BuyIt Prototype
Software Requirements Analysis:
A C-BASS Component

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Abstract

This document contains the software requirements analysis for a prototype of BuyIt. As a component of the Corporate Business Application Software System (C-BASS), this application automates small purchase requests (under $2,500). The document follows the process of structured analysis, or step-wise refinement of requirements, as applied to the development of BuyIt. The "environmental model" includes a high-level system description, followed by a context diagram and a list of events to which the system must respond. The "behavioral model" includes a data flow diagram (DFD) for each of the seven BuyIt subsystems. From this representation, the basic functional specifications are derived and represented in structured English (or program design language). The final segment of the document includes a data dictionary.

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1. Introduction

BuyIt is a component of the Corporate Business Application Software System (C-BASS) family of applications, an integrated set of Lotus Notes and Web-based software to support U.S. Army Research Laboratory (ARL) electronic workflow and task automation. The motivating force behind this project has been ARL downsizing and findings put forth in the Business Process Reengineering (BPR) report on the small purchase process. The BPR "To-Be Model: Small Purchase" [1] identifies potential process improvements—some of which require computer automation—that would increase productivity of purchasing operations at ARL. Development of a full-production BuyIt will proceed in phases, using an incremental, evolutionary approach.

1.1 BuyIt Prototype. The purpose of the BuyIt prototype project is to model a secure client/server system that provides for the processing of small purchase requests. This proof-of-principle prototype will alleviate some of the risks involved in implementing new technologies used to build the ARL Intranet. The project will also refine requirements described in the ARL Business Process Reengineering (BPR) "To-Be Model" [1].

1.2 Development Plan and Project Schedule. The "BuyIt Software Development Plan" [2] states a definition of the problem; gives an overview of technical, management, and reliability issues; and provides a detailed project schedule. The report enclosed herein covers the work accomplished to solidify user requirements (drawn from existing high-level design documents) and the analytical expansions used to derive a data flow model, a pseudocode representation of processing, and a data dictionary. As stated in the project schedule, the analysis represents a 10-working-day effort and was completed within the stated timeframe of 13 January 1997 to 27 January 1997.

1.3 Contents of This Report. This document presents the results of a structured system analysis used to derive the software requirements for BuyIt, starting with the baseline given in the BPR "To-Be Model: Small Purchase" [1]. The body of the report contains five sections.

- *Structured Analysis Overview* - briefly explains the methodology used to extract the software functional specifications.

- *System Overview* - delineates the basic BuyIt concept and outlines the high-level requirements.

- *Requirements* - breaks the generic statements into low-level, derived requirements and describes each in detail.

- *Functional Specifications* - discusses the products of the structured analysis (i.e., the data flow diagrams and structured English narrative) for each subsystem of BuyIt.

- *Data Dictionary* - lists each of the BuyIt data elements, giving a full description and type for the data model.

2. Structured Analysis Overview

Modern software engineering utilizes structured analysis [3] as a powerful methodology for developing system specifications. Through a series of step-wise refinements, detailed delineations of the system's components and their behavior are extracted from high-level descriptions of system features and functions. In other words, primary system elements are broken down into progressively more detailed levels of processes, and the data paths between these processes are defined. Three modeling tools facilitate this decomposition: (1) data flow diagrams (DFDs), (2) structured English process narratives (pseudocode or program design language [PDL]), and (3) a data dictionary. Accuracy and precision in progressively expanding design definitions are critical to successful system development.

The results of this analytical approach are systematic elaborations of product requirements, typically expressed as two separate models:

- An environmental model that defines the system's interfaces to the outside world. (See section 3, "System Overview.")

- A behavioral model that defines the internal behavior the system must exhibit in order to deal with the environment. (See section 4, "System Requirements," and section 5, "Functional Specifications.")

3. System Overview

The environmental model typically consists of three components: (1) a concise statement of the system's purpose or required functionality, (2) a context diagram, and (3) an events list. The context diagram is the highest level DFD. It shows the system as a single process, including user interaction and communication with external systems, as well as data flow input and output. The events list creates an index of outside stimuli to which the system responds.

3.1 Required Functionality. As a system, the BuyIt prototype provides a secure, automated means for the preparation, routing, approval, tracking, and reporting of small purchase requests. Table 1 lists the high-level requirements for the BuyIt prototype and a general description of what each requirement involves.

3.2 Context Diagram. Figure 1 shows the context diagram for the prototype. Each square in the diagram represents an external entity (e.g. users, functional areas, and legacy systems) with which BuyIt communicates. The arrows indicate the data that flow into and out of BuyIt. A few elements on the DFD need additional explanation. First, the external entity "User" represents all users of the system, and the data flow associated with this box is limited to display of information. Second, all the other external entities (e.g., "Requester" and "Supervisor"), and their corresponding data flow, show the specific information that is passed to BuyIt either by that user or by the system. Lastly, the data store EMPLOYEE contains user information such as name, phone number, address, office symbol, etc.

Table 1. High-Level Requirements for the BuyIt Prototype

Requirement	General Description
Security	Provide security measures to prevent unauthorized access to the system and its data and keep authorized users from performing tasks not allowed in their roles.
Purchase request preparation	Provide a means for the requesters and functional users to input/edit relevant information pertaining to a purchase request.
Automated request routing	Automate the process of routing purchase requests to the various functional areas.
Electronic approval	Provide a means for approving officials and functional users to electronically approve or reject a purchase request.
Receive/Accept order	Provide a means for Receiving to notify requesters of shipment arrival and for the purchaser to accept or decline the order.
Request tracking	Allow users to track the status of active purchase requests currently in the system.
Legacy system interface	Implement automated interfaces to SOMARDS and SAACONS legacy systems.
Reporting	Provide users and management with a means for reporting cycle times and costs.

3.3 Event List. The following list contains events to which the system must respond.

- Requester initiates new purchase request.
- Requester prepares request.
- Requester corrects rejected request.
- Requester, supervisor, or budget analyst completes fund source.
- Requester or supervisor cancels request.
- Budget analyst certifies fund source.
- SOMARDS certifies and commits funds.
- Special approving official(s) approves request item(s).
- Property book officer attaches item tags.
- Property book officer approves request.
- Contracting officer assigns buyer to request.
- SAACONS downloads purchase order information.
- Supervisor approves actual costs.
- Receiving marks shipment as received.

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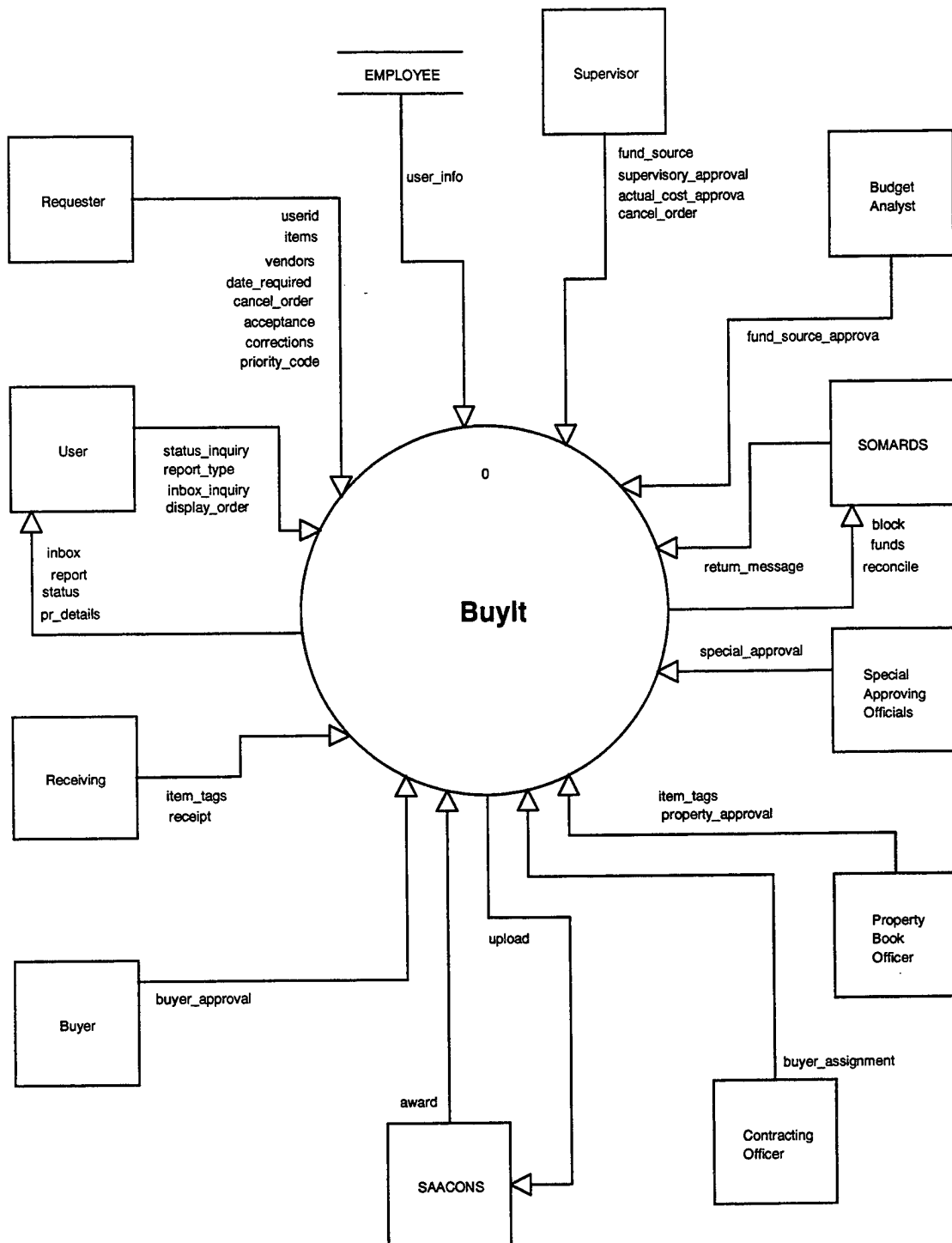
Figure 1. Context Diagram for BuyIt.

- Receiving checks off tagged items.
- Requester accepts shipment.
- User submit status inquiry.
- User request report.

4. System Requirements

Antecedent studies and legacy systems also contribute to BuyIt's requirements. The "Automation Requirements" [4] and the "To-Be Model: Small Purchase" [1] were produced during the BPR development effort. However, for some areas, these documents lack detail, and necessary elements had to be derived. Additionally, the limited scope of a prototype necessitated leaving out some of the more complicated or vague automation requirements of the "To-Be Model" (e.g., a pull-down product selection) or areas where the requirement already exists in a Department of Defense (DOD) standard system (e.g., functionalities handled by SAACONS). "BuyIt: Software Development Plan" [2] more fully addresses the constraints on the prototype and the requirements of legacy systems.

E1 Security

 E11 Prevent unauthorized access

  Description -- Prevent unauthorized access to the system and its data.

  Source -- Derived, due to the nature of the system.

  Interfaces to major functions and external entities:

   User.

 E12 Enforce role restrictions

  Description -- Prevent users from performing tasks or accessing/editing data that are out of the scope of their role.

  Source -- BPR "To-Be Model" document, Automation Requirements section, requirement A12.

  Interfaces to major functions and external entities:

User.

Approvals.

Edits.

Employee address book (for roles).

E2 Purchase request preparation

E21 Create new purchase request

Description -- Allow the requester to create a new purchase request with preliminary user information filled-in

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A111 and A114.

Interfaces to major functions and external entities:

User.

Security.

Employee address book (for user info).

E22 Select items

Description -- Provide a means for the requester to enter item descriptions, specifications, quantities, and estimated costs.

Source -- BPR "To-Be Model" document, Automation Requirements section, requirement A112.

Interfaces to major functions and external entities:

User.

Security.

E23 Complete purchase request

Description -- Provide a means for the requester and/or approving supervisor to complete the purchase request.

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A114.

Interfaces to major functions and external entities:

User.

Security.

E24 Item tag input

Description -- Provide a means for the Property Book Officer to enter item tags.

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A113.

Interfaces to major functions and external entities:

      User.

      Security.

E25 Edit purchase request

Description -- Provide a means for users to edit certain request details as needed.

Source -- Derived, due to the need for making corrections to rejected purchase request.

Interfaces to major functions and external entities:

      User.

      Security.

E3 Automated routing

Description -- Automate the process of routing purchase requests to the various functional areas and approving officials.

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A12.

Interfaces to major functions and external entities:

      Security.

      Employee address book (for default routing).

E4 Electronic approval

Description -- Provide a means for approving officials and functional users to approve or reject a purchase request.

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A12.

Interfaces to major functions and external entities:

User.

Security.

E5   Receive/Accept order

E51   Receive shipment

Description -- Provide a means for Receiving to notify purchasers of shipment arrival.

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A12. .

Interfaces to major functions and external entities:

User.

Security.

E52

E53   Tag item

Description -- Provide a means for Receiving to attach item tags to received items.

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A3.

Interfaces to major functions and external entities:

User.

Security.

E54   Accept shipment

Description -- Provide a means for the requester to accept or decline the order or items.

Source -- BPR "To-Be Model" document, "Automation Requirements" section, requirements A31.

Interfaces to major functions and external entities:

User.

Security.

E6   Request tracking

Description -- Allow users to track the status of active purchase requests currently in the system.

Source -- User requested.

Interfaces to major functions and external entities:

      User.

E7   Legacy system interfaces

    E71   Budget legacy system interface

        Description -- Provide an electronic interface to the legacy financial system (SOMARDS) that automates the certification and commitment of funds.

        Source -- BPR, "To-Be Model" section, process model diagram A12, process A122.

    E72

    E73   Procurement legacy system interface

        Description -- Provide an electronic interface to the legacy procurement system (SAACONS) that automates the uploading of request information to that system and the download of purchase order data.

        Source -- Derived. SAACONS is the primary tool the buyers use during the procurement process; therefore, there is a definite need for interfacing with this legacy system in order to eliminate the need for double entry into both BuyIt and SAACONS.

E8   Reporting

    Description -- Provide users and management with a means for reporting cycle times and costs.

    Source -- BPR "Reports Specifications" document.

    Interfaces to major functions and external entities:

      User.

      Security.

E9   Navigation

    Description -- Provide users with a means for navigating to the various functional areas within the system.

    Source -- Derived from the requirements previously listed.

    Interfaces to major functions and external entities:

      User.

5. Functional Specifications

The behavioral model expands the analytical results from the environmental model to more fully define how the system performs prescribed tasks. Typical representations in this model are (1) concise flowcharts showing how information is transformed as it moves through the system and subsystems, (2) a set of structured English statements that form a processing narration based on data types, control structures, and transformations, and (3) a data dictionary defining each data item.

5.1 BuyIt Subsystems. The nine functionalities listed in the previous section identify the major components of BuyIt: (1) security, (2) request preparation, (3) automated routing, (4) electronic approval, (5) status tracking, (6) receive/accept notification, (7) legacy system interfaces, (8) report generation, and (9) navigation. These categories consolidate into seven subsystems.

Figure 2 shows the major functional subsystems of BuyIt, as represented by a DFD. Each of the seven bubbles in the diagram represents a major subsystem or process of BuyIt, with the arrows showing the data flowing into and out of the processes.

The data store ACTIVE—located in the center of the diagram—holds all the active purchase requests, each waiting for the appropriate users to perform their functions on them. The CLOSED and CANCELED data stores contain purchase requests that have been closed out or canceled, respectively. The small squares along the outer edges of this DFD are interfaces to the outside world.

No process bubble for security appears at this level because the application environment (i.e., Lotus Notes) handles unauthorized user security. Additionally, enforcement of role restrictions is handled within each subsystem, as detailed in the following section.

Figure 2. Major Subsystems of BuyIt.

5.2 Subsystems Data Flow Diagrams. System objects and operations can be coherently represented as data flow diagrams (DFDs). A DFD can be used to capture system concepts and components at any level of abstraction. Each of the following seven DFDs (Figures 3 through 9) provides more detail for the information flow and functionality of each of the identified BuyIt subsystems.

Figure 3 represents the DFD for the Prepare Purchase Request subsystem. The major inputs to this process (and its basic functions) are the requester information (derived from the user-supplied userid and the EMPLOYEE data store), item details, vendor information (if known

Figure 3. Prepare Purchase Request Process.

at this time), and the date by which the items are required. The fund source completes the information for the request, and the supervisory approval puts the request into the procurement cycle.

Figure 4 shows the DFD for the Approve Funds subsystem. This subsystem, besides having interfaces to users for approvals, also has connections to the SOMARDS legacy system. The Build Block process is executed at the start of the day and creates the transaction block that will be used by BuyIt for the remainder of the day. As certified purchase requests are created during the course of the day, the Certify Funds process queries SOMARDS and grabs the returning message. Depending on the results of this query, the request is either certified or rejected (with explanation). At the end of the day, the Reconcile process is executed to balance the transaction block.

The Approvals process is shown in Figure 5. At this point, the various approving officials attach their approval or rejection to the request. The property book officer also attaches item tags to the individual items in order to flag them during receipt of the shipment.

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return_message

2.4
Build
Block

block

fund_source_approval

2.1
Approve
Fund
Source

completed_pr

certifiable_pr

rejected_pr

return_message

2.3
Certify
Funds

certifiable_pr

funds

actual_cost_approval

2.2
Approve
Actual
Cost

actual_pr

certifiable_pr

rejected_pr   certified_pr

rejected_pr

return_message

2.5
Reconcile

reconcile
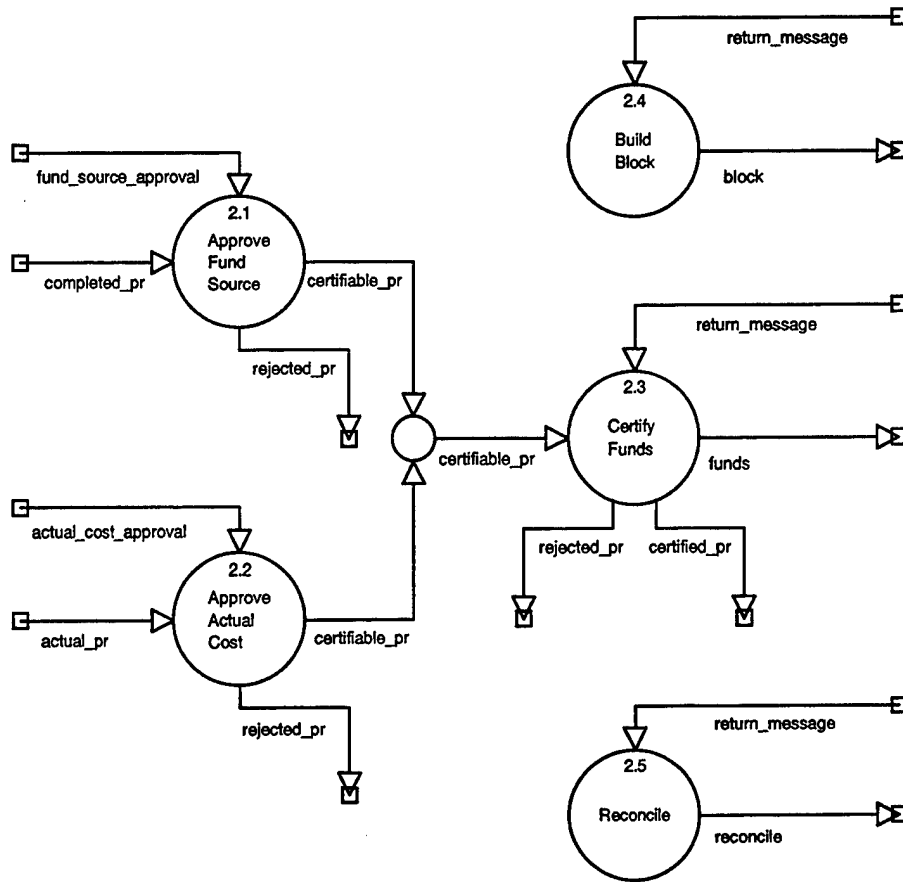
Figure 4. Approve Funds Process.

special_approval

item_tags

property_approval

3.1
Approve
Special
Items

certified_pr

special_pr

3.2
Attach
Item
Tags

taggable_pr

3.3
Property
Approval

orderable_pr

rejected_pr
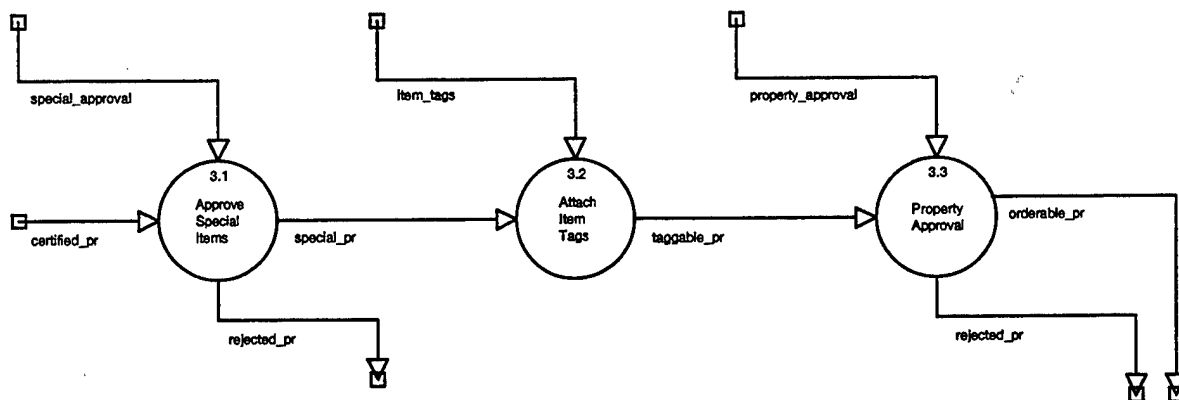
rejected_pr

Figure 5. Approvals Process.

Figure 6 diagrams the Edit Purchase Request process. The rejected purchase request is displayed for the requester, who then enters the corrections. What fields within the request the user can edit depends on where the rejection came from and how far along in the approval process the request traveled.
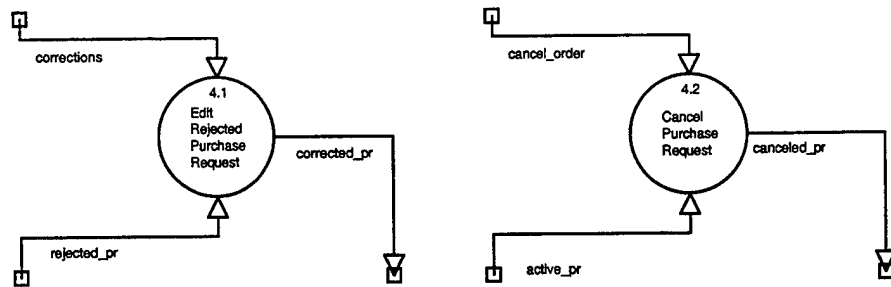
Figure 6. Edit Purchase Request Process.

The Prepare Purchase Order process is diagramed in Figure 7. The first step of the process is assigning a buyer. This triggers the upload of the purchase request information to SAACONS. The buyer then proceeds to work within SAACONS. The second part of the SAACONS interface is the downloading of information (actual costs, selected vendor, delivery date). The request is then forwarded to Receiving in order to alert that office of the pending shipment.
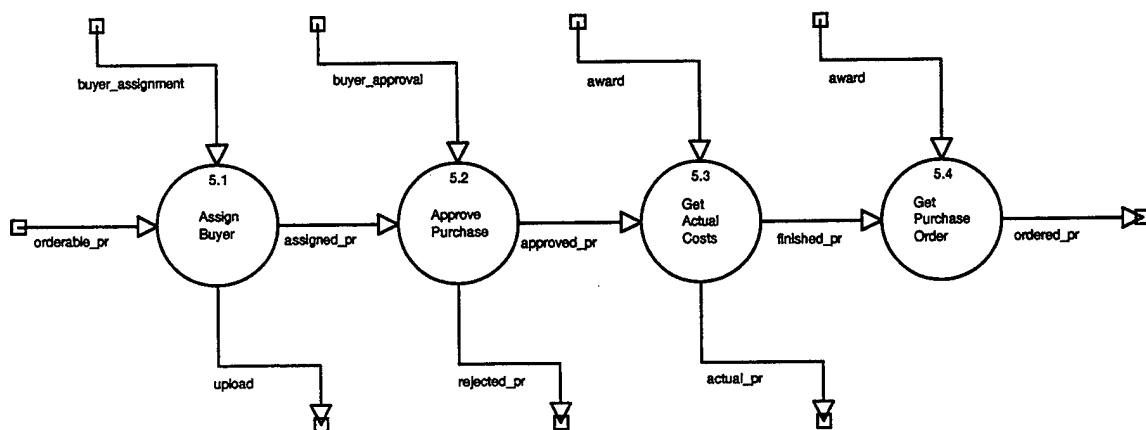
Figure 7. Prepare Purchase Order Process.

Figure 8 represents the Receive Shipment process. Once the shipment has been delivered to the warehouse, Receiving marks the request as received and checks off any tagged items once each has been properly accounted for. At this point, the system notifies the requester of receipt and allows the user to accept or return items once they have been delivered.
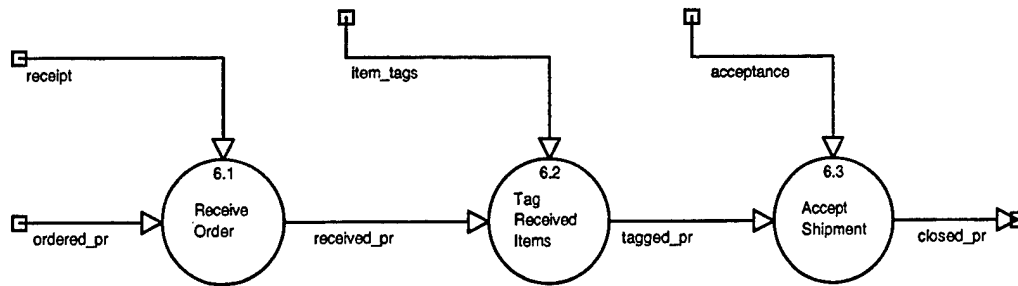
Figure 8. Receive Shipment Process.

The Inquires process is diagramed in Figure 9. The processes shown in this figure are used to display to the user (1) pending actions (inbox), (2) purchase request details, (3) the status of requests, and (4) reports.
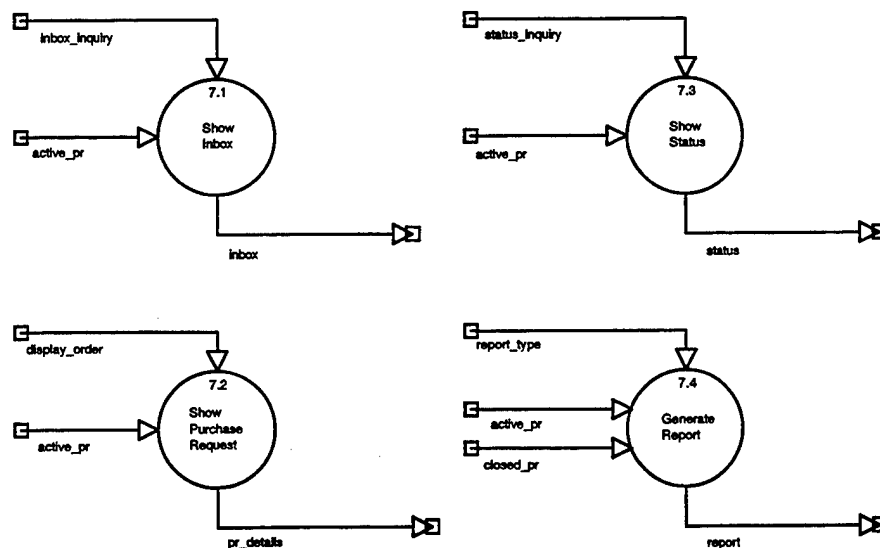
Figure 9. Inquires Process.

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5.3 Processing Narration. Having captured the flow of information and identified data objects, each transformation can be further expanded by using the stylized notation of structured English. Basic procedural constructs are combined with English phrases to give concise descriptions for each major operation listed in the prescribed tasks analysis given in section 4.

E1   Security

    E11   Login

        Input -- userid, passwd

        Process:

            REPEAT

                GET from user the userid, passwd

            UNTIL VALID userid, passwd

            ALLOW login

        Output -- N/A

    E12   Role

        Input -- role, action

        Process

            GET from **EMPLOYEE** the role using **requester_userid**

            IF VALID **action** for **role** THEN

                EXECUTE **action**

            ELSE

                NULL

            ENDIF

        Output -- action_results

E2   Prepare purchase request for ordering

    E21   Create new purchase request

        Input -- pr, requester_userid, user_info

        Process 1.1

GET from **EMPLOYEE** the **user_info** using

requester_userid

SET in **pr** the **requester_userid**

SET in **pr** the **user_info** using **user_info**

Output -- blank_pr

E22 Fill in purchase request

Input -- blank_pr, priority_code, items, vendors, date_required

Process 1.2

GET from user the **priority_code**

SET in **pr** the **priority_code**

DO WHILE there is another **item** to add

GET from user the **item**

SET in **pr** the **item**

ENDDO

GET from user the **specifications**

SET in **pr** the **specifications**

DO WHILE there is another **vendor** to add

GET from user the **vendor**

SET in **pr** the **vendor**

ENDDO

GET from user the **date_required**

SET in **pr** the **date_required**

Output -- partial_pr

E23 Fill in fund source

Input -- partial_pr, fund_source

Process 1.3

GET from user the **fund_source**

SET in **pr** the **fund_source**

Output -- funded_pr

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E24   Correct purchase request

      Input -- rejected_pr, corrections

      Process 4.1

            DISPLAY to user **rejected_pr** and **explanation**

            DO WHILE there are more **corrections**

                  GET from user the **corrections**

                  SET in **pr** the **corrections**

            ENDDO

      Output -- corrected_pr

E25   Attach item tags

      Input -- special_pr, item_tag

      Process 3.2

            DO WHILE there are more **items** to tag

                  GET from user **item_tag**

                  SET in **pr** the **item_tag**

            ENDDO

      Output -- taggable_pr

E26   Cancel request

      Input -- active_pr, cancel_order

      Process 4.2

            DISPLAY to user the **active_pr**

            GET from user the **cancel_order**

            PUT **canceled_pr** into **CANCELED**

      Output -- canceled_pr

E3   Routing

E31   Automated routing

      Input -- active_pr

      Process -- **TBD**

      Output -- active_pr

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E32 Manual routing

>> *Input* -- active_pr

>> *Process* -- **TBD**

>> *Output* -- active_pr

E33 Assign Buyer

>> *Input* -- orderable_pr

>> *Process 5.1*

>>> DISPLAY to user the **orderable_pr**

>>> GET from user the **buyer_assignment**

>>> SET in **pr** the **buyer_assignment**

>>> SET in **pr** the **inbox_location** to buyer

>> *Output* -- assigned_pr

E4 Approvals

E41 Supervisory approval

>> *Input* -- funded_pr, supervisory_approval

>> *Process 1.4*

>>> DISPLAY to user the **funded_pr**

>>> GET from user the **supervisory_approval**

>>> IF **supervisory_approval** is "Yes" THEN

>>>> SET in **pr** the **supervisory_approval** to "Yes"

>>>> SET in **pr** the **request_date** to today's date

>>>> SET in **pr** the **inbox_location** to budget

>>> ELSE

>>>> GET from user the **explanation**

>>>> SET in **pr** the **supervisory_approval** to "No"

>>>> SET in **pr** the **explanation**

>>>> SET in **pr** the **inbox_location** to requester

>>> ENDIF

>> *Output* -- completed_pr, rejected_pr

E42   Fund source approval

Input -- completed_pr, fund_source_approval

Process 2.1

> DISPLAY to user the **completed_pr**
>
> GET from user the **fund_source_approval**
>
> IF **fund_source_approval** is "Yes" THEN
>
> > SET in **pr** the **fund_source_approval** to "Yes"
> >
> > SET in **pr** the **inbox_location** to certification
>
> ELSE
>
> > GET from user the **explanation**
> >
> > SET in **pr** the **fund_source_approval** to "No"
> >
> > SET in **pr** the **explanation**
> >
> > SET in **pr** the **inbox_location** to requester
>
> ENDIF

Output -- certifiable_pr, rejected_pr

E43   Special approval

Input -- certified_pr, special_approval

Process 3.1

> DISPLAY to user the **certified_pr**
>
> GET from user the **special_approval**
>
> IF **special_approval** is "Yes" THEN
>
> > SET in **pr** the **special_approval** to "Yes"
> >
> > SET in **pr** the **inbox_location** to
> >
> > > > property_book_officer
>
> ELSE
>
> > GET from user the **explanation**
> >
> > SET in **pr** the **special_approval** to "No"
> >
> > SET in **pr** the **explanation**
> >
> > SET in **pr** the **inbox_location** to requester
>
> ENDIF

Output -- special_pr, rejected_pr

E44   Property approval

Input -- special_pr, property_approval

Process 3.3

> DISPLAY to user **special_pr**
>
> GET from user **property_approval**
>
> IF **property_approval** is "Yes" THEN
>
>> SET in **pr** the **property_approval** to "Yes"
>>
>> SET **inbox_location** to contracting_officer
>
> ELSE
>
>> GET from user **explanation**
>>
>> SET in **pr** the **property_approval** to "No"
>>
>> SET in **pr** the **explanation**
>>
>> SET in **pr** the **inbox_location** to requester
>
> ENDIF

Output -- orderable_pr, rejected_pr

E45   Actual cost approval

Input -- actual_pr, actual_cost_approval, explanation

Process 2.2

> DISPLAY to user **actual_pr**
>
> GET from user **actual_cost_approval**
>
> IF **actual_cost_approval** is "Yes" THEN
>
>> SET in **pr** the **actual_cost_approval** to "Yes"
>>
>> SET in **pr** the **inbox_location** to buyer
>
> ELSE
>
>> GET from user **explanation**
>>
>> SET in **pr** the **actual_cost_approval** to "No"
>>
>> SET in **pr** the **explanation**
>>
>> SET in **pr** the **inbox_location** to requester
>
> ENDIF

Output -- certifiable_pr, rejected_pr

E46 Buyer approval

Input -- assigned_pr, buyer_approval, explanation

Process 2.2

    DISPLAY to user **assigned_pr**

    GET from user the **buyer_approval**

    IF **buyer_approval** is "Yes" THEN

        SET in **pr** the **buyer_approval** to "Yes"

    ELSE

        GET from user **explanation**

        SET in **pr** the **buyer_approval** to "No"

        SET in **pr** the **explanation**

        SET in **pr** the **inbox_location** to requester

    ENDIF

Output -- approved_pr, rejected_pr

E5   Interface with legacy systems

E51   Build block

Input -- N/A

Process 2.3

    PUT to **SOMARDS** the **block**

    GET from **SOMARDS** the **return_message**

Output -- N/A

E52   Certify funds

Input -- certifiable_pr

Process 2.4

    GET from **certifiable_pr** the funds

    PUT to **SOMARDS** the **block, funds**

    GET from **SOMARDS** the **return_message**

    IF **return_message** is "OK" THEN

        SET in **pr** the **certification** to "Yes"

        SET in **pr** the **inbox_location** to special_approval

ELSE

    SET in **pr** the to **certification** to "No"

    SET in **pr** the **explanation** to **return_message**

    SET in **pr** the **inbox_location** to requester

ENDIF

Output -- certified_pr, rejected_pr

E53 Reconcile

Input -- N/A

Process 2.5

    PUT to **SOMARDS** the **block, reconcile**

    GET from **SOMARDS** the **return_message**

Output -- N/A

E54 Upload to SAACONS

Input -- assigned_pr

Process 5.1

    GET from **assigned_pr** the upload

    PUT to **SAACONS** the **upload**

Output -- N/A

E55 Download from SAACONS

Input -- assigned_pr, actual_cost, vendor, delivery_date, po_number

Process 5.3, 5.4

    GET from **SAACONS** the **award**

    IF **total_actual_cost** are greater than

                total_estimated_cost THEN

        SET in **pr** the **explanation** to "Actual cost greater"

        SET in **pr** the **inbox_location** to supervisor

    ENDIF

    GET from **SAACONS** the **award**

    SET in **pr** the **vendor, delivery_date, po_number, award_date**

    SET in **pr** the **inbox_location** to receiving

Output -- ordered_pr, actual_pr

E6   Receive shipment

    E61   Receive shipment

        Input -- ordered_pr, receipt

        Process 6.1

            DISPLAY to user the **ordered_pr**

            GET from user the **receipt**

            SET in **pr** the **receipt**

        Output -- received_pr

    E62

    E63   Check off taggable items

        Input -- received_pr, item_tag

        Process 6.2

            DISPLAY to user **received_pr**

            FOR EACH item in **received_pr**

                IF **item_tag** is "Yes" THEN

                    GET from user the **item_tag**

                    SET in **pr** the **item_tag**

                ENDIF

            ENDFOR

            SET in **pr** the **inbox_location** to requester

        Output -- tagged_pr

    E64   Accept shipment

        Input -- tagged_pr, acceptance

        Process 6.3

            DISPLAY to user **tagged_pr**

            FOR EACH item in **tagged_pr**

                GET from user the **acceptance**

                IF **acceptance** is "No" THEN

                    GET from user the **explanation**

                    SET in **pr** the **explanation**

                ENDIF

ENDFOR

PUT **closed_pr** into **CLOSED**

Output -- closed_pr

E7   Status inquires

Input -- active_pr

Process 7.3

GET current **status** from **ACTIVE**

DISPLAY to user the **status**

Output -- status

E8   Generate reports

Input -- report_type

Process 7.4 -- **TBD**

Output -- report

E9   Navigation

E91   Navigate

Input -- **TBD**

Process -- **TBD**

Output -- **TBD**

E92   Logout

Input -- N/A

Process -- **TBD**

Output -- N/A

6. Data Dictionary

While DFDs and pseudocode (structured English) are important to system specification, additional information is required for a complete analytical model. The content of each data or control item should be more fully identified. A data dictionary is a quasi-formalism for describing content of information as it flows through the system. The standard notation conventions are

Notation	Meaning
=	is composed of
+	and
[|]	either/or
{ }n	n repetitions of
( )	optional data
* *	comments

BuyIt prototype's data dictionary follows. Each left-hand element is taken from the DFD and the Process Narrative representations of the system. These data items are then given an expanded, unambiguous definition in the right-hand column.

acceptance =
requester accepts or returns shipment item
["Yes" | "No"]

ACTIVE =
{active_pr}

action =
**
TBD

action_results =
**
TBD

active_pr =
purchase request at some point in the approval cycle

actual_cost =
actual cost of an item
units: dollars

actual_cost_approval =
supervisory approval of the total actual cost of the request
["Yes" | "No"]

actual_pr =   *purchase request where the total actual cost is greater than
                                the total estimated cost*
                                approved_pr + {actual_cost} + {item_tot_act_cost} +
                                total_actual_cost

address =   **
                                street_address + (mail_stop) + city + state + postal_code +
                                (country)

al_cost =   *SAACONS line item actual cost*
                                actual_cost

al_regdeld =   *SAACONS delivery date*
                                delivery_date

approved_pr =   *purchase request that has procurement buyer approval*
                                assigned_pr + buyer_approval

assigned_pr =   *purchase request that has been assigned to a buyer by the
                                contracting officer*
                                orderable_pr + buyer_assignment

award =   *SAACONS award download information*
                                awd_piin + pr_num + splline + awd_status + awd_date +
                                al_regdeld + al_cost + desc_text + vend_name +
                                vend_addrss1 + vend_city + vend_stat + vend_zipcode +
                                vend_phone

awd_date =   *SAACONS line item award date*
                                format: DD-MON-YY
                                {legal_character}

awd_piin =   *SAACONS purchase order number*
                              TBD

awd_status =   *SAACONS line item award status*
                              {numeric_digit}

award_date =   *SAACONS purchase order award date*
                              date

bar_code_no =   *property book bar code number*
                              {alphanumeric}

batch_no =   *SOMARDS batch number*
                              "BuyIt"

blank_pr =   *purchase request with the requester and delivery info
                              filled*
                              requester_userid + user_info

bldg_no =   *building number*
                              {alphanumeric}

blk_no =   *SOMARDS block number*
                              "ARL"

blk_tkt_dt =   *SOMARDS block ticket date*
                              format: MMDDYY
                              date

block =   *SOMARDS build block data*

                           trns_cd + user_auth_key + cmd_dsg + update_code +

                           blk_no + blk_tkt_dt + tot_blk + batch_no + tot_batch

buyer_approval =   *buyer approval of purchase request*

                           ["Yes" | "No"]

buyer_assignment =   **

                           buyer_userid + saacons_buyer_code

buyer_userid =   **

                           userid

cancel_order =   *order to cancel purchase request*

                           ["Yes" | "No"]

CANCELED =   {canceled_pr}

canceled_pr =   *purchase request that has been canceled*

                           active_pr + cancel_order

certifiable_pr =   *purchase request that has fund source approval or actual

                           costs approved*

                           [completed_pr + fund_source_approval | actual_pr +

                           actual_cost_approval]

certification =   *SOMARDS certification*

                           ["Yes" | "No"]

certified_pr =   *purchase request that has been certified by SOMARDS*

                           certifiable_pr + certification

30

city =   **
                                {alphabetic_character}

CLOSED =   {closed_pr}

closed_pr =   *purchase request that has been accepted by the requester*
                                tagged_pr + {acceptance}

cmd_dsg =   *SOMARDS CMD-DSG*
                                "I"

company_address =   **
                                address

company_email =   **
                                email_address

company_fax_no =   **
                                phone_no

company_name =   **
                                {legal_character}

company_phone_no =   **
                                phone_no

company_poc =   **
                                name

completed_pr =   *purchase request that has been approved by the
                          supervisor*
                          @doc_ref_no   +   funded_pr   +   request_date   +
                          supervisory_approval

comt_ref_no =   *SOMARDS document reference number*
                          doc_ref_no

corrected_pr =   *purchase request that has been corrected by the requester*
                          rejected_pr + corrections

corrections =   *corrections to a rejected purchase request*
                          TBD

country =   **
                          {alphabetic_character}

cum_btch_value =   *SOMARDS cumulative batch total for the days
                          certification*
                          units: dollars

date_required =   *date shipment is required by*
                          date

delivery_date =   *estimated date for delivery from vendor*
                          date

desc_text =   *SAACONS item description*
                          description

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description = *item description*

{legal_character}

desc_text = *SAACONS description text*

description

doc_ref_no = *purchase request document reference number*

"W-" + **TBD**

email_address = **

TBD

EMPLOYEE = {employee}

employee = *employee information - the bare minimum should contain*

user)info + {roles}

eor = *funding element of resource*

{alphanumeric}

estimated_cost = *estimated cost of an item*

units: dollars

explanation = *rejection, cancellation, or return explanation*

{legal_character}

finished_pr = *purchase request where the total actual cost is less than or

equal to the total estimated cost*

approved_pr + {actual_cost} + {item_tot_act_cost} +

total_actual_cost

first_name =   *a person's first name*

                                {alphabetic_character}

fund_source =   **

                                jo_no + eor

fund_source_approval =   *budget analyst approval of fund source*

                                ["Yes" | "No"]

funded_pr =   *purchase request with a fund source*

                                partial_pr + fund_source

funds =   *funding information for SOMARDS certification*

                                trns_cd + user_auth_key + cmd_dsg + update_code +

                                blk_no + blk_tkt_dt + batch_no + rej_rept_director +

                                doc_ref_no + jo_no + eor + act_amt

inbox =   *purchase requests requiring action from user*

                                {active_pr}

inbox_inquiry =   **

                                TBD

inbox_location =   *current purchase request location*

                                TBD

item =   **

                                @line_item_no + description + unit_of_issue + qty +

                                estimated_cost + actual_cost + item_tag + acceptance +

                                item_tot_est_cost + item_tot_act_cost

items =   **

                                {item} + specifications

item_tag =   *property book officer inputs "yes" item is taggable,
                                receiving overwrites with bar_code_no*

                                ["Yes" | bar_code_no]

item_tags =   {item_tags}

item_tot_act_cost =   *line item total actual cost*

                                units: dollars

item_tot_est_cost =   *line item total estimated cost*

                                units: dollars

jo_no =   *funding job number*

                                {alphanumeric}

last_name =   *a person's last name*

                                {alphabetic_character}

line_item_no =   *line item number*

                                {numeric_digit}

mail_stop =   *mail stop or department*

                                {legal_character}

name =   **

                                first_name + last_name

nomenclature =   *SOMARDS certification comment field*

                                {alphanumeric}

office_symbol =   *ARL office symbol*

                                       "AMSRL-"   +   {alphabetic_character}   +   "-"   +
                                       {alphabetic_character}

orderable_pr =   *purchase request that can be ordered by procurement*

                                       taggable_pr + property_approval

ordered_pr =   *purchase request that has been ordered*

                                       finished_pr + delivery_date + vendor + po_number

partial_pr =   *purchase request with items and vendors filled in*

                                       blank_pr + date_required + priority_code + items + vendors

phone_no =   *a phone number*

                                       {numeric_digit}

po_number =   *purchase order number*

                                       TBD

postal_code =   *postal/zip code*

                                       {numeric_digit}

pr_authamt =   *SAACONS authorized amount*

                                       total_estimated_cost

pr_authby =   *SAACONS authorized by*

                                       TBD

pr_buyerid =   *SAACONS buyer code*

                                       saacons_buyer_code

pr_contact =   *SAACONS purchase request point of contact*

                                   requester_name

pr_details =   *details about the purchase request*

                                   TBD

pr_item =   *SAACONS purchase request item details*

                                   pr_num + splline + splum + splcost + splqty + splreqdeld +

                                   desc_text

pr_num =   *SAACONS purchase request number*

                                   doc_ref_no

pr_phone =   *SAACONS POC phone number*

                                   requester_phone_no

pr_priority =   *SAACONS priority code*

                                   priority_code

pr_reqdeld =   *SAACONS required delivery date*

                                   date_required

pr_type =   *SAACONS purchase request type*

                                   "S"

priority_code =   *request priority code*

                                   range:01 - 15, 99

                                   {numeric_digit}

property_approval =   *property book officer approval*

                                   ["Yes" I "No"]

qty =   *quantity requested*
                          {numeric_digit}

receipt =   *shipment receipt*
                          ["Yes" | "No"]

received_pr =   *purchase request that has been received*
                          ordered_pr + receipt

reconcile =   *end of the day SOMARDS reconcile info*
                          trns_cd + user_auth_key + cmd_dsg + update_code +
                          blk_no + blk_tkt_dt + batch_no + tot_blk + tot_batch +
                          ty_act_cd + cum_btch_value + variance

rejected_pr =   *purchase request that has been rejected*
                          active_pr + explanation

rej_rept_director =   *SOMARDS REJ-REPT-DIRECTOR*
                          "R"

report =   **
                          TBD

report_type =   *type of report to generate*
                          TBD

request_date =   *date purchase request was approved by supervisor*
                          date

requester_userid =   **
                          userid

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return_message =   *message returned from SOMARDS process*

["processing complete" | "bad user_auth_key" | "wrong update code" | "blk_no/blk_tkt_dt already exists" | "accounting class displayed" | "blk_no/blk_tkt_dt doesn't exist" | "invalid jo_no" | "invalid eor" | "insufficient funds" | "duplicate comt_ref_no" | "cum_btch_value" | "make changes" | "variance"]

role =   *user role*
{alphanumeric}

room_no =   *room number*
{alphanumeric}

saacons_buyer_code =   *buyer's SAACONS buyer code*
TBD

sole_source_just =   *justification for using a single vendor*
{legal_character}

special_approval =   *approval from a special approving officials*
["Yes" | "No"]

special_pr =   *purchase request with special approvals*
certified_pr + special_approval

splcost =   *SAACONS estimated item cost*
estimated_cost

spline =   *SAACONS line item number*
line_item_no

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splum =   *SAACONS unit of measure*
                               unit_of_measure

splqty =   *SAACONS quanity requested*
                               qty

splreqdeld =   *SAACONS item required delivery date*
                               date_required

state =   *state or province*
                               {legal_character}

status =   **
                               TBD

status_inquiry =   **
                               TBD

street_address =   **
                               {legal_character}

supervisory_approval =   *approval from supervisor*
                               ["Yes" | "No"]

taggable_pr =   *purchase request that has had item tags attached by
                               property book officer*
                               special_pr + item_tags

tagged_pr =   *purchase request that has been received and taggable items
                               have been appropriately tagged*
                               received_pr + item_tags

total_actual_cost =   *the total actual cost of the purchase request*

                             units: dollars

total_estimated_cost =   *the total estimated cost of the purchase request*

                             units: dollars

tot_batch =   *SOMARDS batch number*

                             units: dollars

                             ["0.00" | cum_btch_value]

tot_blk =   *SOMARDS total block*

                             units: dollars

                             ["0.00" | cum_btch_value]

trns_cd =   *SOMARDS transaction code*

                             ["003" | "004" | "310"]

ty_act_cd =   *SOMARDS action code*

                             "C"

unit_of_issue =   **

                             TBD

update_code =   *SOMARDS update code*

                             ["CM" | "NM"]

upload =   *SAACONS purchase request upload information*

                             pr_num + pr_type + pr_contact + pr_phone + pr_reqdeld +

                             pr_authamt + pr_priority + pr_authby + pr_buyerid +

                             {pr_item}

user_auth_key = *SOMARDS user authorization key*

{alphanumeric}

user_info = *user information*

name + office_symbol + phone_no + bldg_no + room_no

userid = **

{alphanumeric}

variance = *SOMARDS variance between tot_batch and cum_btch_value - should be 0.00*

units: dollars

vend_addrss1 = *SAACONS vendor address*

street_address

vend_city = *SAACONS vendor city*

city

vend_name = *SAACONS vendor name*

company_name

vend_phone = *SAACONS vendor phone number*

company_phone_no

vend_stat = *SAACONS vendor state*

state

vend_zipcode = *SAACONS vendor zip code*

postal_code

vendor =   *vendor information*

                                      company_name + company_address + company_phone_no

                                      + company_fax_no + company_poc + company_email

vendors =   *up to three suggested vendors*

                                      {vendor} + sole_source_justification

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13. ABSTRACT (Maximum 200 words)

This document contains the software requirements analysis for a prototype of BuyIt. As a component of the Corporate Business Application Software System (C-BASS), this application automates small purchase requests (under $2,500). The document follows the process of structured analysis, or step-wise refinement of requirements, as applied to the development of BuyIt. The "environmental model" includes a high-level system description, followed by a context diagram and a list of events to which the system must respond. The "behavioral model" includes a data flow diagram (DFD) for each of the seven BuyIt subsystems. From this representation, the basic functional specifications are derived and represented in structured English (or program design language). The final segment of the document includes a data dictionary.

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