compliance Checker is an excellent candidate for a rule-based solution because the processing fits the model of asynchronous testing of a large number of independent conditions. This approach was facilitated by using a highly optimized inference engine and a powerful pattern-matching rule language. The specific architectural features, and their significance as employed by GECCO, include the following:

- *Agenda-driven inferencing* fires only for rules that apply as opposed to exhaustively testing for each rule sequentially.
- *Partitioned rule sets* provide the flexibility of reusing a single application across multiple functional components of the loan processing pipeline, including :
 - prequalification at point of sale
 - investor guideline compliance for resale/funding
 - tracking required documents for closing
 - portfolio analysis for quality assurance
 - batch checking for repurchased loan packages

- *Selective, optimized database access* is controlled through the rules -- only data required by the given process/ruleset is loaded.
- *Ruleset partitions* serve to make actual distinctions in the business model explicit.

Insulated interface to external tools. Modularity of the GECCO architecture is achieved by insulation of the knowledge base from the GUI and the database (See Figure 3). A generic ART-IM/SQL interface was developed for GECCO. The interface is based on functions which define mappings between the physical database model and the object model created in ART-IM. The functions are implemented as stored procedures (compiled SQL programs) where Sybase is used, or embedded SQL in C functions elsewhere. The function names are stored as attributes of the ART-IM objects and are called to generate instances of ART-IM schema, analogous to create-instance methods. The ART-IM/SQL interface used in GECCO is robust in that it permits arbitrarily complex object mappings to be written and compiled incrementally.

- *Platform independence.* The ART-IM deployment compiler generates compilable "C" code for the complete contents of the knowledge base, which has allowed the GECCO rulebase to be ported from OS/2 to Windows to Unix without modification of the source code.
- *Rule parameterization,* the separation of declarative knowledge, allows the user to customize compliance rules dynamically through the GUI maintenance

screens without requiring a change to the executable.

- *High level rule language* permits a straightforward software coding of compliance business rules. Direct expression of business policies and exceptions in rules has allowed for faster development and easier maintenance of the rulebase.

The following code fragment from the knowledge base gives the flavor of a typical compliance checker rule:

```
(defrule check-geographic-non-conforming-loan-amount
  "Check if the loan amount exceeds the guideline limit for the given type of dwelling in
  the given state."
;; Match a property instance
(schema ?
  (instance-of property)
  (prop-dwelling-type ?dwl-code) ;; (e.g., single-family, duplex,...)
  (prop-state ?state)) ;; (e.g., NY,FL,CA...)

;; Bind the loan amount
(schema ?
  (instance-of loan-application)
  (loan-amount ?loan-amt))

;; Check if the loan amount exceeds the guideline loan amount limit
;; for the matching property state and dwelling type.
(schema ?
  (instance-of geographic-loan-limit)
  (geo-loan-limit-dwelling-type ?dwl-code)
  (geo-loan-limit-property-state ?state)
  (geo-loan-limit-amount ?loan-limit&:(< ?loan-limit ?loan-amt))
)

=>
(bind ?msg (sprintf "Loan amount of %ld over limit of %ld."
  ?loan-amt ?loan-limit))
;; Post a fatal message for exceeded loan limit.
(message FTL ?msg)
)
```

Project History and Development Schedule

The development timeline of the GECCO application is broken down by project as follows:

GECCO / Third-party underwriting

Mar - Apr 1992 : Knowledge acquisition, requirements analysis and high level design
 May - Aug : Implementation by 4 developers
 Sep - Oct : Test and refinement of the knowledge base
 November 1992 : In Beta test at GEMMS.
 January 1993 : In production at GEMMS for third party processing and underwriting.

GECCO / Wholesale Pricing

Nov - Dec 1993 : Partition knowledge base into distinct rule sets for integration into the
 GECMSI Wholesale Pricing and Registration system
 Jan 1993 : GECCO regression-tested on a database of test loans
 Feb 1994 : GECCO put into production at GECMSI for wholesale pricing.

GECCO / Loan Processing and Closing

Dec 1993 - Jan 1994 : Requirements analysis / gathering of business rules for new rule sets.
Jan - Mar 1994 : Implementation of new rulesets for documents and conditions processing.
Apr - May, 1994 : Run rule sets on the database of test loans.
Jun 1994 : Deploy GECCO/Loan Processing and Closing to GECMSI.

GECCO / GENIUS™

May - Jun 1994 : Requirements analysis and high level architecture design
Jul - Aug : Design of the shared data model for compliance and risk assessment modules.
Sep - Oct : Update compliance rulesets for the two largest mortgage investors, Fannie Mae and Freddie Mac.
Nov - Dec, 1994 : Beta test phase conducted at six volunteer lender sites across the country.
January 13, 1995 : Available for commercial product.

Application Use

GECCO / Third-party underwriting

The GECCO third-party underwriting deployment contains over 170 investor guidelines for 70 mortgage lenders. The knowledge base contained approximately 120 guideline compliance rules. The usage data for the fiscal years 1993-4 shows that GECCO was run on approximately 15,400 mortgage loans, with an average weekly volume of 150 loans. During this period GECCO was run over 52,000 times - over 3 times per loan on average.

Because the loan application information can fluctuate during the 20-30 day window during which a loan file is typically open for processing, it is useful to rerun the Compliance Checker at various points during the process to ensure that important changes are noted, such as with borrower's income, employment status, assets, or credit profile, and their consequences for the salability of the loan taken into account. It is also often customary for GECCO to be run at any point when the loan file passes hands from mortgage loan processors to underwriters to closing agents, as a safeguard against possible oversights.

GECCO / Wholesale Pricing

Usage data for GECCO/Wholesale Pricing reports that for the period from February through December 1994, GECCO has been run on over 7000 loans, of which 1700, or roughly 1/4 were found to violate GECMSI guidelines for purchase.

GECCO / Loan Processing and Closing

The addition of the required documents ruleset and the special conditions ruleset grew the knowledge base to 230 rules. Some database optimizations resulted in a

performance improvement which reduced GECCO runtime from 40 to 25 seconds per loan on average. GECCO/ Loan Processing has been run on over 5000 loans for the six-month period from July through December, 1994.

GECCO / GENIUS™

The use of GENIUS prior to its becoming a commercial product is described in [Golibersuch95]. (This version of GENIUS was mainframe-based and did not use GECCO.) Actual use of the commercial version (which does embed GECCO) is not known as customers have not shared their usage data with GECMC at this point.

Application Maintenance

Maintenance screens are built into the GECCO GUI, giving the authorized user (an assigned GECMC guidelines administrator) access to the declarative information used by the inference engine. Rule parameterization allows guideline information to be inserted or updated in the database via the GUI without modification of the rulebase. Changes outside the scope of the interface are made by GECMC engineers who have ART-IM experience.

Application Payoff

It was not conceived at the time that the initial effort to build a compliance checker for third-party underwriting would result in a tool that is germane to so many different aspects of the mortgage loan business process. GECCO exploits the overlap of data used across the processing pipeline while providing the flexibility to apply the set of business rules distinct to each of several specific phases, including conditional prequalification at

origination, underwriting for salability and for mortgage insurance, processing of required documents, appraisal and credit reports, and quality control. Included in the following are specific benefits attributed to use of GECCO:

Improved throughput and productivity:

The time savings of at least 30 minutes per loan directly increased the number of loans processed and underwritten by GEMMS, GECMSI and outside lenders. Comments from underwriters who have used GECCO suggest that they have noted a greater feeling of accomplishment due to increased productivity, that exposure to state-of-the-art information technology makes their job more interesting, and that they have more confidence in the consistency of their work.

Improved risk management

GECCO produces a consistent evaluation of compliance with investor guidelines; this helps to equalize the disparate levels of underwriter experience and gives standardization to the subjective art of underwriting. The result of better quality of underwriting is a stronger portfolio and a fewer number of loans refused by the investor.

Improved customer service:

GECCO for third-party underwriting provided a high-quality and timely level of customer service to mortgage lenders who dispatched loans to GEMMS for processing and underwriting. GECCO is now offered directly to lenders as a commercial product for assessing salability of their mortgage loans.

Improved business process:

- GECCO /third-party underwriting made it feasible for GEMMS to pursue the loan processing overflow market.
- GECCO /wholesale pricing allowed GECMSI agents to quickly approve or reject purchase of individual loans in a package for resale on the secondary market.
- GECCO / GENIUS™ allows GECMC to offer their customers a Windows® product for assessing investor requirements for mortgage loan resale.

Future Work

It is expected that the flexibility gained through the GECCO application will continue to have a positive impact on the efficiency of several key GECMC businesses. The GENIUS™ product will continue to be

enhanced and supported as driven by external customer needs.

Plans are underway to rearchitect the GECCO database access layer so that it can be available as a plug-in tool for new and existing GECMC software applications with a minimum of integration work. GECCO is presently being integrated with a Unix-based loan processing system developed for automated underwriting according to GECMC mortgage insurance guidelines; a new ruleset is being defined for this effort. New guidelines are also being developed to increase GECCO functionality for FHA,VA and affordable housing loans.

Summary

GECCO has proven to be an effective tool for the underwriter who must balance the need to bring in new business against the imperative of keeping a portfolio of salable loans. GECCO also gives the benefit of applying standardization to a process that in practice is subjective and prone to variances introduced by different underwriting philosophies.

The reuse of the GECCO as a generic loan salability, prequalification, underwriting and quality assurance tool has been a remarkable success for GE Capital Mortgage Corporation.

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List of Figures

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