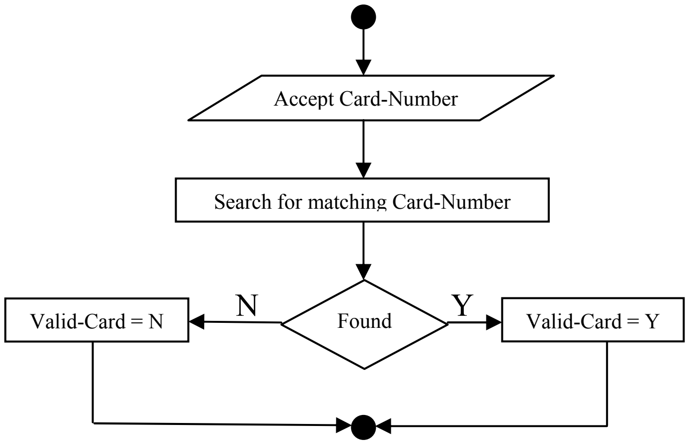
User View

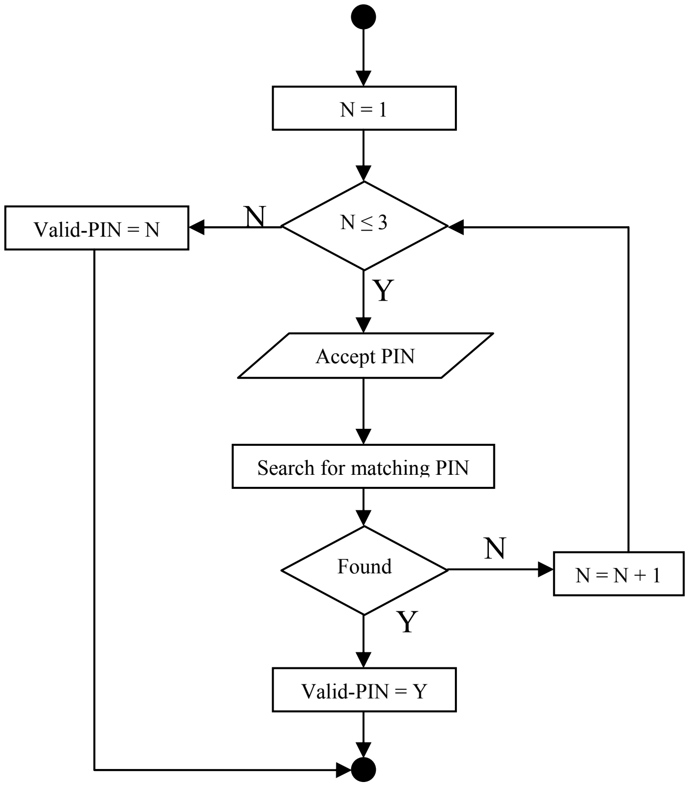
1. Insert card
2. Enter PIN
3. Select transaction type
4. Enter amount
5. Pick up cash
6. NO to “Another transaction?”
7. Pick up card

“User View” Language	“Systems View” Language
1. Insert card	1. Accept/Validate Card Number
2. Enter PIN	2. Accept/Validate PIN
3. Select transaction type	3. Accept Transaction Type
4. Enter amount	4. Accept/Validate Amount
5. Pick up cash	5. Disburse Bills
6. NO to “Another transaction?”	6. Accept Another-Transaction
7. Pick up card	7. Eject Card

Process Logic View

Why do we need to state the process in such a structured and precise manner?

User View	Process Logic View	
	Structured English Version	***Flowchart Version***
1. Insert card	1. Accept/Validate Card Number Prompt user to insert card Read Card-Number Search for matching Card-Number in stolen-cards file If found, then Valid-Card = N (keep card) Else set Valid-Card = Y	 Accept Card-Number Search for matching Card-Number Found N Y Valid-Card = N Valid-Card = Y

2.
Enter
PIN
	2. Accept/Validate PIN
	
	For up to three times:
	      Prompt user to enter PIN
	      Accept PIN
	      Search for matching PIN in customer file
	      If found, then
	             Valid-PIN = Y
	             Stop
	      Else
	             repeat
	
	Valid-PIN = N
	(keep card)
		 N = 1
		N ≤ 3
		N
		Valid-PIN = N
		Y
		Accept PIN
		Search for matching PIN
		Found
		N
		N = N + 1
		Y
		Valid-PIN = Y

User View	***Structured English Version***	
3. Select transaction type	3. Accept Transaction Type	

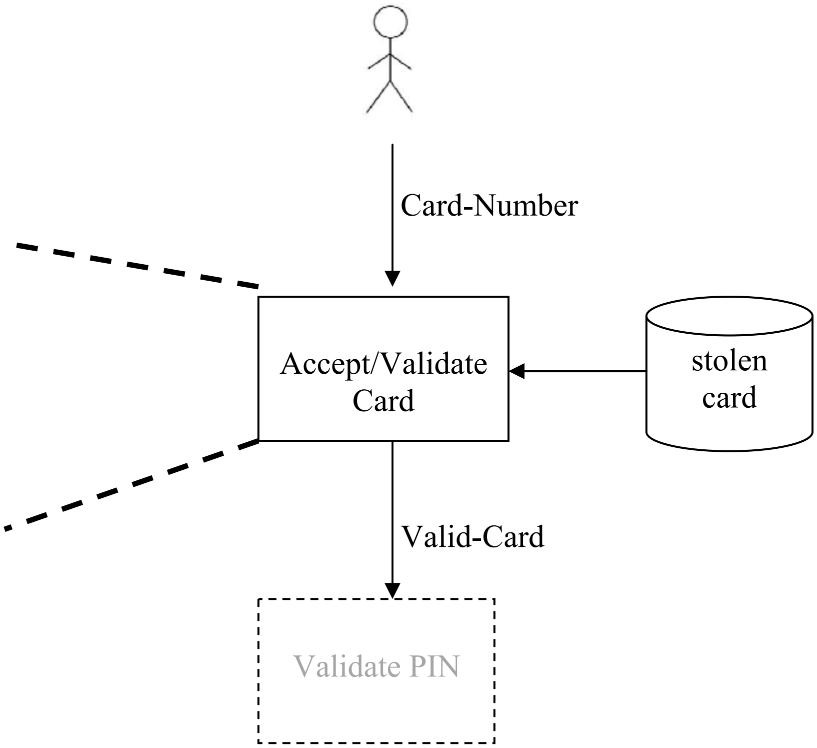
4. Enter amount	4. Accept/Validate Amount	4.1. Validate Amount/20
		
		For up to three times:
		    Prompt user to enter amount
		    Accept amount
		    If amount is a multiple of 20, then
		        amount/20 = Y
		        Stop
		    Else
		        Produce the multiple-of-20 message
		        repeat
		
		Eject card

		4.2. Validate Amount/maximum-daily-withdrawal-allowed (MDWA) amount + amount-already-withdrawn-today = total-day-withdrawal If total-day-withdrawal > maximum-daily-withdrawal-allowed then Produce the MDWA-exceeded message (Eject card) Else amount/MDWA = Y
		4.3. Validate Amount/balance Retrieve account-balance If amount > account-balance then Produce insufficient-funds message Else amount/balance = Y Eject card
5. Pick up cash	5. Disburse Bills Send dispense command to the cash dispensing unit, with number-of-bills = amount/20 Update customer’s balance	
6. NO to “Another transaction?”	6. Accept Another-Transaction	
7. Pick up card	7. Eject Card	

Process Logic View

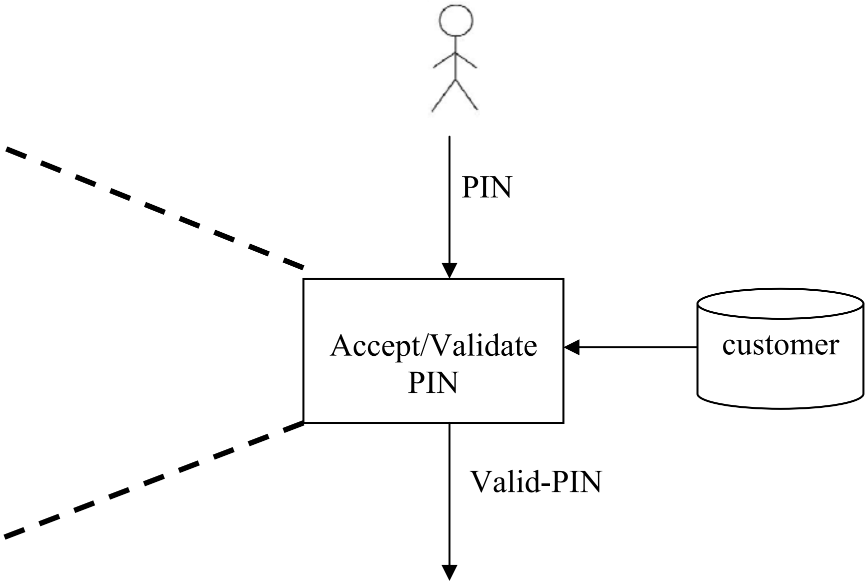
Data Flow View

```
Prompt user to insert card
Read Card-Number
Search for matching Card-Number in stolen-cards file
If found, then
        Valid-Card = N
        (keep card)
Else
        set Valid-Card = Y
```



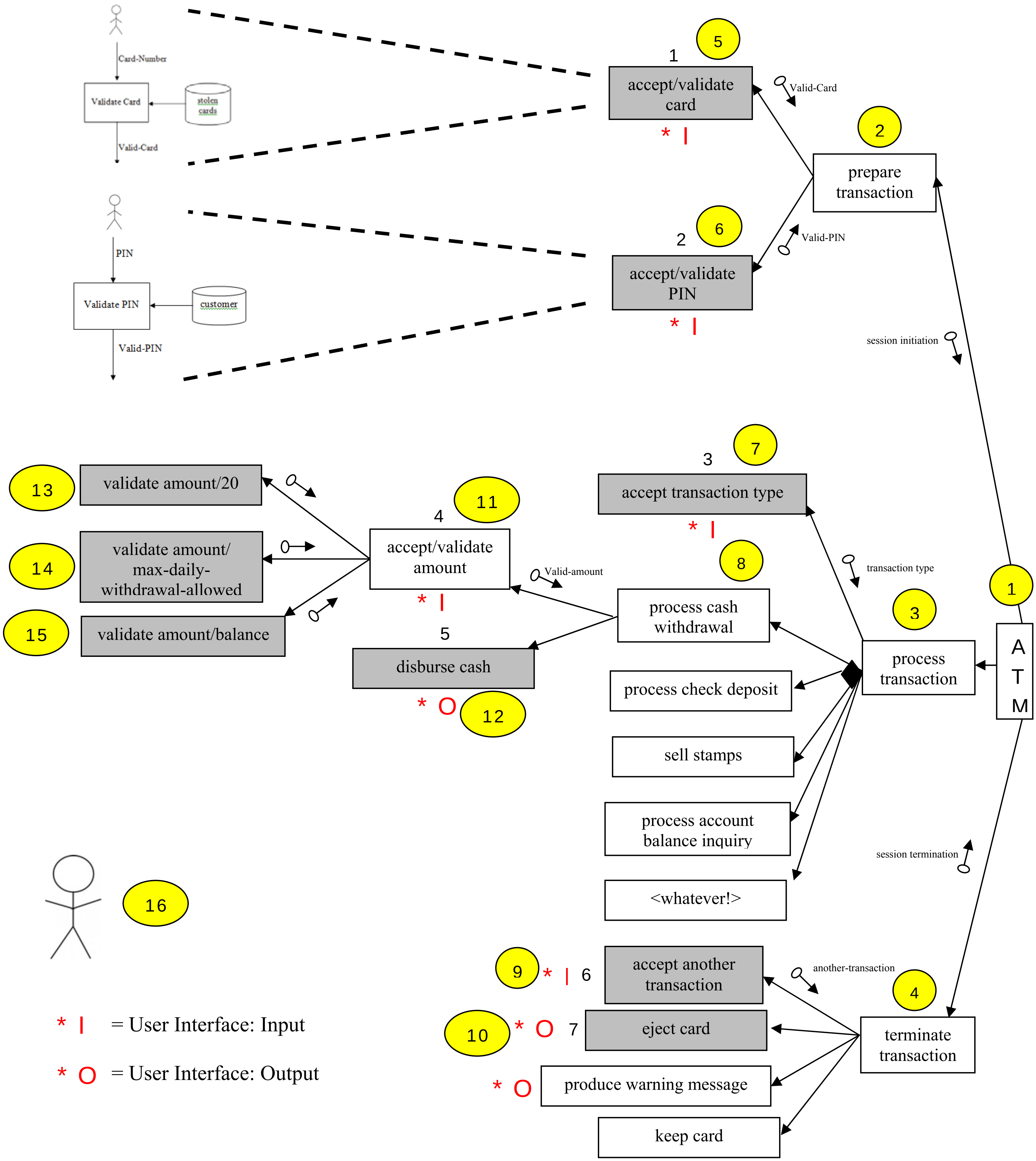
```
For three times:
      Prompt user to enter PIN
      Accept PIN
      Search for matching PIN in customer file
      If found, then
            Valid-PIN = Y
            Exit
      Else
            repeat

Valid-PIN = N
```



Data Flow View

Program Structure View



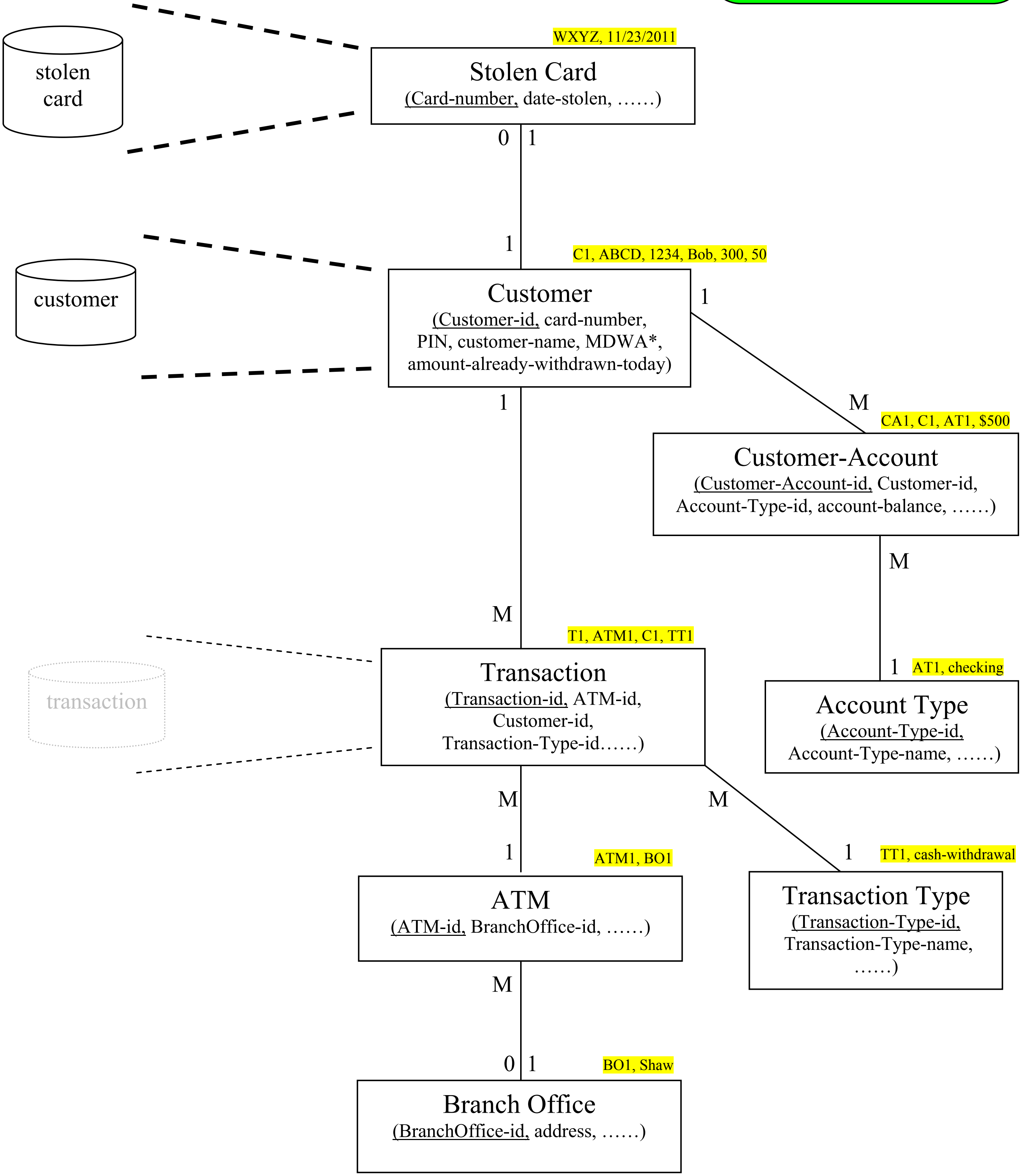
* I = User Interface: Input

* O = User Interface: Output

Database Structure View

Data Entered

Card number: ABCD
PIN: 1234
Transaction Type:
Cash withdrawal from checking
Amount: $200



WXYZ, 11/23/2011

Stolen Card
(Card-number, date-stolen, ……)

C1, ABCD, 1234, Bob, 300, 50

Customer
(Customer-id, card-number, PIN, customer-name, MDWA*, amount-already-withdrawn-today)

CA1, C1, AT1, $500

Customer-Account
(Customer-Account-id, Customer-id, Account-Type-id, account-balance, ……)

AT1, checking

Account Type
(Account-Type-id, Account-Type-name, ……)

T1, ATM1, C1, TT1

Transaction
(Transaction-id, ATM-id, Customer-id, Transaction-Type-id……)

ATM1, BO1

ATM
(ATM-id, BranchOffice-id, ……)

TT1, cash-withdrawal

Transaction Type
(Transaction-Type-id, Transaction-Type-name, ……)

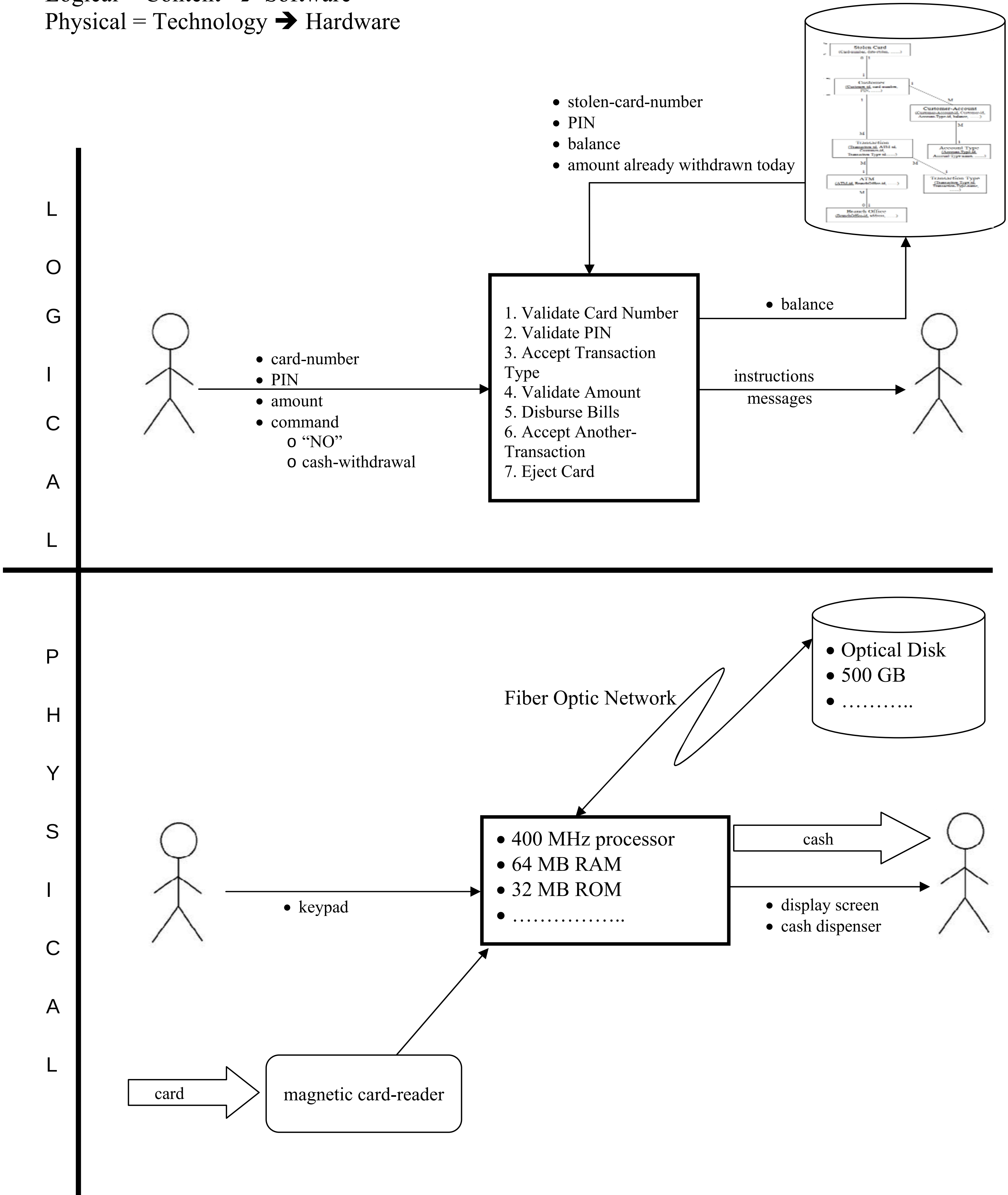
BO1, Shaw

Branch Office
(BranchOffice-id, address, ……)

* MDWA = **M**aximum **D**aily **W**ithdrawal **A**llowed

ATM : *Logical Level* vs. *Physical Level*

Logical = Content ➔ Software
Physical = Technology ➔ Hardware



LOGICAL

- stolen-card-number
- PIN
- balance
- amount already withdrawn today

- card-number
- PIN
- amount
- command
  - o "NO"
  - o cash-withdrawal

1. Validate Card Number
2. Validate PIN
3. Accept Transaction Type
4. Validate Amount
5. Disburse Bills
6. Accept Another-Transaction
7. Eject Card

- balance

instructions
messages

PHYSICAL

Fiber Optic Network

- Optical Disk
- 500 GB
- ………..

- 400 MHz processor
- 64 MB RAM
- 32 MB ROM
- ……………..

- keypad

cash

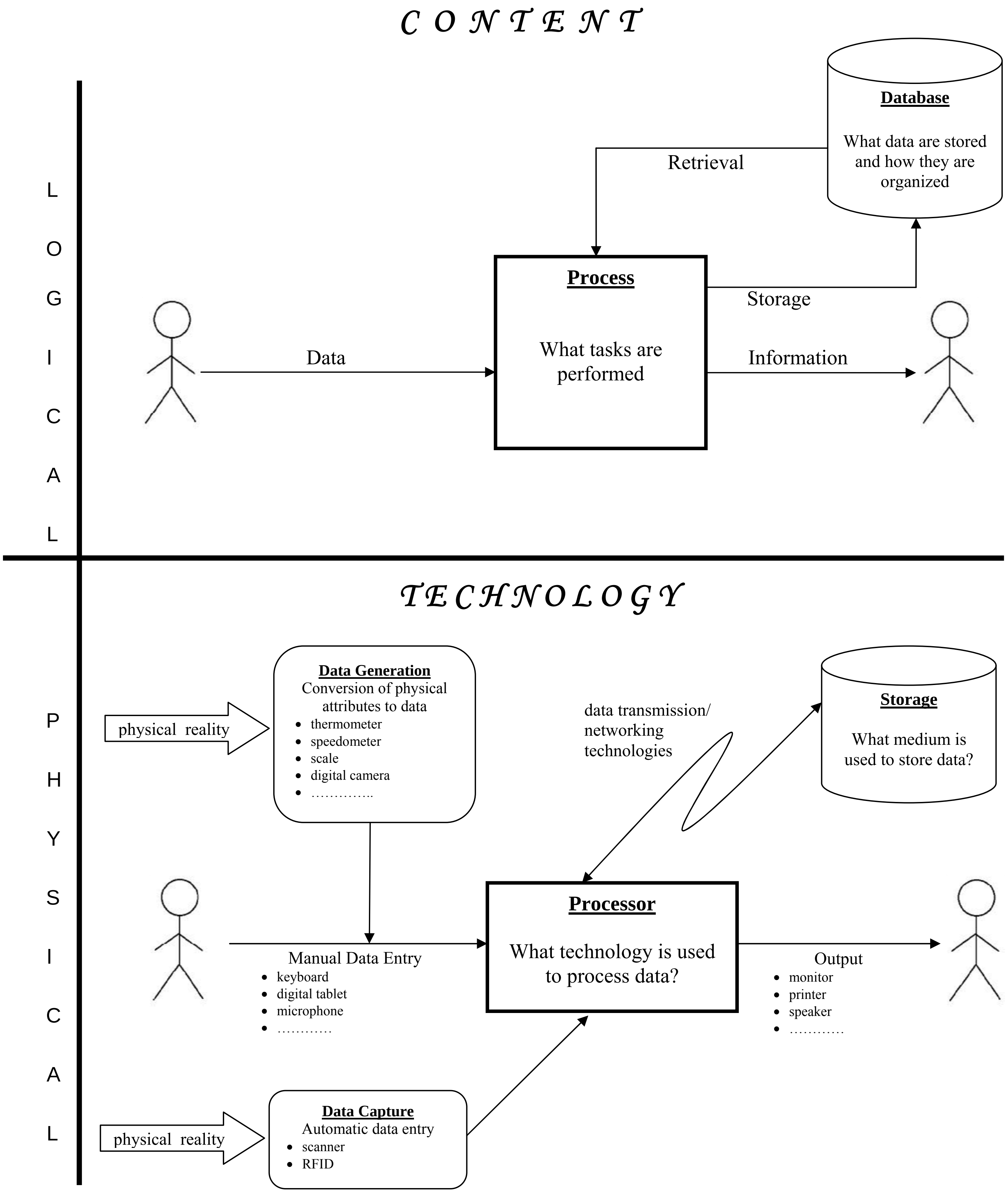
- display screen
- cash dispenser

card

magnetic card-reader

Stolen Card
(Card-number, date-stolen, ...)
0
1
1
Customer
(Customer-id, card number, PIN, ...)
1
1
M
Customer-Account
(Customer-Account-id, Customer-id, Account-Type-id, balance, ...)
M
1
Account Type
(Account-Type-id, Account-Type-name, ...)
M
Transaction
(Transaction-id, ATM-id, Customer-id, Transaction-Type-id......)
M
M
1
1
ATM
(ATM-id, BranchOffice-id, ...)
Transaction Type
(Transaction-Type-id, Transaction-Type-name, ...)
M
0
1
Branch Office
(BranchOffice-id, address, ...)

Information Systems: *Logical Level* vs. *Physical Level*



CONTENT

LOGICAL

Database

What data are stored and how they are organized

Retrieval

Process

What tasks are performed

Storage

Data

Information

TECHNOLOGY

PHYSICAL

physical reality

Data Generation

Conversion of physical attributes to data

- thermometer
- speedometer
- scale
- digital camera
- …………..

data transmission/ networking technologies

Storage

What medium is used to store data?

Processor

What technology is used to process data?

Manual Data Entry

- keyboard
- digital tablet
- microphone
- …………

Output

- monitor
- printer
- speaker
- …………

physical reality

Data Capture

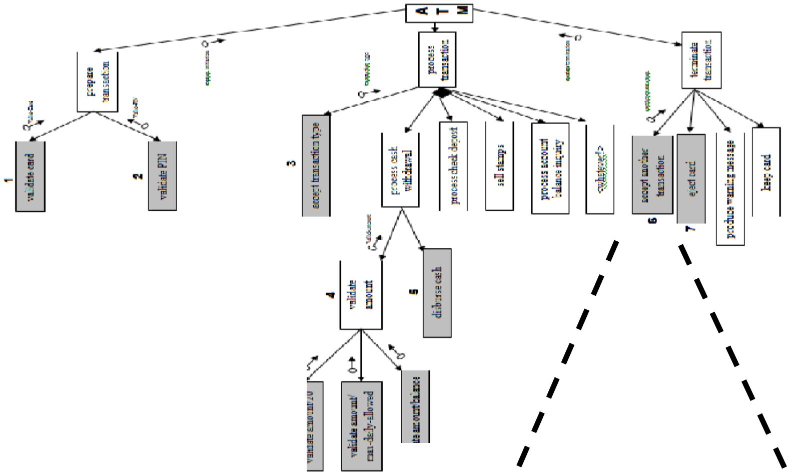
Automatic data entry

- scanner
- RFID

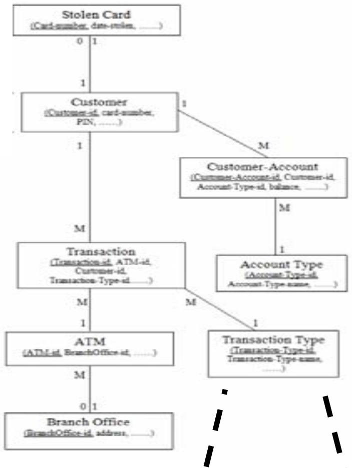
Dimensions

STRUCTURE

Program Structure View

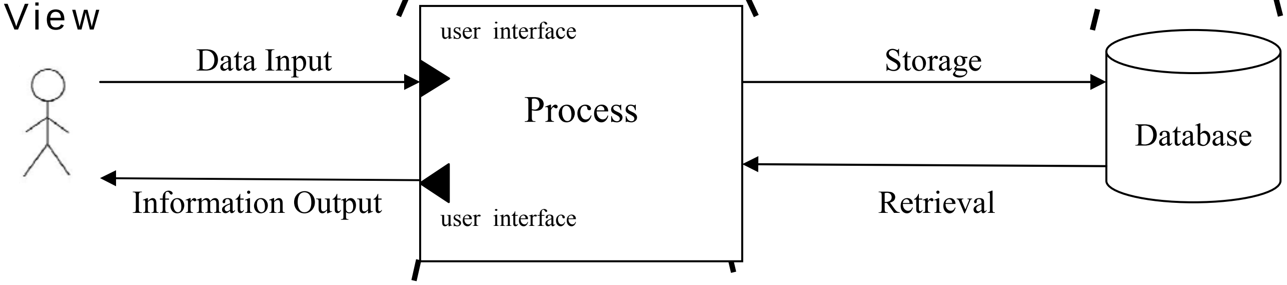


Database Structure View

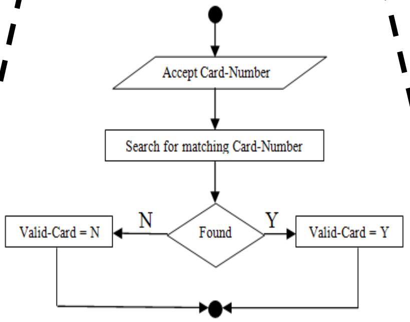

Stolen Card
(Card-number, date-stolen, ...)
0 1
1
Customer
(Customer-id, card-number, PIN, ...)
1
M
Customer-Account
(Customer-Account-id, Customer-id, Account-Type-id, balance, ...)
M
1
Account Type
(Account-Type-id, Account-Type-name, ...)
1
M
Transaction
(Transaction-id, ATM-id, Customer-id, Transaction-Type-id ....)
M
1
ATM
(ATM-id, BranchOffice-id, ...)
M
0 1
Branch Office
(BranchOffice-id, address, ...)
M
1
Transaction Type
(Transaction-Type-id, Transaction-Type-name, ...)

FLOW

Data Flow View



Process Flow/Logic View


Accept Card-Number
Search for matching Card-Number
Found
N
Y
Valid-Card = N
Valid-Card = Y