

EXHIBIT I

```

0 "blurs"
0 "print quality"
=>
1 "Blurs-Smears"
/* If "blurs" and "print quality" strings are detected in the description
field (represented by "0"), then answer the question "What is your print
quality? (question number 1) with "Blurs/Smears". */
34 "3.1"
=>
31 "Windows 3.X"
/* If "3.1" is the answer for the "What version of Windows 3.X are you
using?" question (i.e., question number 34) then answer the "What
major release of Windows are you using?" question (question number
31) with "Windows 3.X". */

```

Figure 12. Examples of Rules Used by QUICKSOLVE to Preanswer Questions.

4. **EZ Reader**

72. EZ Reader was a system employed by Chase Manhattan bank for automatically classifying, responding to, and/or routing incoming email. The EZ Reader system is described in a paper⁸ presented at the 1996 at the Innovative Applications of Artificial Intelligence Conference (IAAI), which consists of case studies of deployed applications with measurable benefits.⁹ According to the paper, EZ Reader was deployed in the first quarter of 1996 and handled up to 80% of incoming mail automatically. (Rice 1507.)

⁸ Amy Rice, Julie Hsu, Angotti Piccolo, Rosanna Piccolo: EZ Reader: Embedded AI for Automatic Electronic Mail Interpretation and Routing, *Proceedings of IAAI'96*, 1507-1517 (1996).

⁹ <http://www.aaai.org/Conferences/IAAI/iaai.php>

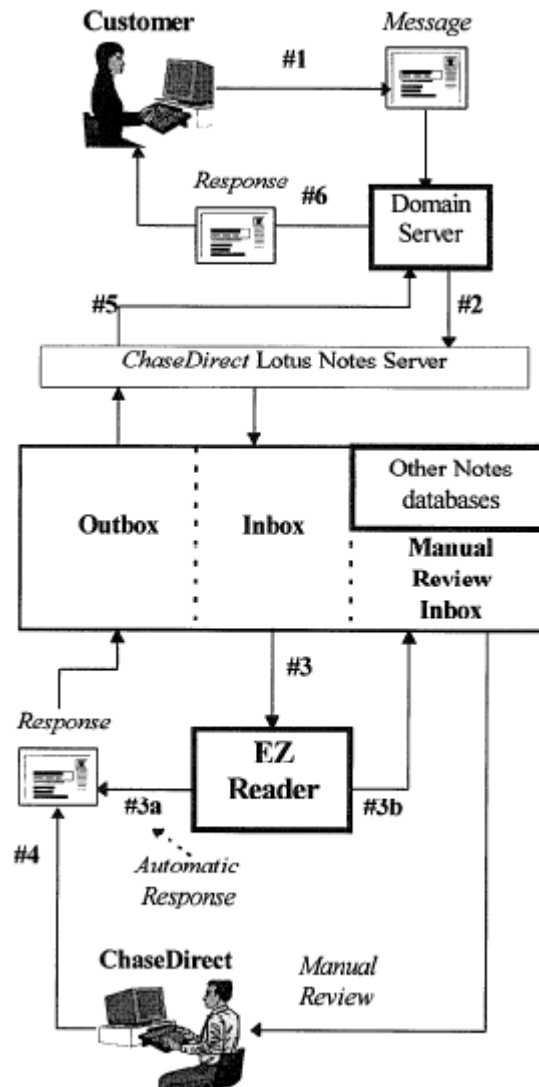


Figure 2. Email Path through ChaseDirect

73. EZ Reader periodically checks the Inbox for new messages. After a customer’s message arrives in the Inbox, EZ Reader retrieves the message and interprets it using rule-based and case-based reasoning. If EZ Reader is able to interpret the message to a satisfactory degree, the message is classified as “automatic,” and the system creates a response consisting of one or more prepared email (“canned responses”) which is then sent back to the customer. If EZ Reader is unable to interpret the message, the message is classified as “referral” or “detected,” and the system sends the message to a human reviewer, potentially with one or more suggested replies. (Rice 1509-1511.)

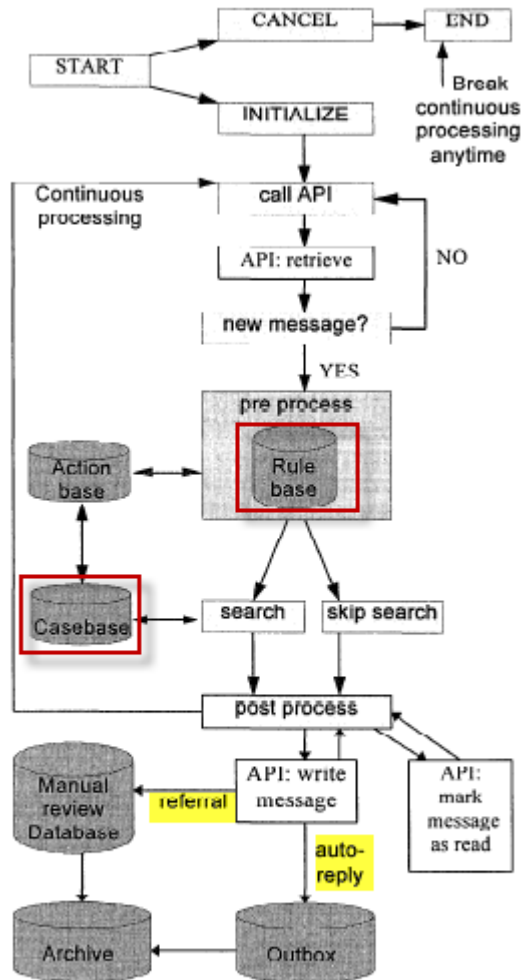


Figure 3. EZ Reader Internal Processing Flow

(Annotations and highlighting added)

74. EZ Reader employs a number of rules to attempt to detect various features within the email message. These features are then set in a presented case model later used by the case-based reasoning system. For instance, EZ Reader attempts to determine whether the email message contains a foreign phone number by looking for certain character strings within the message:

```

RULE foreign-phone
(or
(masked-member$ " +99 " ?message-body)
(masked-member$ " +99-" ?message-body)
(masked-member$ "(+99)" ?message-body)
etc.
)
any other conditions...
=>
(printout "Foreign phone number detected.")
any other actions...

```

75. If the RBR system is unable to classify the system, EZ Reader employs case-based reasoning to try to locate the nearest prior case. The case-based reasoning system is implemented using ART**Enterprise*, a CBR system originally developed by Inference (the same company that made CBR-Express and CasePoint). EZ Reader matches the text and derived attributes of the incoming email with the text and attributes of the stored cases in the case base and assigns match scores, and uses the cases with the highest match scores. The idea is that whatever response was used to resolve the past case can be used or modified to solve the current case. (Rice 1512.)

```

CASE001:
title = "Sign-Up Kit request; Refer."
subject = "chase direct"
message text = "Please send me a
                ChaseDirect sign-up kit.
                My address is"
address? = "Yes"
action = refer:sign-up-kit,
detected:address,
auto:sign-up-ack

CASE002:
title = "Sign-Up Kit request/no address;
Auto Respond."
subject = "chase direct"
message text = "Please send me a
                ChaseDirect sign-up kit."
action = chase-direct-std

```

76. EZ Reader employs trigram (three-character) matching, similar to Allen and CBR Express. Cases with matching attributes have their match scores increased; cases with mismatching attributes may have their match scores decreased, although EZ Reader defaults to a

mismatch weight of zero. (Rice 1512.) “Since stored cases can contain different numbers of features, a presented case’s raw score is normalized by dividing the raw score by the maximum possible match score for the case.” (*Id.*)

77. EZ Reader is further described in The EZ Reader User's Guide and Reference Manual (“EZ Reader Manual”). As depicted in the manual, EZ Reader retrieves emails from a Lotus Notes server inbox and processes each email by “either automatically respond[ing] to it by placing it a Lotus Notes 'outbox' or by forward[ing] it the ChaseDirect 'inbox' for human review and response” (EZ Reader Manual p. 10).

78. The EZ Reader manual is dated February 5, 1996. (EZ Reader Manual p. 3.) The manual further states that “This document describes EZ Reader, currently in use by the ChaseDirect unit of Chase Manhattan Bank.” (*Id.* 6.)

79. Figure 1 of the EZ Reader Manual depicts an overview of the email handling process (EZ Reader Manual p. 17):

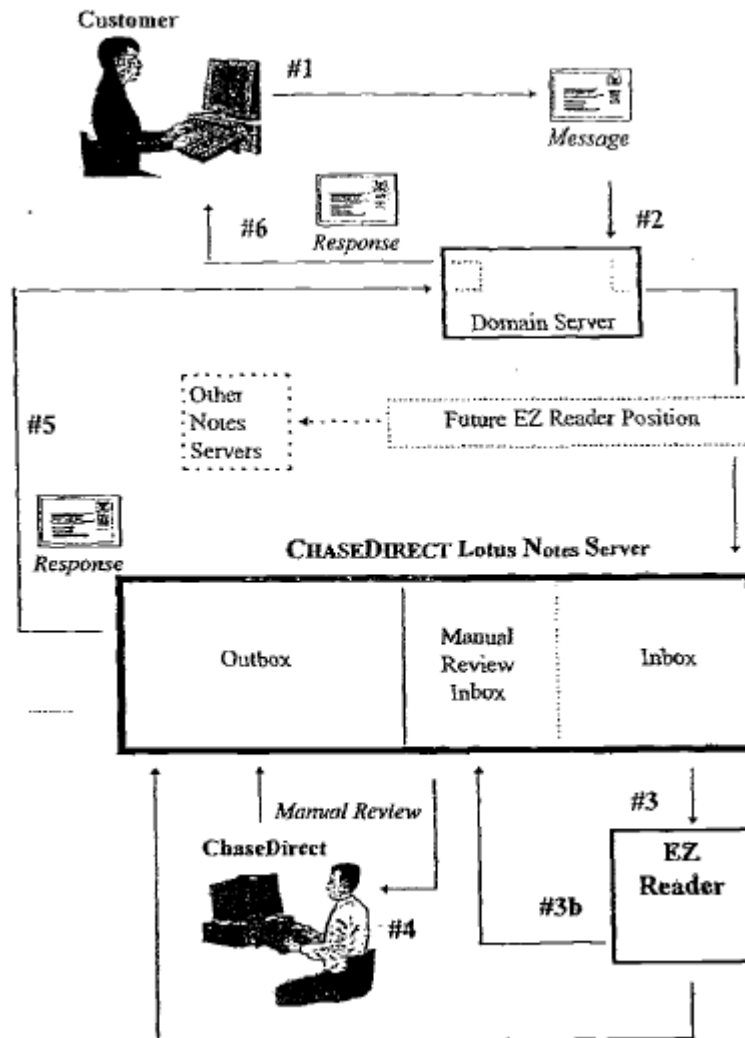


Figure 1: EZ Reader High-Level Architecture

80. The EZ Reader manual also describes each of the numbered steps in Figure 1.

(EZ Reader Manual p. 18):

- a. Step 1: The customer sends an email to Chase Manhattan Bank.
- b. Step 2 (Retrieval): The email is delivered to the Lotus Notes inbox, where it will eventually be detected by EZ Reader.
- c. Step 3 (Interpretation): EZ Reader compares the message to a library of actual customer messages, categorizes it, and based on the message's category and priority and routes the mail to one or more Lotus Notes mailboxes according to one of two action types:
 - i. Step 3a (Automatic): EZ Reader automatically generates a respond to the mail message, then routes its response directly to the outbox.

ii. Step 3b (Referral): EZ Reader cannot respond to the message, so it routes the message to another inbox for human review. EZ Reader also assigns a priority to the message and suggests a response, based on message type.

d. Step 4 (Response): A human reviewer composes responses to the “referral” messages, and those responses are also routed to the outbox.

e. Step 5: The Lotus Notes server transmits the emails in the outbox

f. Step 6: The customer receives a response to the email.

81. EZ Reader performs Step 3 in the process flow described above: interpreting the message and either responding to it or forwarding it to a human reviewer. This step is implemented using rules and cases:

The knowledgebase portion of EZ Reader, written in the ART*Enterprise® language, combines case-based analysis and rule-based reasoning to interpret incoming email messages. Rules are used to drive the flow of processing, but also are utilized in a pre-processing phase, to identify and flag certain characteristics of a message. A case-based retrieval is then performed, searching for the best matching case of the current email against the casebase. If any characteristics were tagged in pre-processing phase, they will contribute to the overall casebase score. (EZ Reader Manual p. 19.)

Thus, the case-base matching algorithm compares the characteristics (or features) of the presented case with the characteristics of the stored cases in the case base.

82. The rulebase contains 2 types of rules: phase-processing rules, and question rules. Phase rules, which “are related to the process flow of the system” (EZ Reader Manual p. 32), are set forth in Table 2. For example, one rule triggers the search of the casebase for the best match to the current case (EZ Reader Manual p. 33).

Table 2: Phase-processing rules

Rule Name	Phase(s)/event(s) that triggers rule
ez-reader:main:start	none – always fires upon start
ez-reader:main:init-event	(gtk:event activate ergw:pb:start \$?) – fires when Start button is clicked in Greeting Window
ez-reader:main:cancel-event	(gtk:event activate ergw:pb:cancel \$?) – fires when Cancel button is clicked in Greeting Window
ez-reader:mail:retrieve:continuous:api	(phase ready-for-next-email), (continuous-process), (api)
ez-reader:mail:retrieve:continuous	(phase ready-for-next-email), (continuous-process), (no-api)
ez-reader:mail:retrieve>manual	(phase ready-for-next-email), (manual-process)
ez-reader:mail:process:pre	(phase ready-to-preprocess-email)
ez-reader:mail:process:skip-search	(phase ready-to-process-email) and (phase skip-search)
ez-reader:mail:process:search	(phase ready-to-process-email) and (not (phase skip-search))
ez-reader:mail:process:post continuous	(phase ready-to-postprocess-email), (continuous-process)
ez-reader:mail:process:post manual	(phase ready-to-postprocess-email), (manual-process)
ez-reader:main:end	(phase end-of-processing)

83. Questions rules are used for tagging characteristics of, or answering questions about, the current email. Question rules themselves fall into 3 categories (EZ Reader Manual pp. 33-36):

- a. *action-setting rules*, e.g., “Does the message request cancellation? If so, the type is ‘referral.’”
- b. *attribute-setting rules*, e.g. “Does the message mention a foreign country? If so, set the foreign-country attribute to ‘true.’”
- c. *action-and-attribute-setting rules*, e.g. “Does the message mention a specific Chase person? If so, flag the person and set type to ‘referral.’”

Table 3: Question rules

Rule name	Question: Does the email/customer...	Type/action
q.address?	reference customer's address?	attribute- and action-setting: detected
q.blank?	contain an empty/blank body?	action-setting: automatic
q.cancel?	request cancellation of services?	action-setting: referral
q.change-of-address?	request a change of customer's address?	action-setting: referral
q.do-not-call-customer?	request specifically not to be called?	attribute- and action-setting: detected

q:fax?	contain a fax number?	action-setting: detected
q:fix-service?	request service or describe an error?	attribute-setting
q:investment?	contain investment references?	attribute-setting
q:foreign?	reference a foreign country?	attribute- and action-setting: detected
q:lengthy?	contain a long message?	attribute-setting
q:macintosh?	reference Macintosh/Apple products?	attribute-setting
q:merger?	reference the Chase/Chemical merger?	attribute-setting
q:multiple?	contain multiple questions?	attribute-setting
q:pay-on-line?	contain references to using Pay-On-Line?	attribute-setting
q:person-referenced?	reference a specific (Chase) person?	attribute- and action-setting: detected
q:phone?	contain a phone number?	action-setting: detected
q:replacement?	reference to a lost or stolen ATM/credit card	action-setting: referral
q:sensitive?	contain information defined as sensitive?	action-setting: referral, auto, and detected

84. Each case in EZ Reader's casebase consists of an actual message with customer-specific information, such as names and addresses, removed (EZ Reader Manual p. 37). A casebase containing at least 200 cases is recommended (EZ Reader Manual p. 39). CBR is used to classify each new message into three general action types (EZ Reader Manual p. 41):

- a. Automatic – No manual review necessary.
- b. Referral – Needs manual review. Referred emails are further classified into 2 categories with one of 4 priorities.
- c. Detected – Information found which matches a pre-specified keyword, phrase, or numbering scheme.

85. The process flow cycle within EZ Reader starts when the “ready-to-preprocess” phase is initiated by receipt of a new message. During this phase, questions rules may fire to set attributes of the current case (EZ Reader Manual p. 34). Phase-processing rules control the progression to the “process-email” phase, in which the casebase is searched for the most similar case, and “postprocess-email” phase in which the appropriate action is taken (EZ Reader Manual p. 32). This rule-controlled process flow is a standard ART**Enterprise* forward-chaining rule-based reasoning (EZ Reader Manual p. 32, footnote). Similarly, while the case-based reasoning process itself is not explicitly described, it appears to be a standard application of the ART**Enterprise* case-based reasoning system.

86. The description of EZ Reader's rule-based reasoning and case-reasoning mechanisms (as distinct from the rules and cases themselves) consists of references to ART**Enterprise* documentation, e.g. “It is strongly recommended that one read and understand the ART**Enterprise*® documentation (especially for an understanding of rules and case-based reasoning) before attempting to make modifications to the EZ Reader code.” (EZ Reader Manual p. 28.) The manual itself primarily provides information on the creation and maintenance of rules and cases for the specific ChaseBank application following the conventions of ART**Enterprise*. Thus, EZ Reader appears to be a typical application of ART**Enterprise* to the kind of business application—automated handling of routine customer messages—for which ART**Enterprise* was designed.

5. GREBE

87. My doctoral dissertation, entitled “Integrating Rules and Precedents for Classification and Explanation: Automating Legal Analysis,” was submitted in May 1991. It describes GREBE (Generator of Exemplar-Based Explanations), a system for legal analysis under Texas worker’s compensation law. (Grebe 5.) GREBE contained a rule base consisting of 57 legal and common-sense rules and a case base containing 35 cases, each of which was a fact pattern drawn from a prior legal case decided under Texas law (Grebe 24-25). GREBE used these rules and cases to determine whether an employee was entitled to worker’s compensation under a given set of facts. The best arguments for and against compensation were returned in the form of a legal memo (GREBE 61-64). My dissertation was and is available through a standard dissertation service (<http://disexpress.umi.com/dxweb>), and dissertations are also all available at the UT graduate library.

88. Suppose, for example, that GREBE is presented with the following new case and is asked whether Jarek is entitled to worker’s compensation:

Jarek was employed as a railroad porter and normally worked from 8:00 A.M. to 5:00 P.M. Because of an unusual work-load, Jarek's employer asked him to work late. Jarek requested and was given permission to walk several blocks