



西安电子科技大学  
XIDIAN UNIVERSITY

# 02

## 系统分析与设计 (SYSTEM ANALYSIS AND DESIGN)

### Information System Building Blocks

# Content Structure

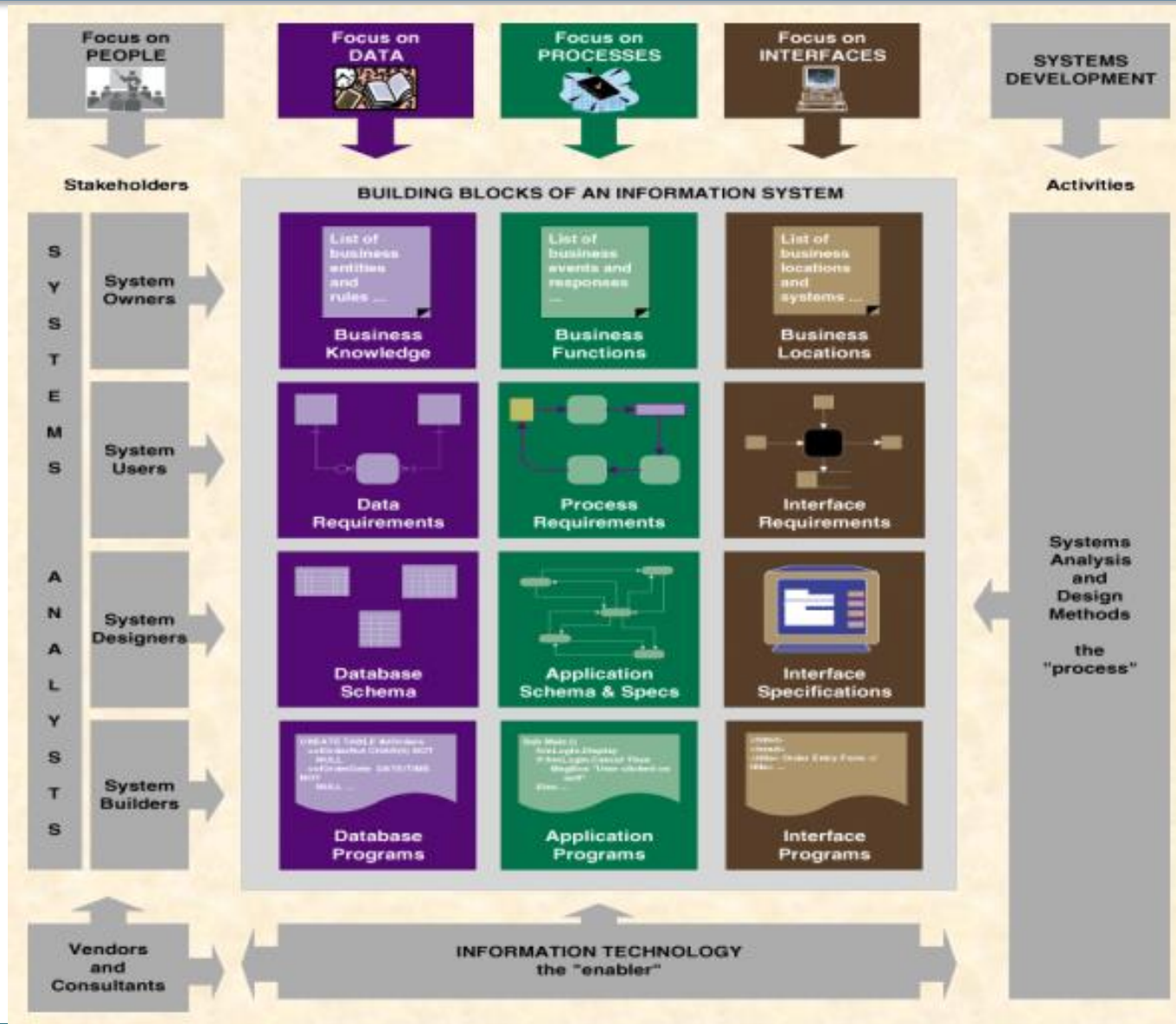
## ❁ The Product – Information Systems

- 数据与信息区别与联系；
- 前台系统与后台系统；
- 信息系统的主要种类。

## ❁ A Framework for Information Systems Architecture

- 信息系统的组成部件与体系结构；
- 三种组成部件：数据、处理、界面 / 接口；
- 与三种组成部件相关的通信；
- 不同的角色在关注这些组成部件和通信时，有不同的结果。

# Chapter Map





# **The Product – Information Systems**



# Data and Information

✿ **Data** are raw facts about the organization and its business transactions. Most data items have little meaning and use by themselves.

✿ **Information** is data that has been refined and organized by processing and purposeful intelligence. The latter, purposeful intelligence, is crucial to the definition—People provide the purpose and the intelligence that produces true information.

# Data and Information

❁ **Data** are raw **Data**  
*Raw*

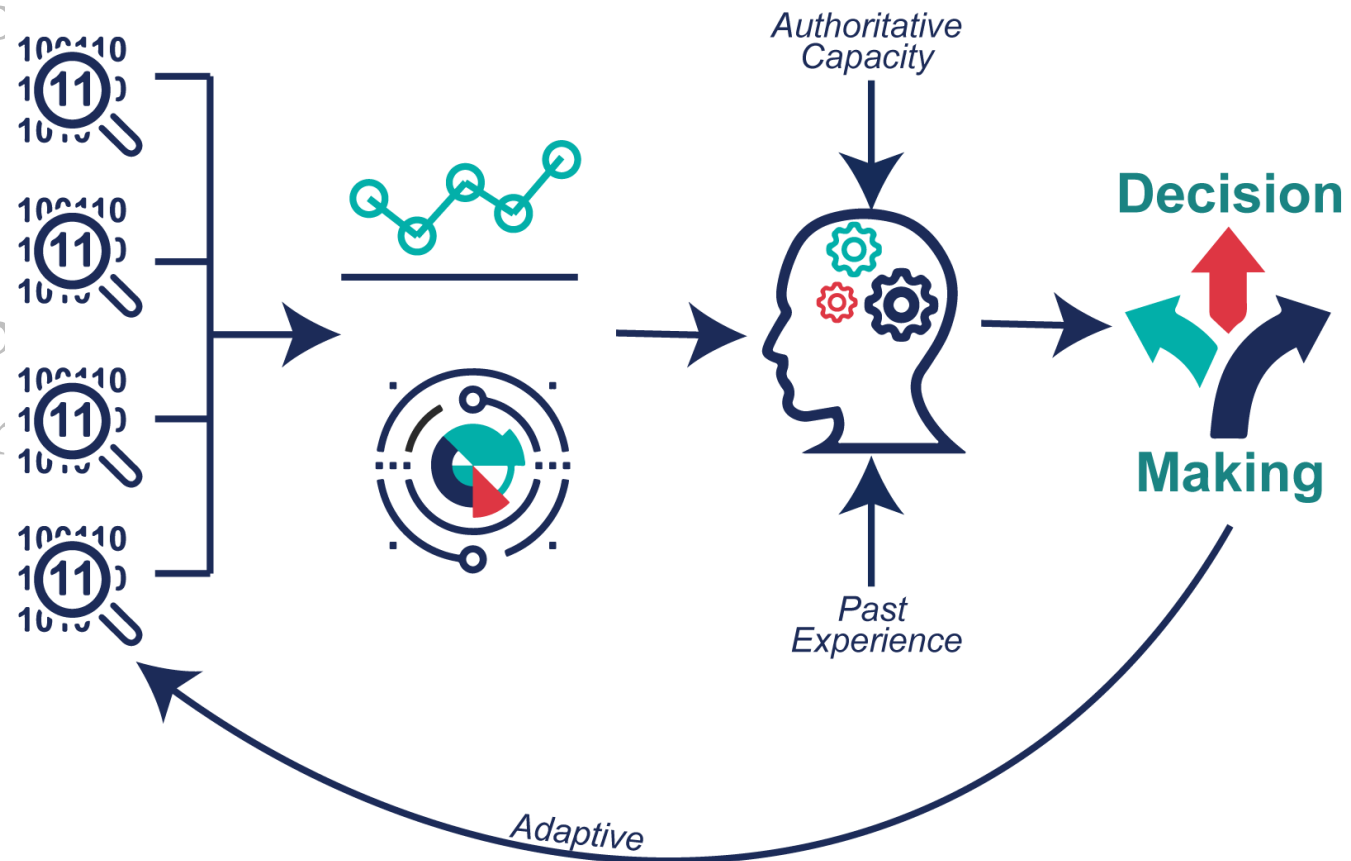
transactions. Mc  
themselves.

❁ **Information**

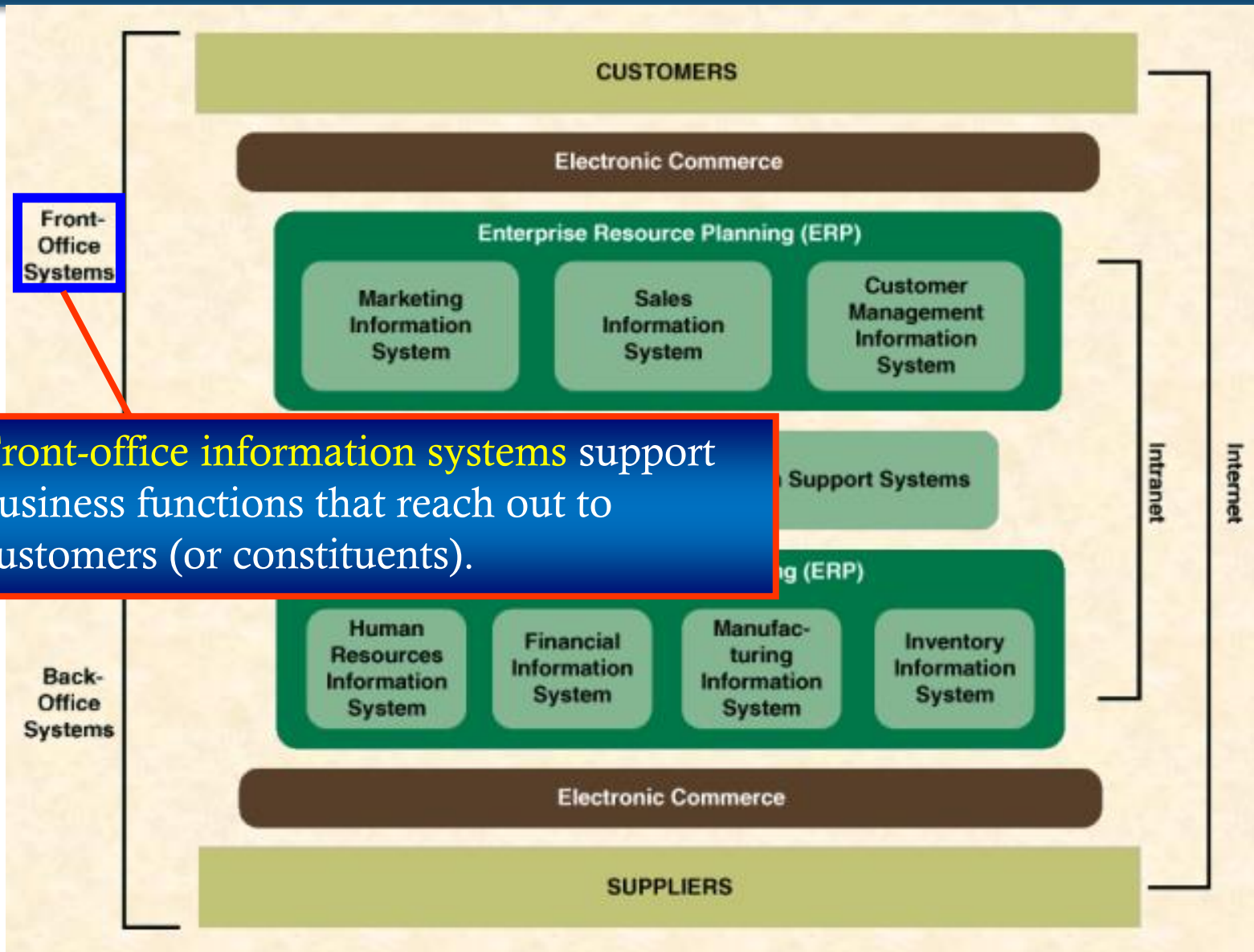
processing and p  
intelligence, is cr  
purpose and the

**Information**  
*Processed*

**Knowledge**  
*Actionable*

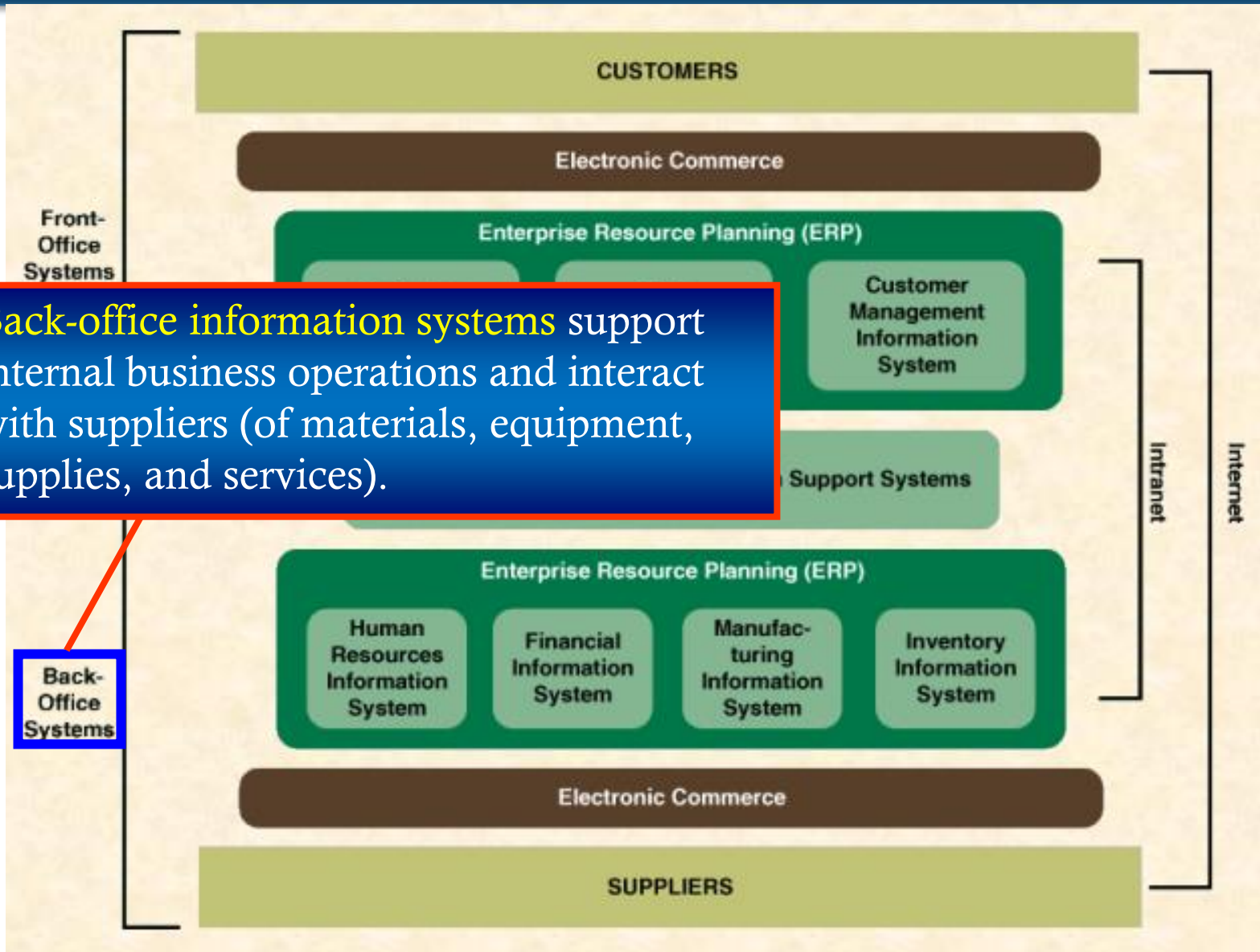


# A Federation of Information Systems



# A Federation of Information Systems

- Back-office information systems support internal business operations and interact with suppliers (of materials, equipment, supplies, and services).





# Classes of Information Systems

- ❁ Transaction processing systems
- ❁ Management information systems
- ❁ Decision support systems
- ❁ Expert systems
- ❁ Office automation systems

# Transaction Processing Systems

✿ **Transaction processing systems** are information system applications that capture and process data about business transactions (events that sever the mission of the business).

# Transaction Processing Systems

✿ Transaction processing systems are information system applications that process transactions (even

## Examples

- ◆ Airline reservations (航班预订)
- ◆ Bank deposits and withdrawals (银行存取款)
- ◆ Course registration (课程注册)
- ◆ Customer returns (客户统计表)
- ◆ Hotel check-in/check-out (宾馆入住与结帐)
- ◆ Inventory procurement (库存采购)
- ◆ Invoicing or billing (开发票或报帐)
- ◆ Order processing (订单处理)
- ◆ Payroll (工资表)
- ◆ Retail point-of-sale ( POS零售)
- ◆ Supplies procurement (补给品采购)

# Transaction Processing Systems

The screenshot displays a web application for managing transactions. The left sidebar contains navigation links: Inbox, Reports, Orders (highlighted), Customers, Returns, Shipments, Products, Purchases, Suppliers, Integrations, and App Store. At the bottom of the sidebar, it indicates '15 Days Left in Free Trial' with options to 'Start Subscription' or 'Clear Demo Data', and a 'Settings' link at the very bottom.

The main content area is titled 'Orders' and features a 'Sort by' dropdown. It is divided into three columns: 'To Confirm', 'To Ship', and 'Now Shipping'.

**To Confirm** (Sort by):

- A yellow banner states: 'All 50 Orders on this page are selected. Select all 87 Orders in To Confirm.'
- Fannie Jimenez** (WooCommerce, #23520) for AUD 584.64. Status: Missing info.
- Hugh Kelly** (Shopify, #23518) for USD 4454.12. Status: Backordered, Urgent, Due Today. 3 comments.
- John Mark** (WooCommerce, #23520) for AUD 2584.64. Status: Missing info. Added Today. 0 comments. Details: Ref. #1548210, St.O #1548210, Ship. FedEx One Day Delivery. Items: iPhone X (256 GB, Space Grey) x1, MacBook Pro 15" Early 2017 (2.8 GHz, Space Grey) x1, + 1 More.
- Fannie Jimenez** (WooCommerce, #23520) for AUD 584.64.

**To Ship** (Newest):

- Jonathan Howard** (eBay, #23509) for GBP 801.73. Status: Partially shipped.
- Betty Edwards** (Orderhive, #23518) for USD 4454.12. Status: Backordered. Due 12 Oct. 0 comments.
- Steve Parker** (eBay, #21549) for GBP 101.00. Status: Partially shipped.
- Jeny Tailor** (Orderhive, #12364) for USD 2254.45. Status: Backordered. Due 12 Oct. 0 comments.

**Now Shipping**:

- Emma Casey** (CS-Cart)
- Betty Wilkerson** (Amazon)
- Warren Cox** (Etsy)
- Lillie Patton** (WooCommerce)
- Kenneth Garner** (Shopify)
- Alfred Goodwin** (Amazon)
- Jay Blair** (eBay)
- Tyler Russell** (CS-Cart)
- Marvin Garrett** (eBay)

At the bottom of the main area are '+ Add' and 'Search' buttons.

# Management Information Systems

- ❁ A **management information system** (MIS) is an information system application that provides for management-oriented reporting. These reports are usually generated on a predetermined schedule and appear in a prearranged format.
- ❁ MIS can present detailed information, summary information and exception information.

# Management Information Systems

- ✿ A management information system (MIS) is an information system application that provides information for management reporting. These reports are used for decision making, planning, scheduling and other management activities.
- ✿ MIS can present information in a variety of ways, including graphical and exception information.

## Examples

- ◆ Budget forecasting and analysis (预算预测与分析)
- ◆ Financial reporting (财务报告)
- ◆ Inventory reporting (库存报告)
- ◆ Materials requirements planning (材料需求计划)
- ◆ Production scheduling (生产调度)
- ◆ Salary analysis (薪金分析)
- ◆ Sales forecasting (销售预测)
- ◆ Sales reporting (销售报告)
- ◆ Schedule of classes (排课)

# Management Information Systems

## Shipping Status Dashboard

Klipfolio

### Orders

Filter Order Status: Backordered

Customer	Order Status	Order Date
Testa Inc.	Backordered	May 10, 2016
Weldon	Backordered	May 9, 2016
Johnny's	Backordered	May 5, 2016
Testa Inc.	Backordered	May 4, 2016
Weldon	Backordered	May 3, 2016
Testa Inc.	Backordered	May 3, 2016
Welltown Inc.	Backordered	May 2, 2016
Richards Brothers	Backordered	May 1, 2016

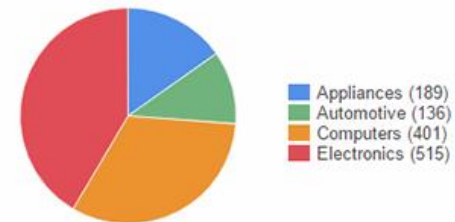
### Volume Today

Orders to Ship	Overdue Shipments	Open POs	Late Vendor Shipments
106	20	198	12

### Inventory

Category	Product	SKU	In Stock
Electronics	Sony Bravia KDL-42V4100	789451	106
Electronics	LG 42PQ60	874842	12
Electronics	Sharp LC46D65U	874101	8
Electronics	Samsung LN46A750	711238	87
Electronics	Apple iPod Classic 120 GB	611235	

### Global Financial Performance



### KPIs - Monthly

	Metric	This Month	Past Month	Change	Past 30 Days
▲	Inventory	\$826,905	\$754,638	10%	
▼	Shipping Costs	\$23,092	\$25,748	-10%	
—	Perfect Order ...	94.5%	94.1%	0%	
—	Back Order Ra...	12.1%	12.5%	-3%	
—	Warehouse Ca...	98.0%	95.4%	3%	

# Decision Support Systems

- ✿ A **decision support system** (DSS) is an information system application that provides its users with decision-oriented information whenever a decision-making situation arises. When applied to executive managers, these systems are sometimes called executive information systems (EIS).
  - A **data warehouse** is a read-only, informational database that is populated with detailed, summary, and exception data and information generated by other transaction and management information systems. The data warehouse can then be accessed by end-users and managers with DSS tools that generate a virtually limitless variety of information in support of unstructured decisions.



# Decision Support Systems

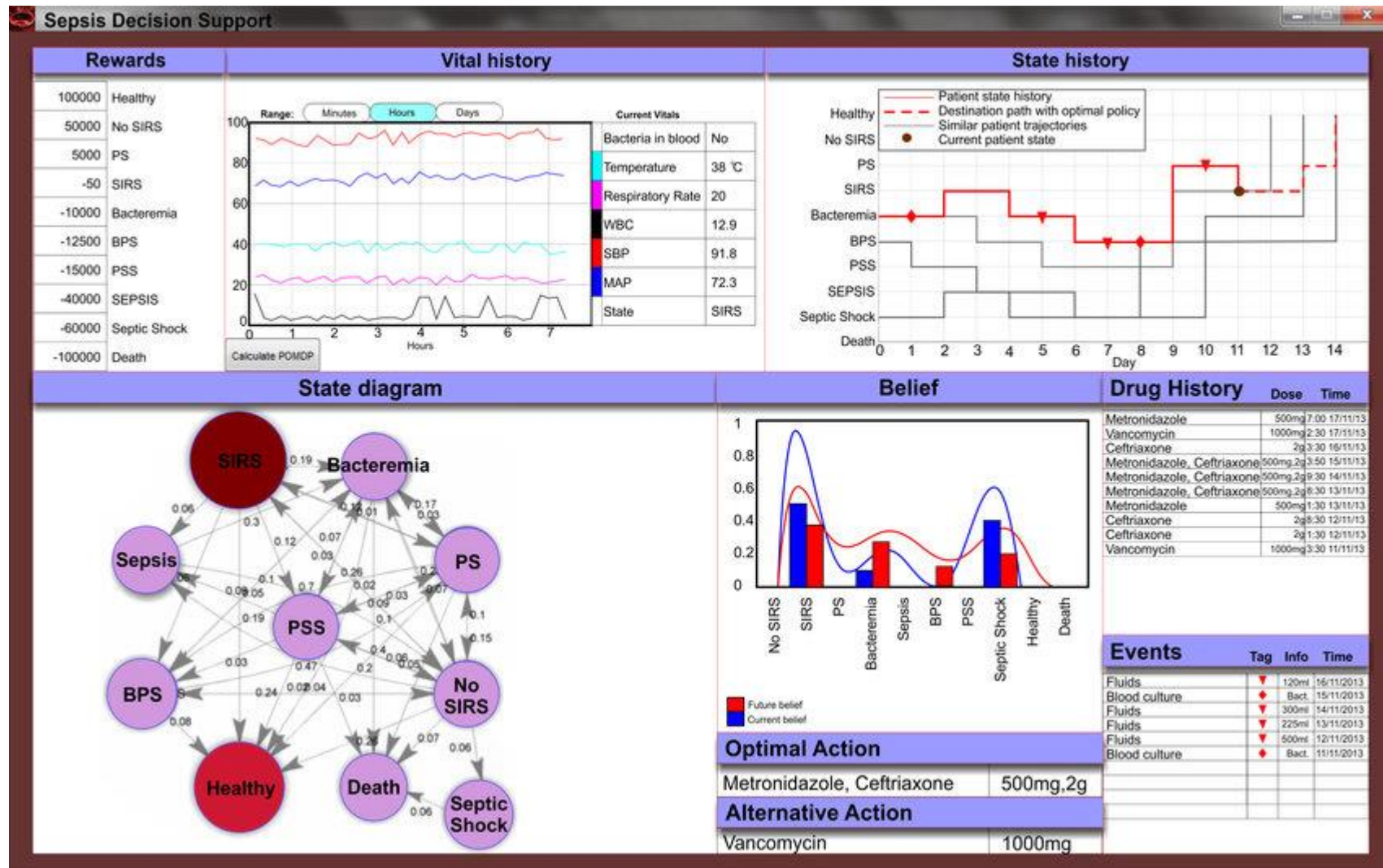
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- A **data warehouse** is a database that stores data and information from multiple sources for management and analysis. It can be accessed by users to generate a virtual view of unstructured data.

## Types of support to the decision maker

- ◆ Identification of problems or decision-making opportunities.
- ◆ Identification of possible solutions or decisions.
- ◆ Access to information needed to solve a problem or make a decision.
- ◆ Analysis of possible decisions or of variables that will affect a decision.
- ◆ Simulation of possible solutions and their likely results.

# Decision Support Systems



# Expert Systems

✿ An **expert system** is a **programmed** decision-making information system that captures and reproduces the knowledge and expertise of an expert problem solver or decision maker and then simulates the “thinking” or “actions” of that expert.

# Expert Systems

Bookmydoc

admin

Online

MAIN NAVIGATION

Patient Details

Doctor Details

Clinic Details

Medical Center Details

Hospital Details

Manage Location

Manage Additional Details

Settings

Rating Details

Doctor Appointment Details

View Patient Details

Home > Patient Details > View Patient Details

View Patient Details

Show 10 entries

Search:

Patient Firstname	Patient Lastname	Email	Patient Sex	Terms	Action
ron	weasley	patient@bookmydoc.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
voja	teja	voja@gmail.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
Nixon	Solomon	nixones@gmail.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
girijesh	ganesh	girijesh.techware@gmail.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
anoop	aa	a@gmail.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
praveen	john	praveen@gmail.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
jainy	joseph	jainymol@techware.in	female	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
mathew	mathew	mathew@gmail.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
kiran	kiran	kiran@gmail.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>
raju	shun	raju.shun@live.com	male	agreed	<div>View</div> <div>Edit</div> <div>Delete</div>

# Office Automation Systems

❁ **Office automation** (OA) systems support the wide range of business office activities that provide for improved work flow and communications between workers, regardless of whether or not those workers are located in the same office.


# Office Automation Systems

❁ Office automation (OA) systems support the wide range of business office activities that provide for improved work flow and communications between those workers are local or not







## To support both individuals and work groups



- ♦ **Personal information systems** are those designed to meet the needs of a single user. They are designed to boost an individual's productivity.
- ♦ **Work group information systems** are those designed to meet the needs of a work group. They are designed to boost the group's productivity.

# Office Automation Systems

PortalFlowReportBranchSynergyPlanSurvey

Popular: Address Book Report Travel





Notice

Summary

More

[Notice]

Conduct attendance check in December

2016-11-28

[summary]

Learn the President's Speech

2016-11-28

Annual Employee Business Insurance Plan

2016-11-28

Notice of preparation of annual budget


2016-11-28

Notice of Heyu Real Estate Audit

2016-11-28


News

More



Shang Yi HaoInto the city  
This is one market that is hot

This is one market that is hot, 3 days of sales 180 million



knowledge

More

[system]

Attendance check knowledge

2016-11-28

[plan]

Group Management Knowledge

2016-11-28

Employee Insurance Knowledge

2016-11-28

System Knowledge Tree


2016-11-28

Personnel System Management Training

2016-11-28


Appointment

More




About three project appointment

2016-11-28



A technical department appointment

2016-11-28



About the Ministry of personnel appointment

2016-11-28

Culture

Activity

Magazine

More

[Magazine]

Attendance Behavior Check

2016-11-28

[Culture]

Speech by Group President

2016-11-28

[Magazine]

Commercial Insurance Scheme

2016-11-28

About the establishment


2016-11-28

Transport Group's Activities


2016-11-28

Document


More




system




Document




contract




operation




Name card



Dispatch



summary



Data

Tender notice

Cooperation

Guidelines

More

[Tender]

Notice of tendering units for supply projects

2016-11-28

[Guide]

A bridge and three low-income housing projects to recruit water notice

2016-11-28

[co]

Notice of Intelligent Home Project Recruitment and Bidding Unit

2016-11-28

Notice of Recruitment of CFG Pile Bidding Units for Banqiao School Project

2016-11-28


Notice of Recruitment and Bidding Units for Distribution Box Manufacturers of Heyu Real Estate Project

2016-11-28

Couple


Recruit

More




Purchasing Manager - Nie Yaman

2016-11-28



Sales Representative Xia Denggang

2016-11-28

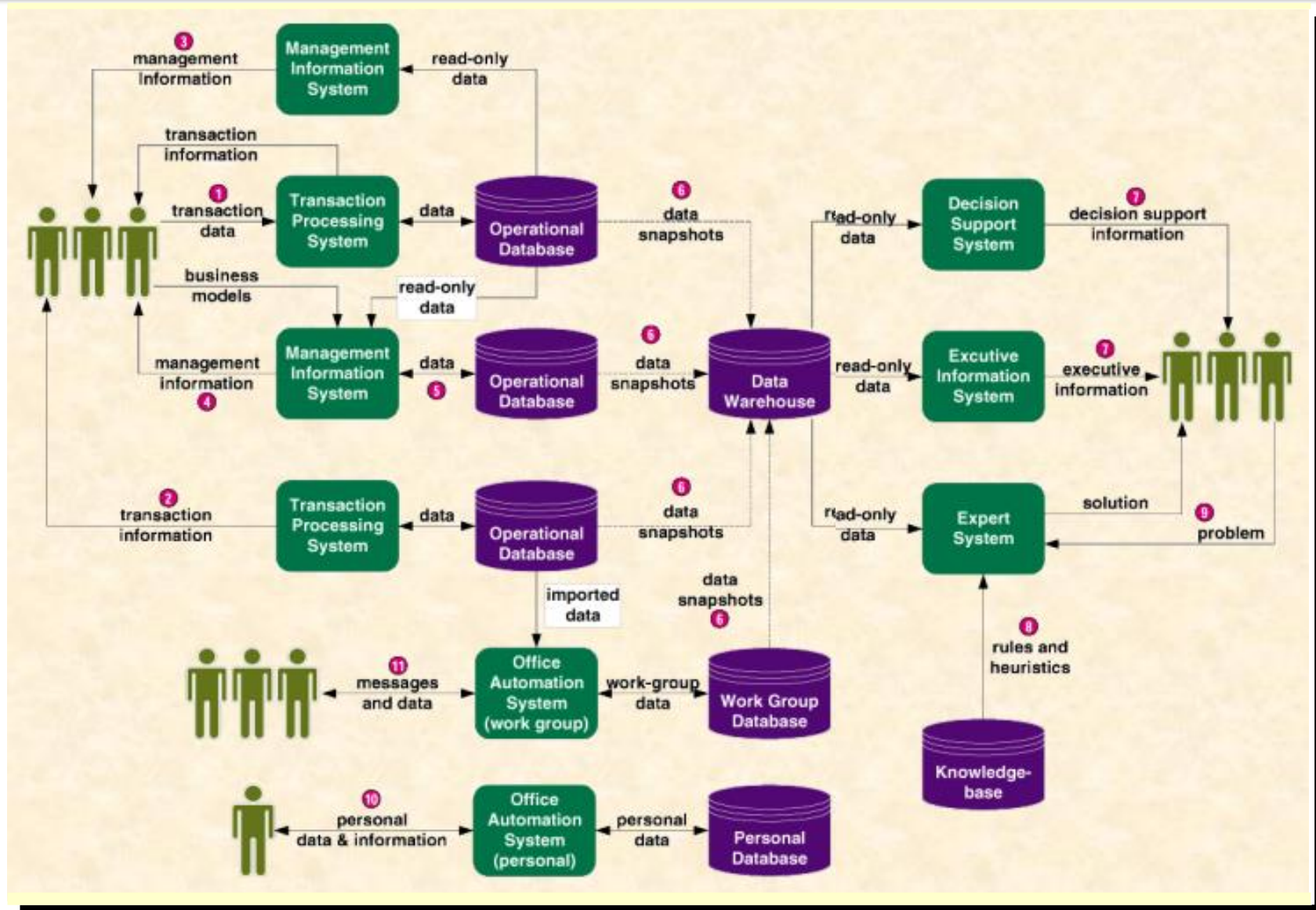


Sales Representative - Zhao Peng


2016-11-28



# Putting It All Together







# **A Framework for Information Systems Architecture**

# Information Systems Architecture

## ✿ Information Systems Architecture

- **Information systems architecture** provides a unifying framework into which various people with different perspectives can organize and view the fundamental building blocks of information systems.

## ✿ The *Zachman* Framework

- This framework is a matrix.
- The rows correspond to **perspectives** of different people involved in systems development and use.
- The columns correspond to **focuses** on different aspects of the information system.

# Zachman Framework

## The Zachman Framework for Enterprise Architecture™ The Enterprise Ontology™

Version 3.0



# Perspectives or Stakeholders

- ❁ **System owners** pay for the system to be built and maintained. They own the system, set priorities for the system, and determine policies for its use. In some cases, system owners may also be system users.
- ❁ **System users** actually use the system to perform or support the work to be completed. System users define the business requirements and performance expectations for the system to be built.
- ❁ **System designers** are the technical specialists who design the system to meet the users' requirements. In many cases, system designers may also be system builders.

# Perspectives or Stakeholders

- ❁ **System builders** are the technical specialists who construct, test, and deliver the system into operation.
- ❁ **Systems analysts** facilitate the development of information systems and computer applications by **bridging the communications gap** that exists between nontechnical system owners and users and technical system designers and builders.
- ❁ **IT vendors and consultants** sell hardware, software, and services to businesses for incorporation into their information systems.

Note: **These are roles, not positions or job titles.**

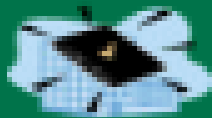
# Focuses for Information Systems

## Focus on DATA



☼ **Data** — the raw material used to create useful information.

## Focus on PROCESSES



☼ **Processes** — the activities (including management) that carry out the mission of the business.

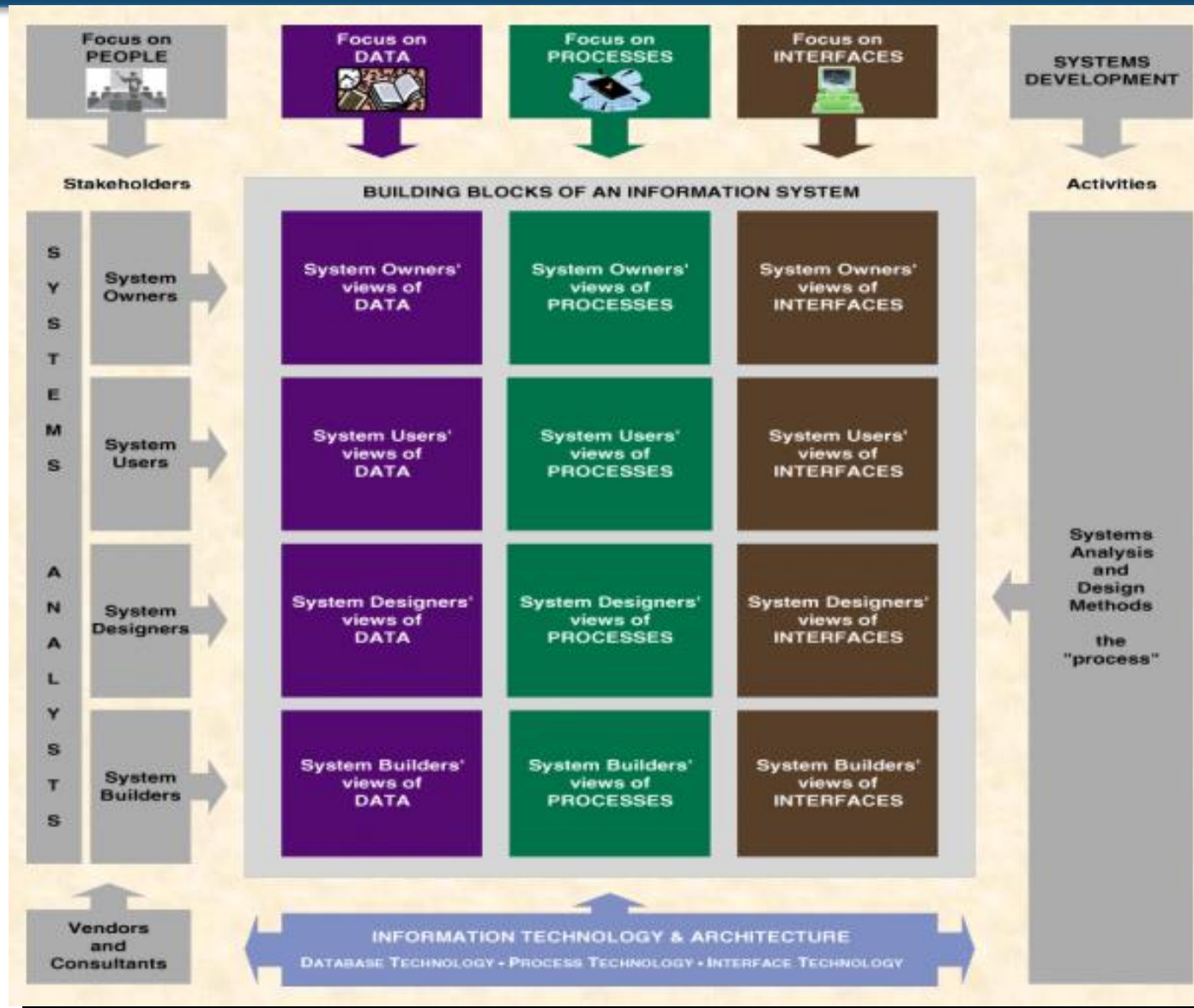
## Focus on INTERFACES



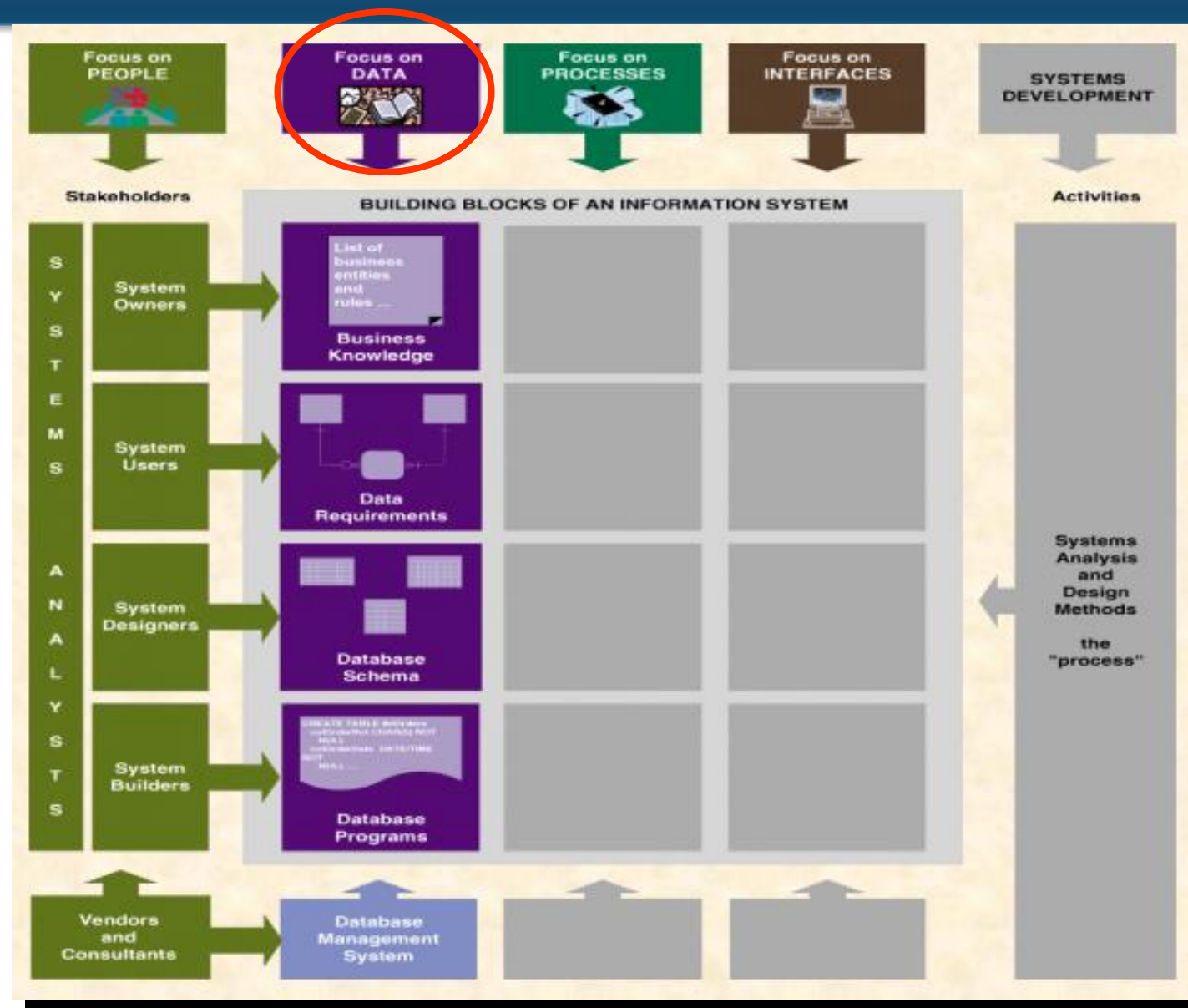
☼ **Interfaces** — how the system interfaces with its users and other information systems.



# Information System Building Blocks

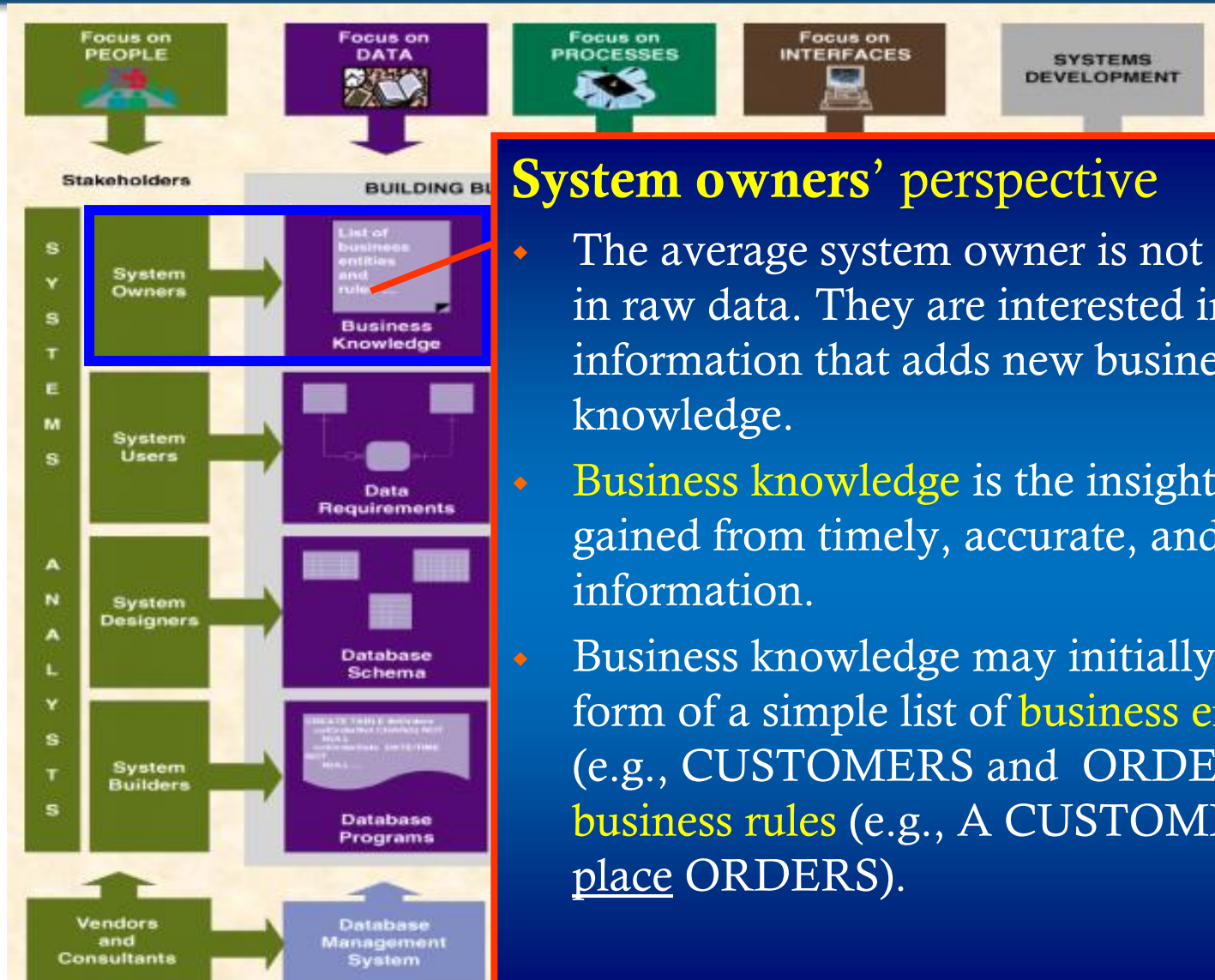


# The DATA Focus





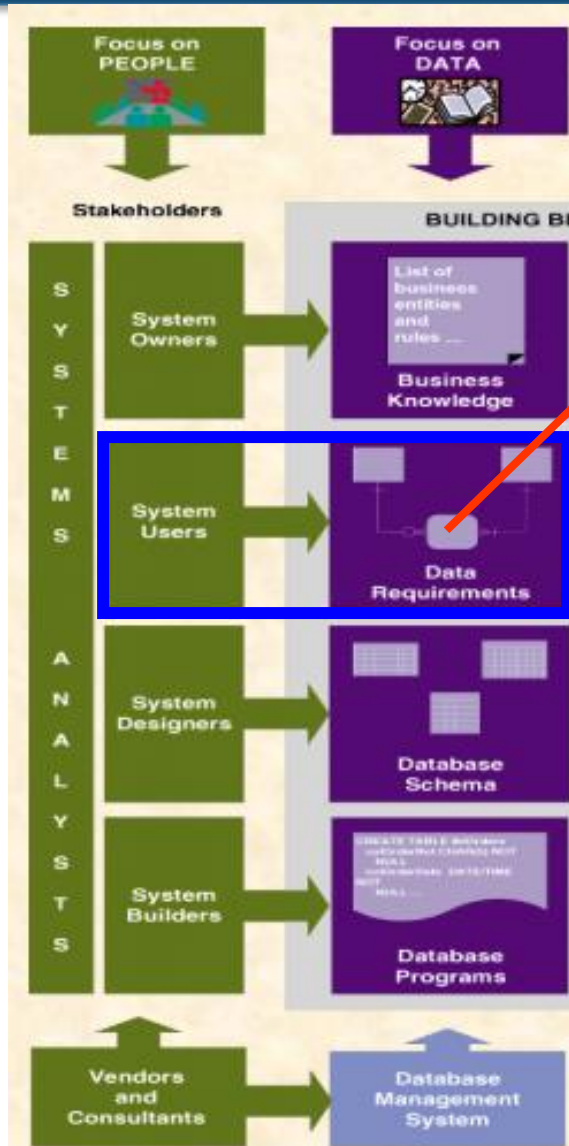
# The DATA Focus



## System owners' perspective

- ♦ The average system owner is not interested in raw data. They are interested in information that adds new business knowledge.
- ♦ **Business knowledge** is the insight that is gained from timely, accurate, and relevant information.
- ♦ Business knowledge may initially take the form of a simple list of **business entities** (e.g., CUSTOMERS and ORDERS) and **business rules** (e.g., A CUSTOMER can place ORDERS).

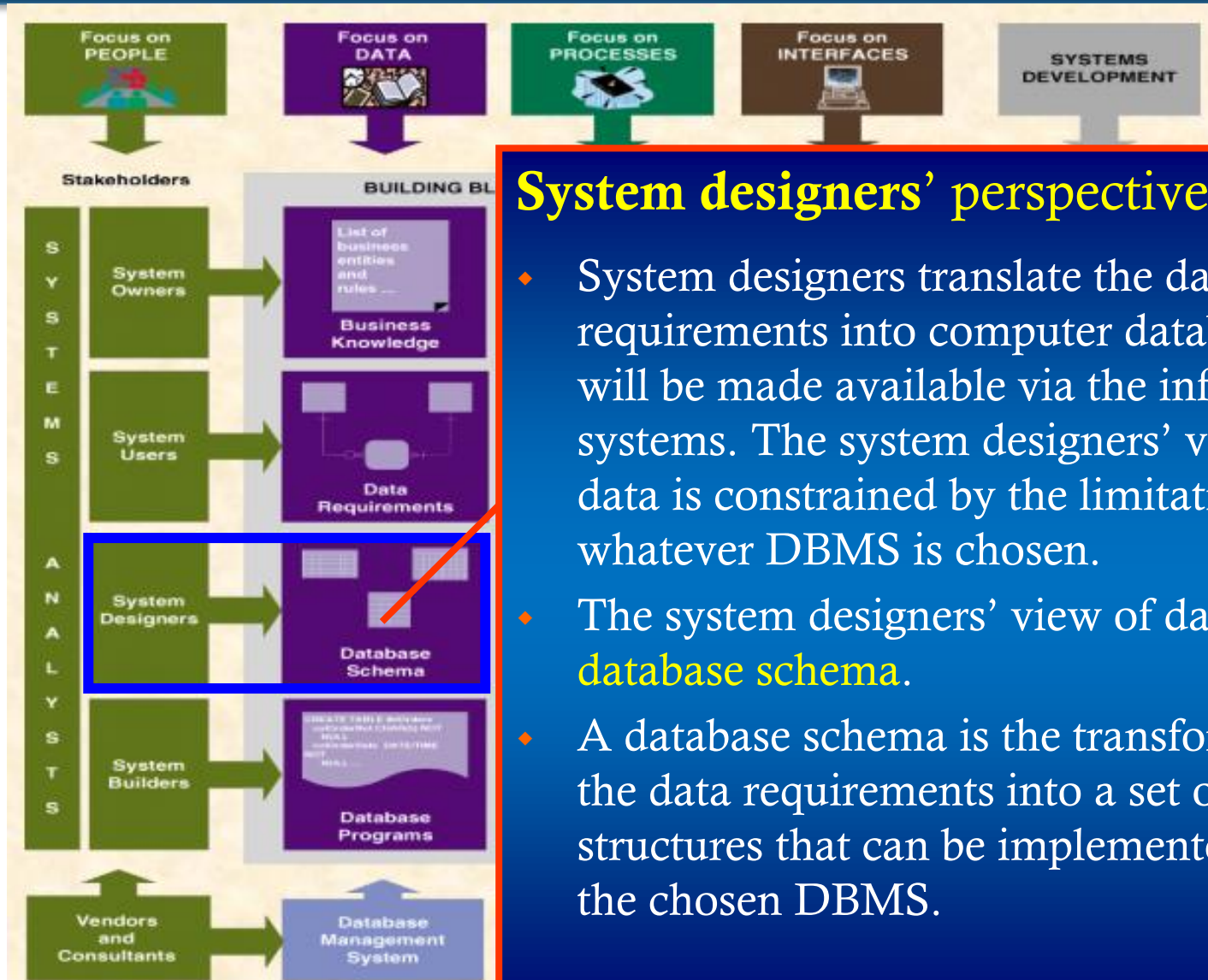
# The DATA Focus



## System users' perspective

- ♦ The users of an information system are the experts about the data that describe the business. Unfortunately, they frequently see the data only in terms of how data are currently stored or how they think data should be stored.
- ♦ The challenge in systems development is to correctly identify and verify users' business data requirements.
- ♦ **Data requirements** are a representation of users' data in terms of **entities, attributes, relationships, and rules**. Data requirements should be expressed in a format that is **independent of** the technology that can or will be used to store the data.
- ♦ Data requirements are an extension of the business entities and rules.

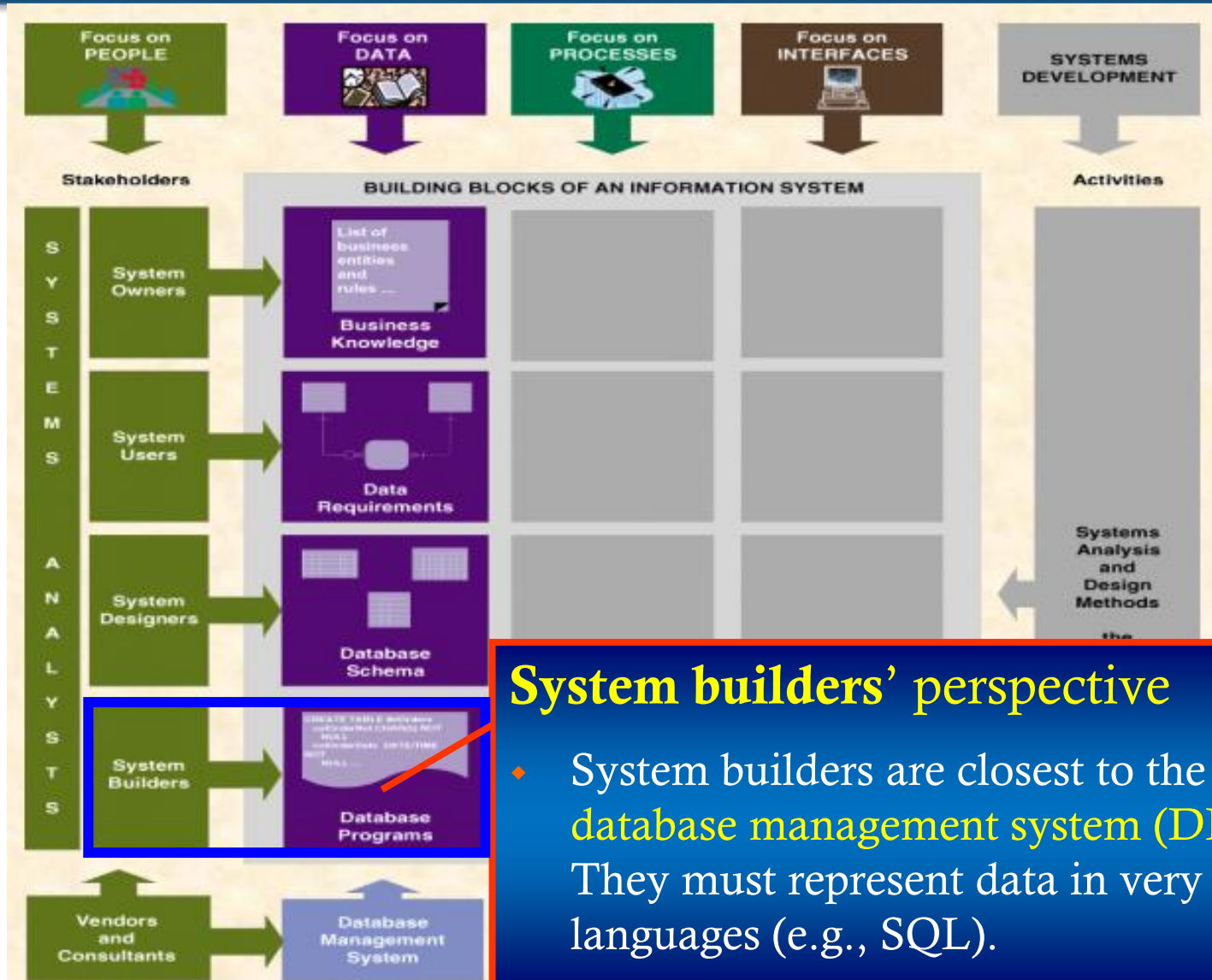
# The DATA Focus



## System designers' perspective

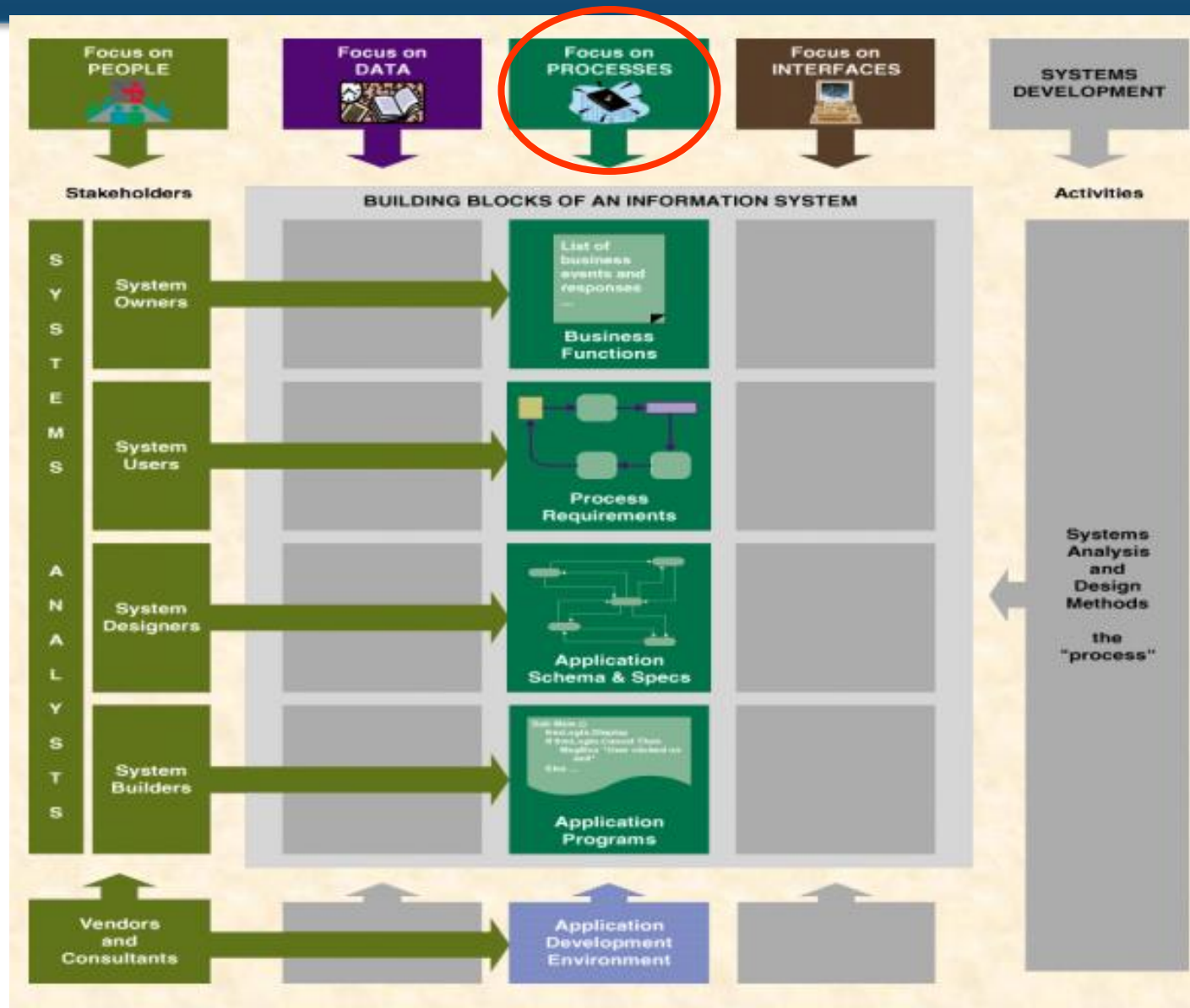
- System designers translate the data requirements into computer databases that will be made available via the information systems. The system designers' view of data is constrained by the limitations of whatever DBMS is chosen.
- The system designers' view of data is a **database schema**.
- A database schema is the transformation of the data requirements into a set of data structures that can be implemented using the chosen DBMS.

# The DATA Focus

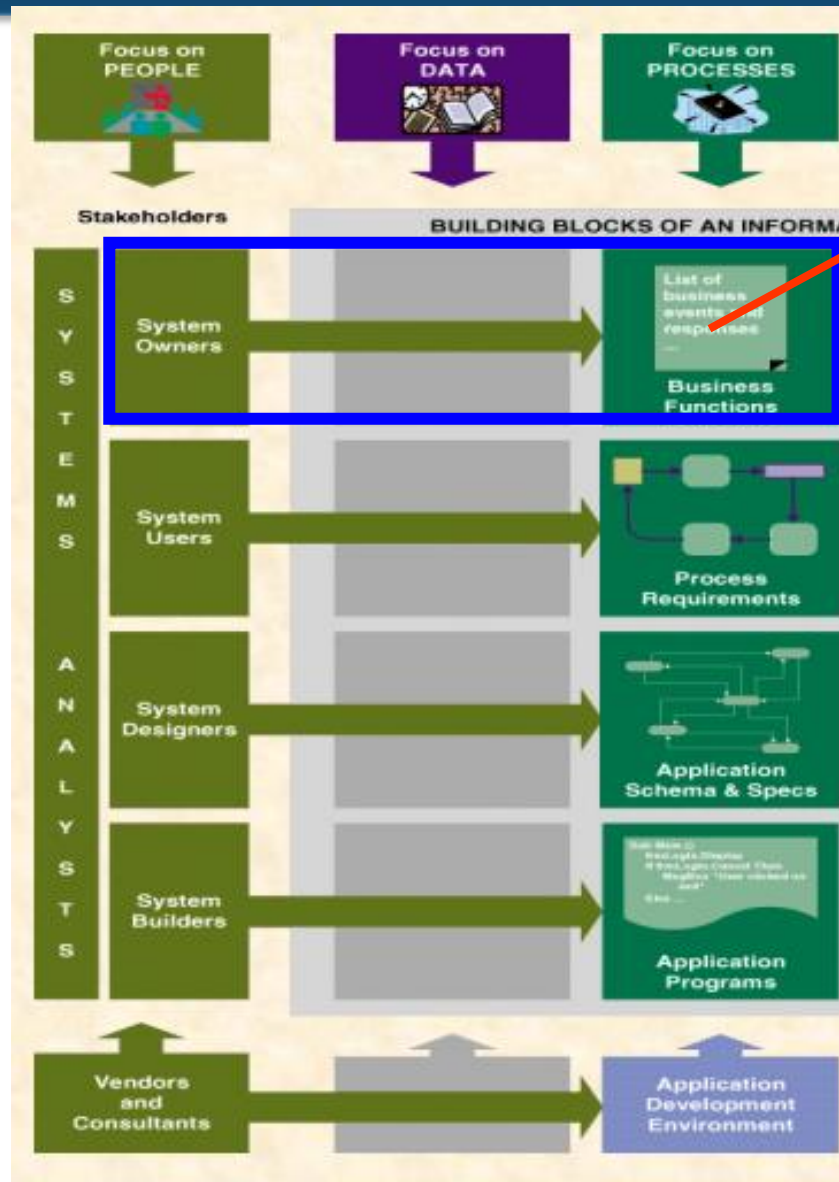




# The PROCESS Focus



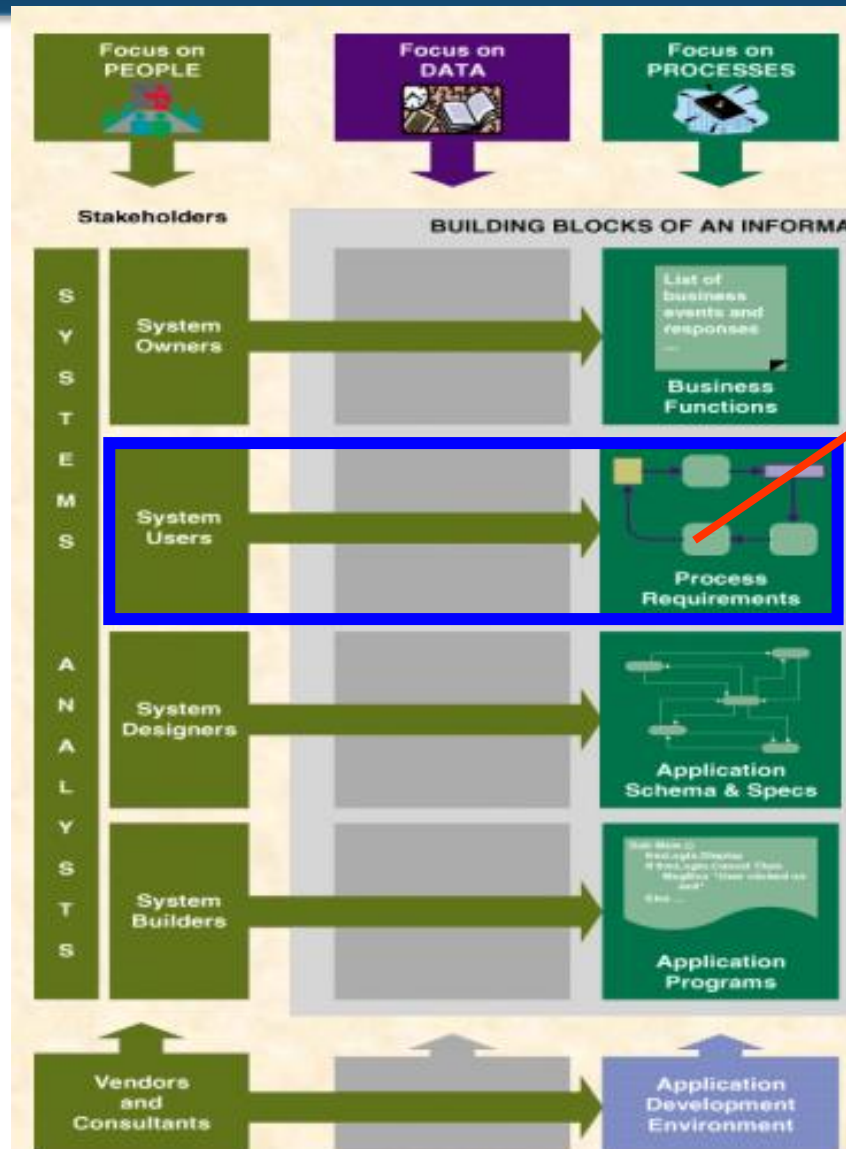
# The PROCESS Focus



## System owners' perspective

- Business functions are ongoing activities that support the business. Functions can be decomposed into other subfunctions and eventually into processes that do specific tasks.
- A cross-functional information system supports relevant business processes from several business functions without regard to traditional organizational boundaries such as divisions, departments, centers, and offices.

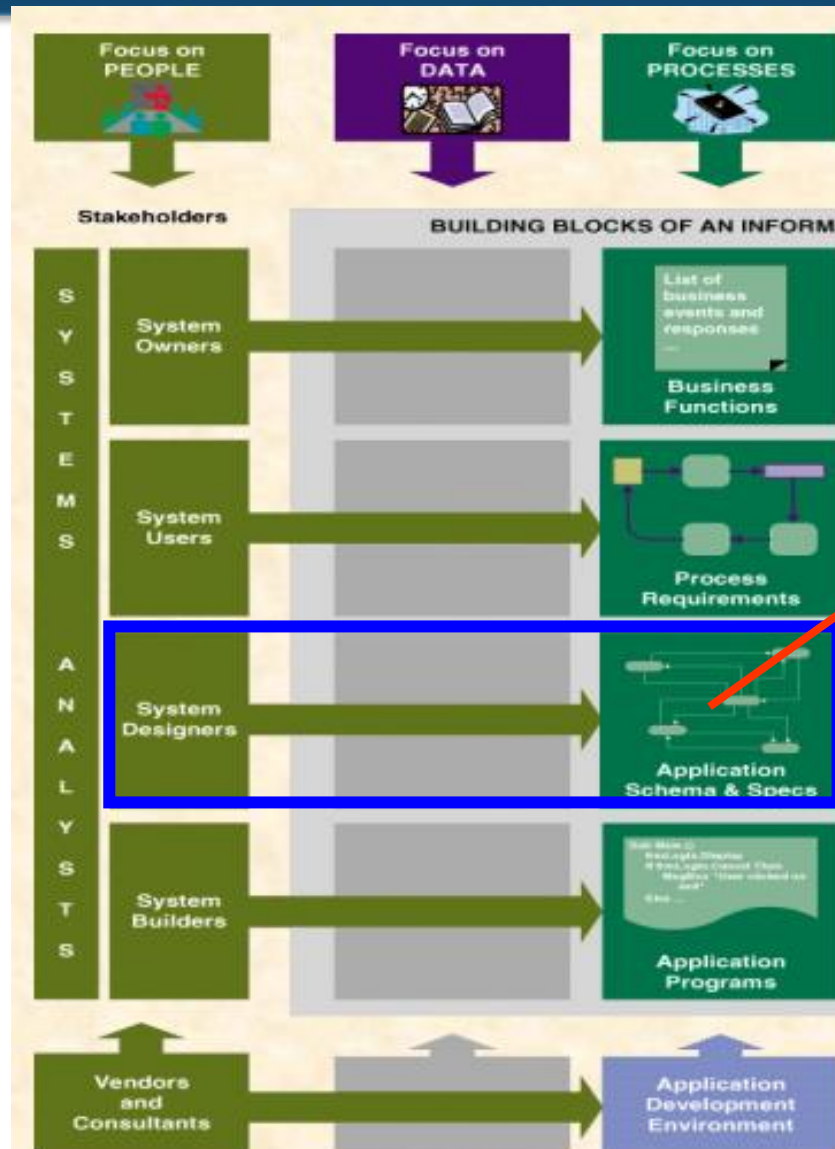
# The PROCESS Focus



## System users' perspective

- ♦ Business processes are activities that respond to business events. Business processes are the “work” performed by the system.
- ♦ Process requirements are a representation of the users’ business processes in terms of activities, data flows, or work flow.
- ♦ A policy is a set of rules that govern a business process.
- ♦ A procedure is a step-by-step set of instructions and logic for accomplishing a business process.

# The PROCESS Focus

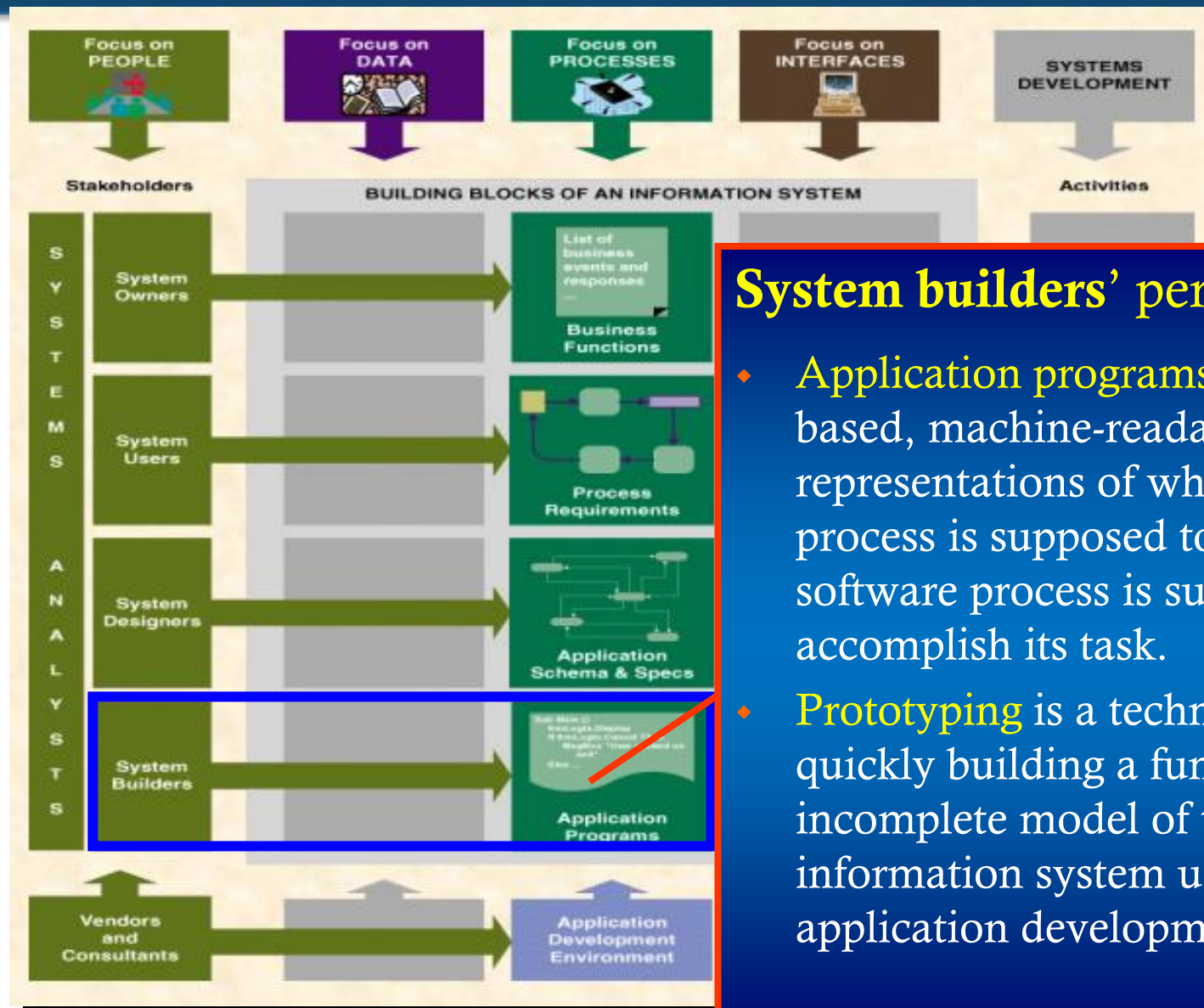


## System designers' perspective

- ♦ An **application schema** is a model that communicates how selected business processes are, or will be, implemented using the software and hardware.
- ♦ Today many business purchase commercial off-the-shelf software instead of building that software in-house. In this scenario, the application schema specifies how the software package will be integrated into the enterprise.
- ♦ **Software specifications** represent the technical design of business processes to be automated or supported by computer programs to be written by system builders.
- ♦ Examples of software specifications include state transition diagrams, flowcharts, structure charts, or unified modeling language diagrams.



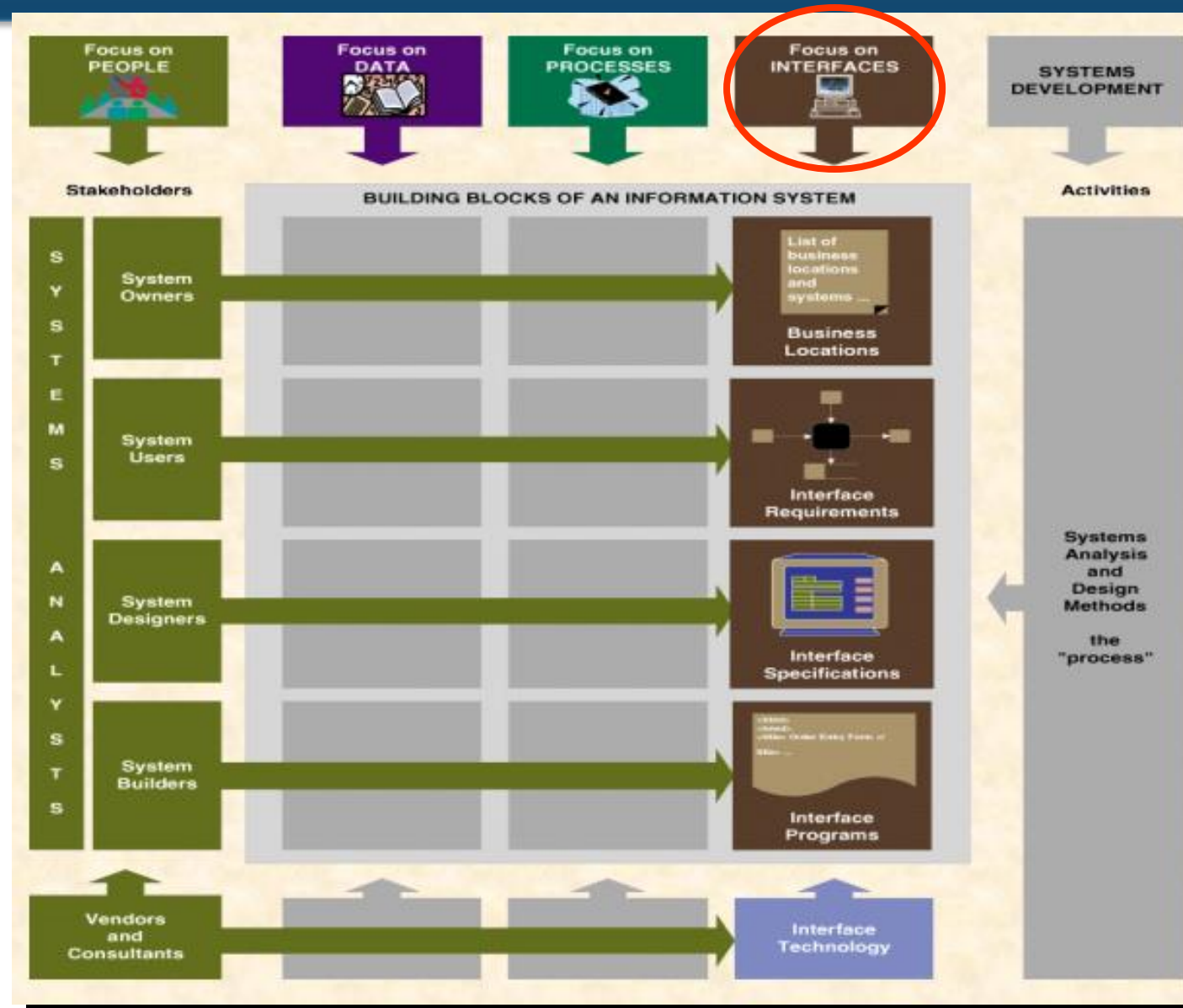
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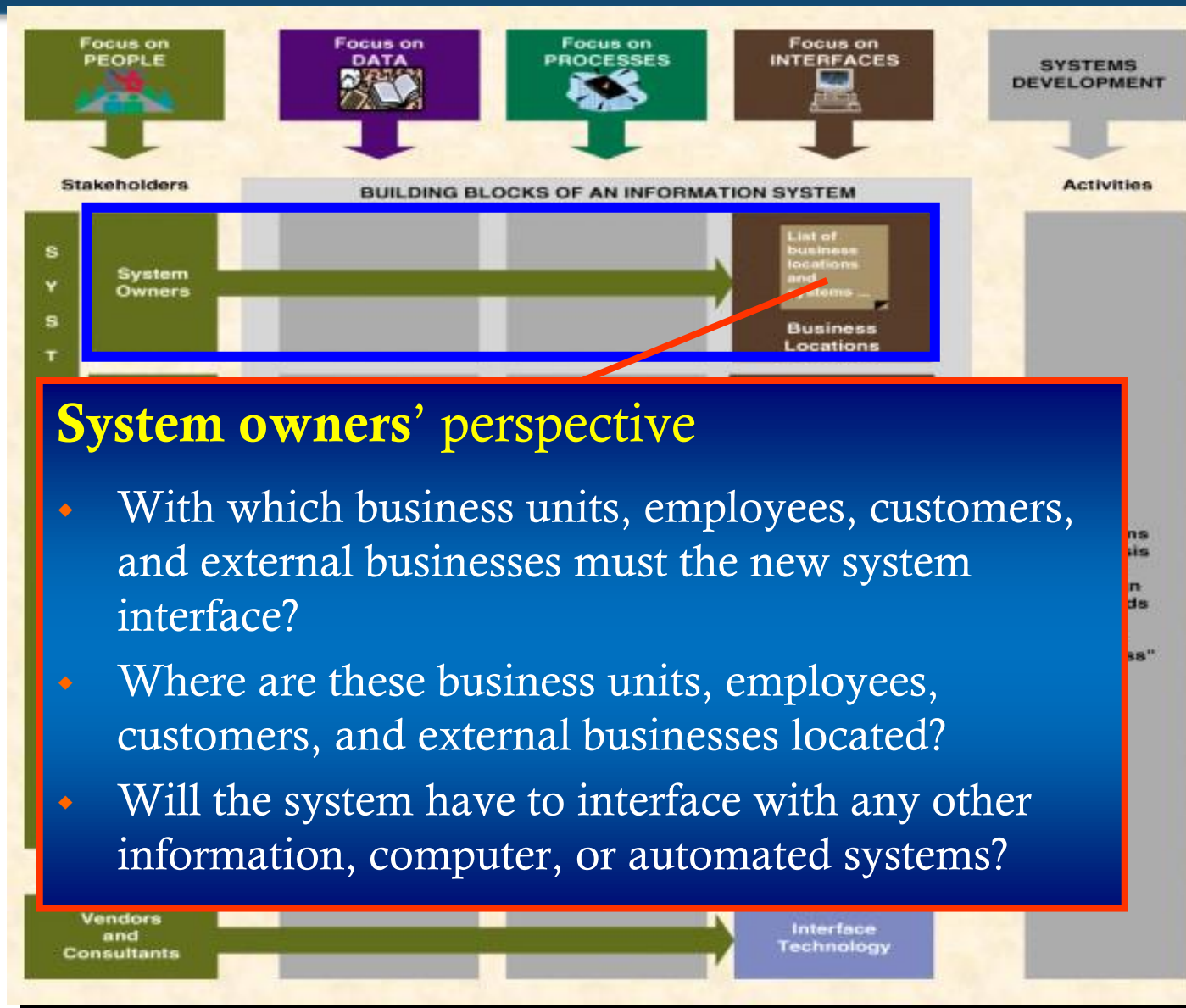
## System builders' perspective

- Application programs are language-based, machine-readable representations of what a software process is supposed to do, or how a software process is supposed to accomplish its task.
- Prototyping is a technique for quickly building a functioning, but incomplete model of the information system using rapid application development tools.

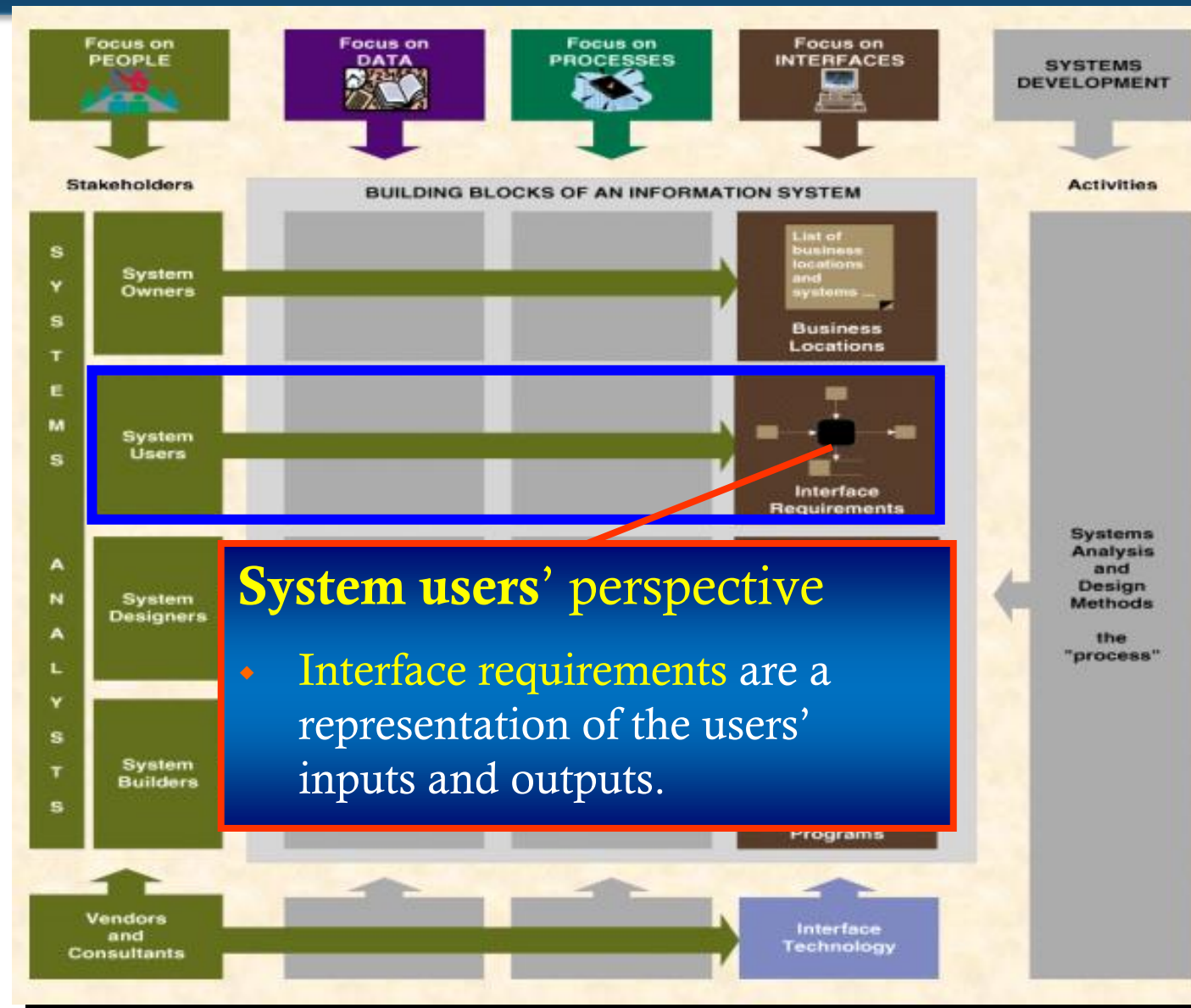
# The INTERFACE Focus



# The INTERFACE Focus



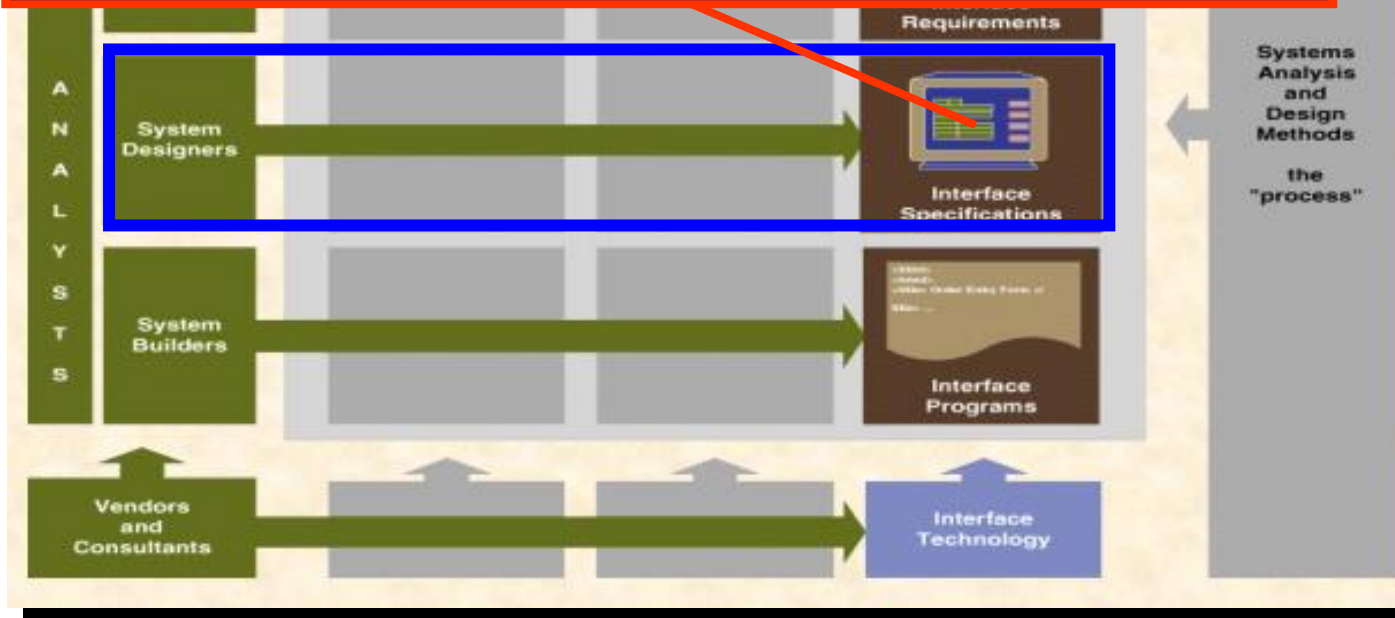
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# The INTERFACE Focus

## System designers' perspective

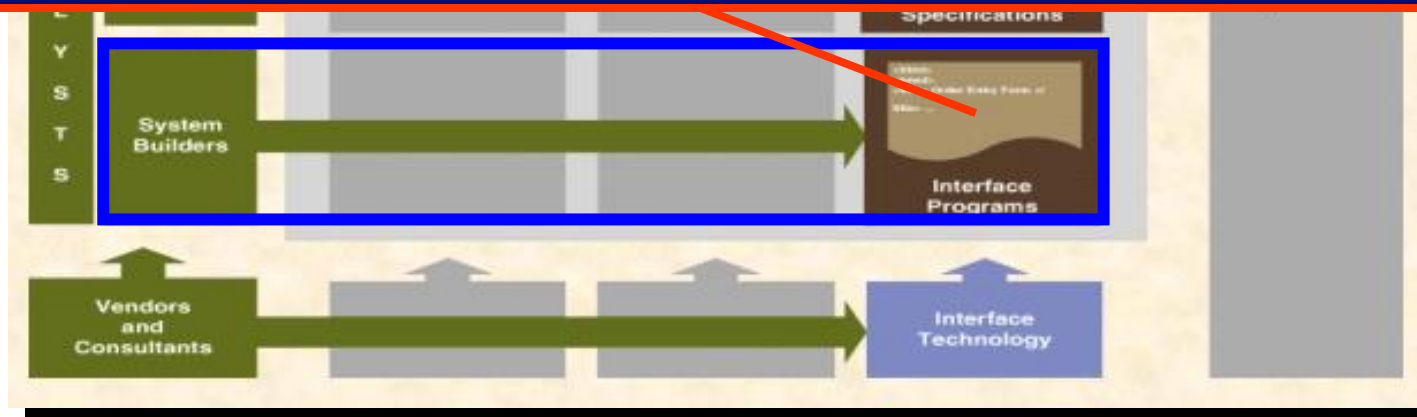
- ♦ System designers must be concerned with the technical design of both the user and system-to-system interfaces. We call these **interface specifications**.
- ♦ **User dialogues** describe how the user moves from window-to-window, interacting with the application programs to perform useful work.



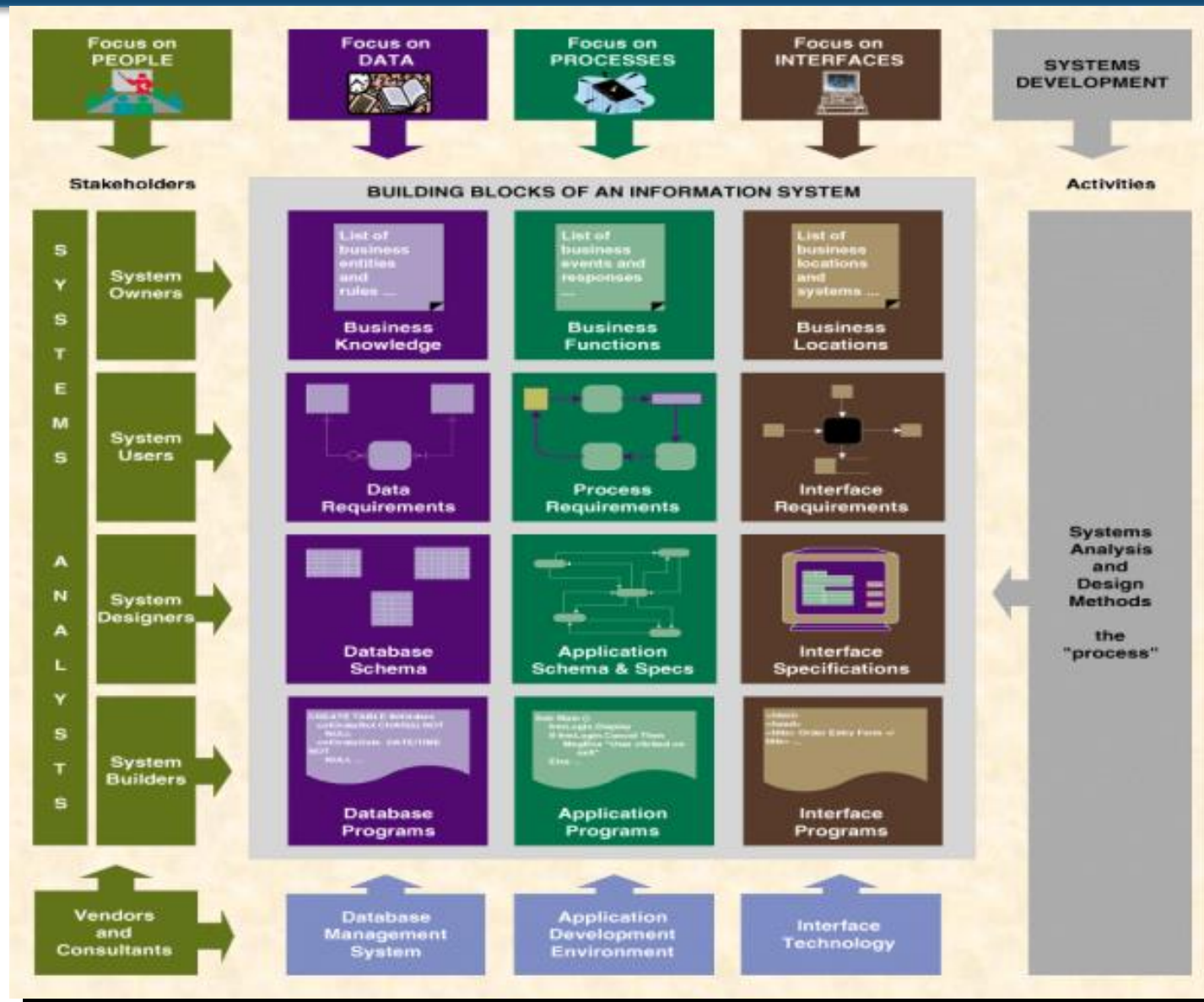


## T System builders' perspective

- ♦ System builders construct, install, test, and implement both user and system-to-system interfaces using **interface technology**.
- ♦ The application development environments (ADE) (e.g., VB, Java, or PB) or markup languages (e.g., XML or HTML) are frequently used to develop **user interfaces**.
- ♦ **System-to-system interfaces** are considerably more complex than user interfaces to construct or implement. A technology that is currently popular is middleware.
- ♦ **Middleware** (中间件) is a layer of utility software that sits in between application software and systems software to transparently integrate differing technologies so that they can interoperate (e.g., ODBC, COBAR, or J2EE).



# Information System Building Blocks



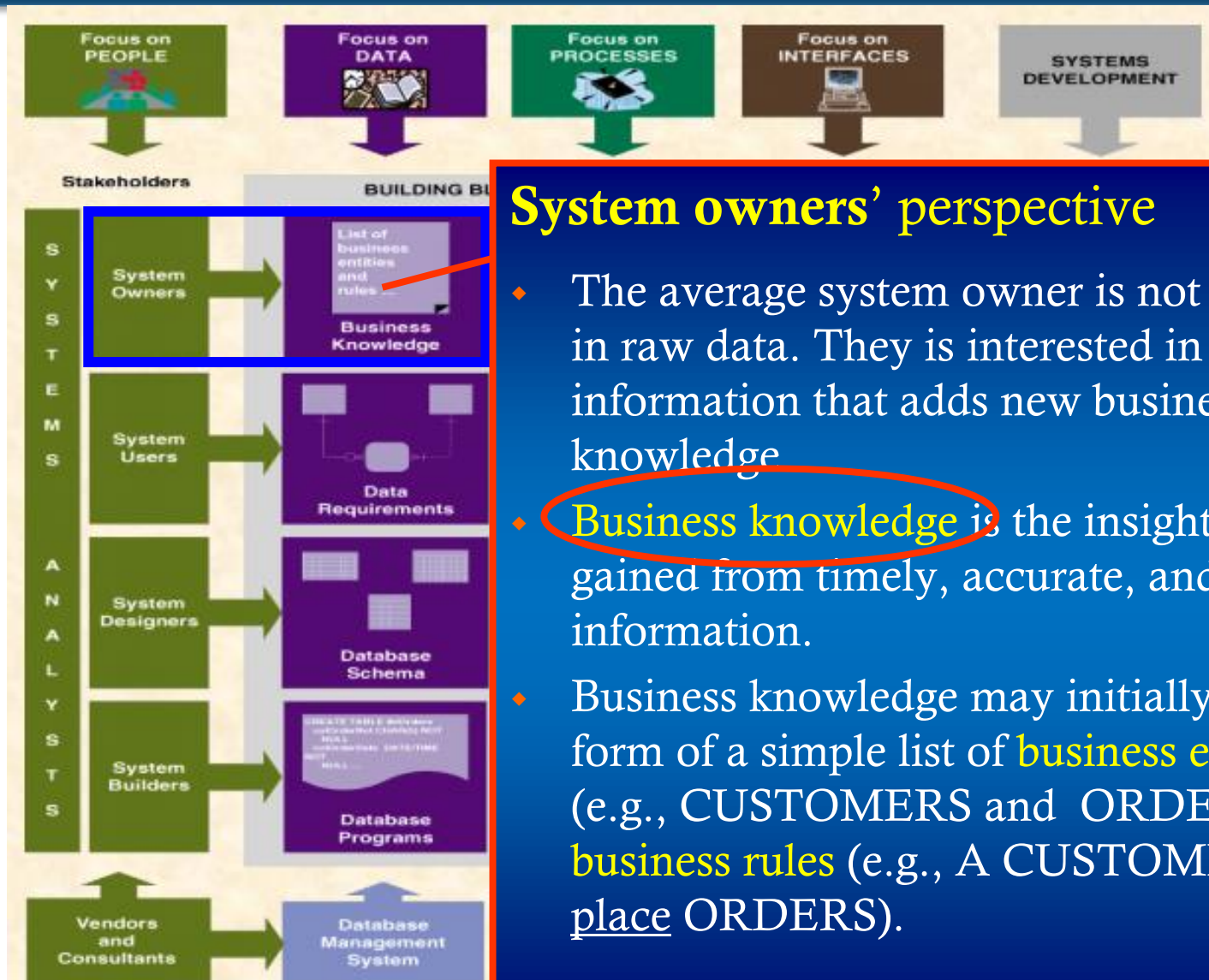




**Let's consider the framework again  
in different perspectives:**



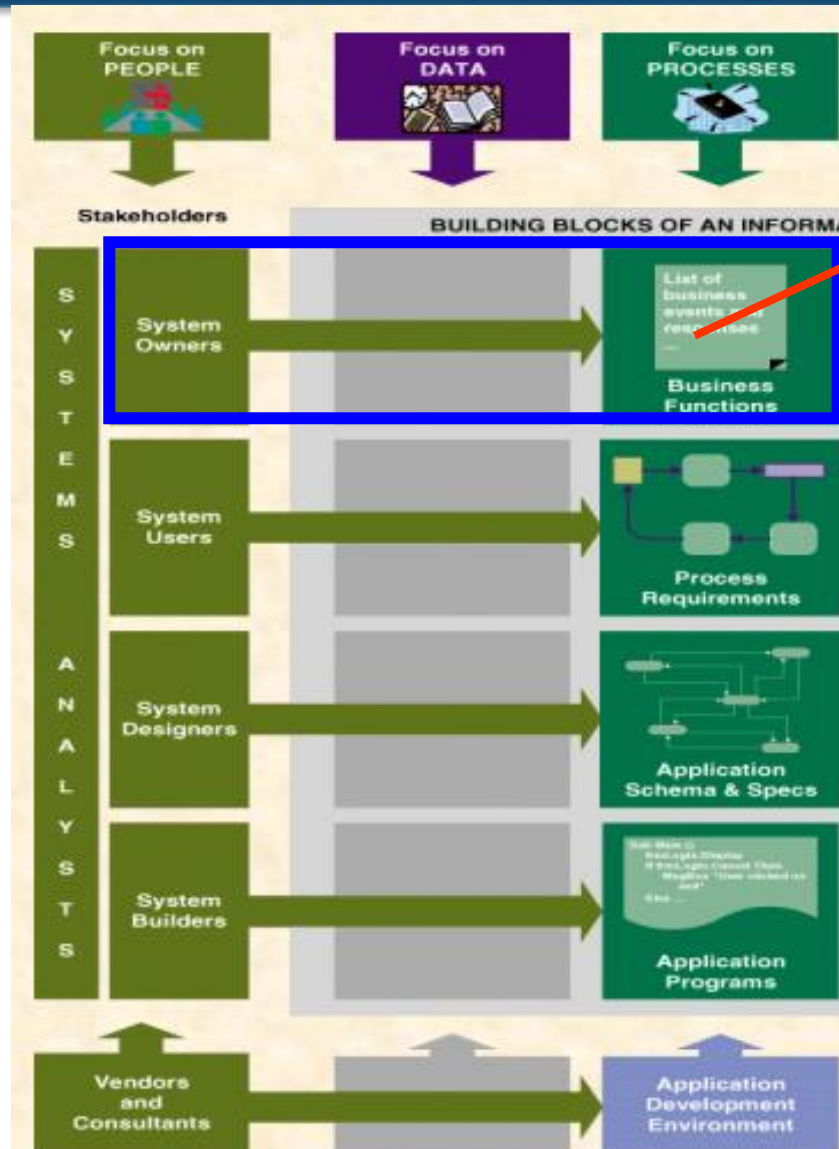
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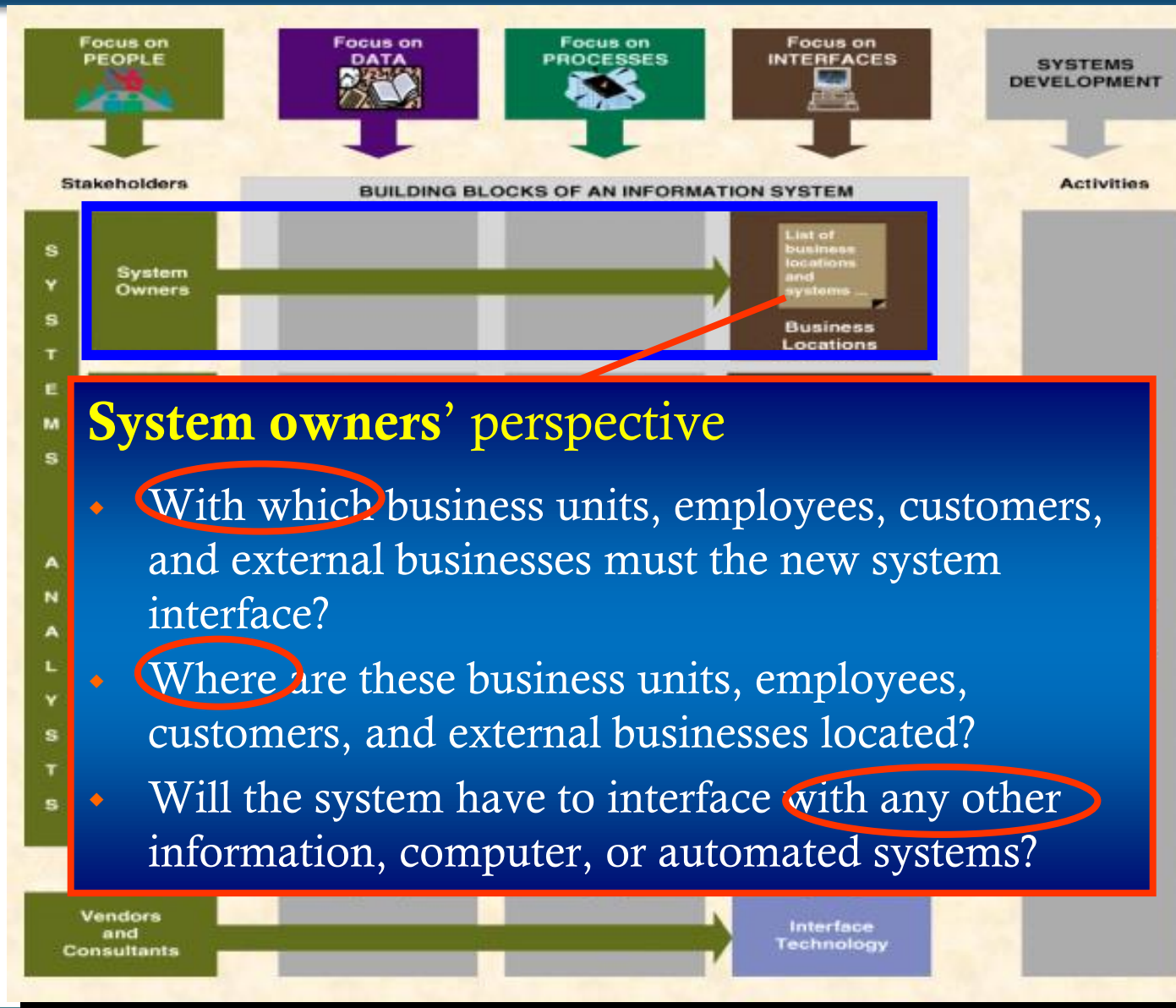
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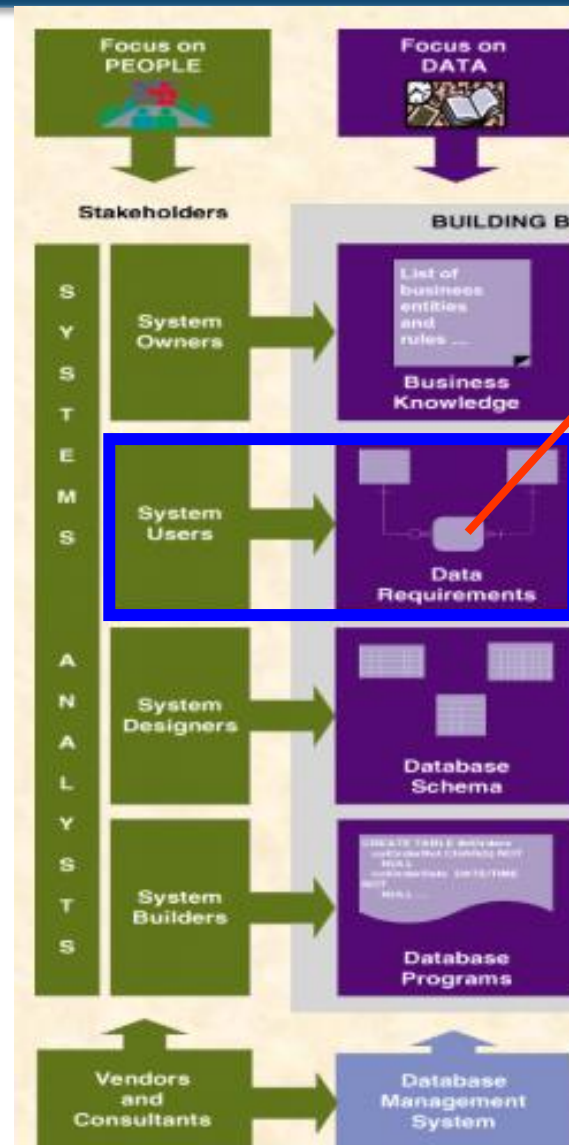
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- ♦ A **cross-functional information system** supports relevant business processes from several business functions without regard to traditional organizational boundaries such as divisions, departments, centers, and offices.

# System Owners' Perspective



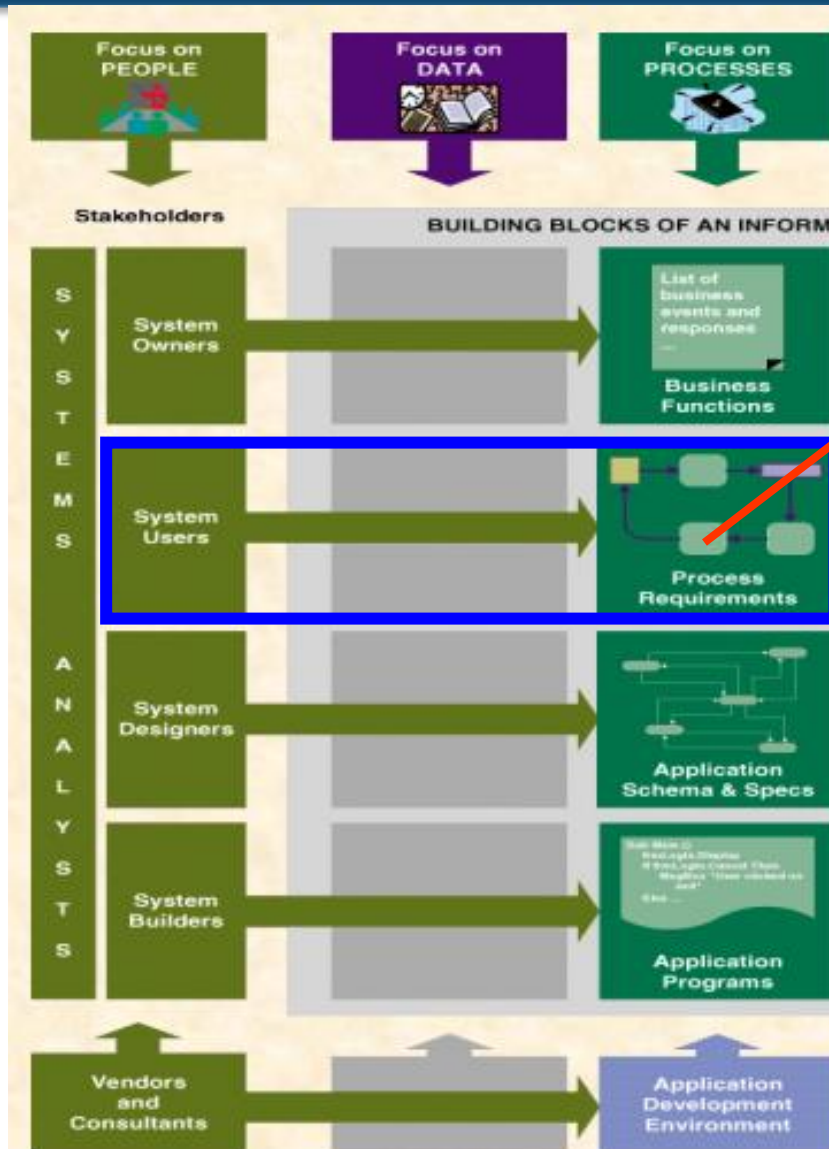
# System Users' Perspective



- ♦ The users of an information system are the experts about the data that describe the business. Unfortunately, they frequently see the data only in terms of how data are currently stored or how they think data should be stored.
- ♦ The challenge in systems development is to correctly identify and verify users' business data requirements.
- ♦ **Data requirements** are a representation of users' data in terms of **entities, attributes, relationships, and rules**. Data requirements should be expressed in a format that is **independent of** the technology that can or will be used to store the data.
- ♦ Data requirements are an extension of the business entities and rules.



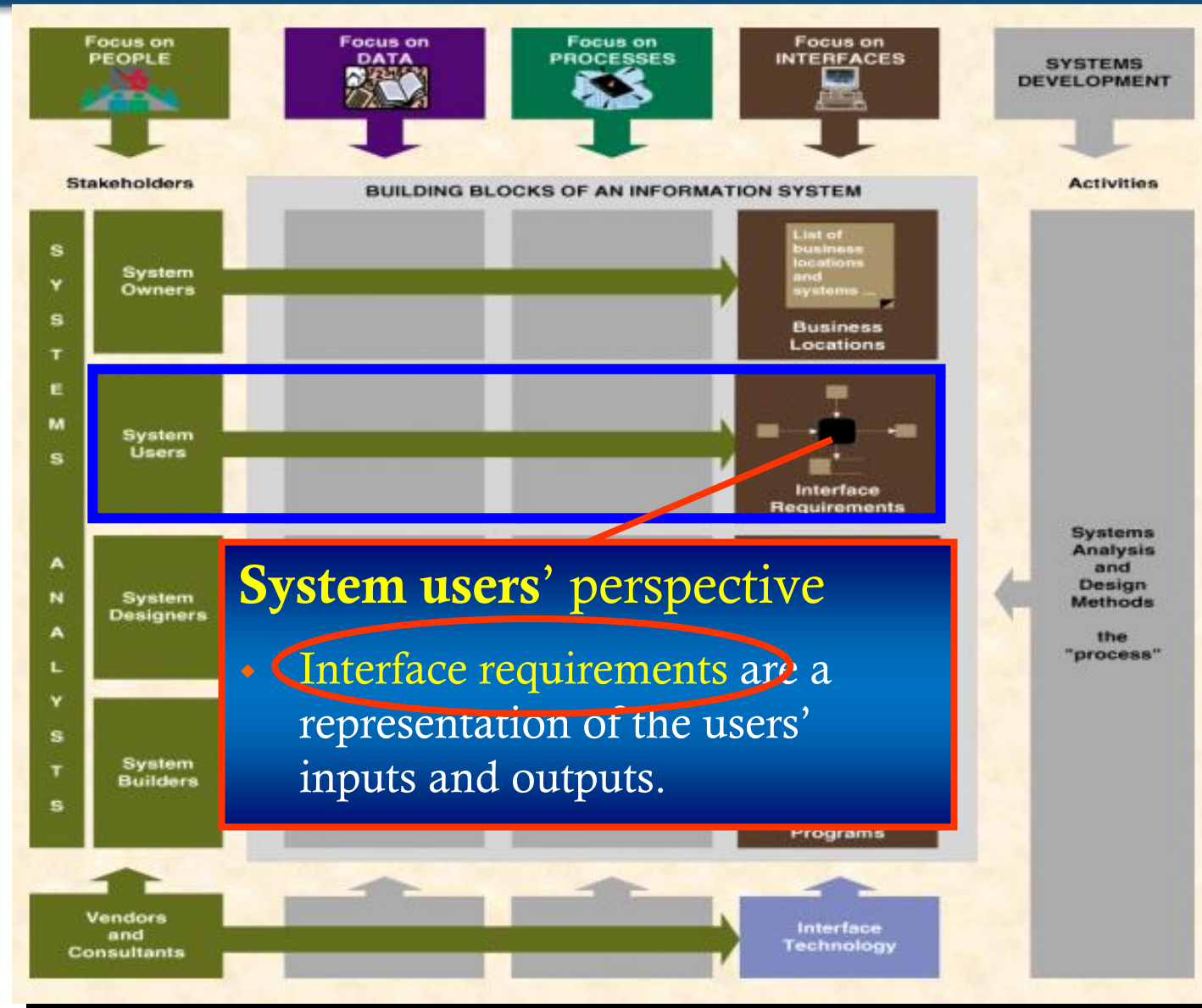
# System Users' Perspective



## System users' perspective

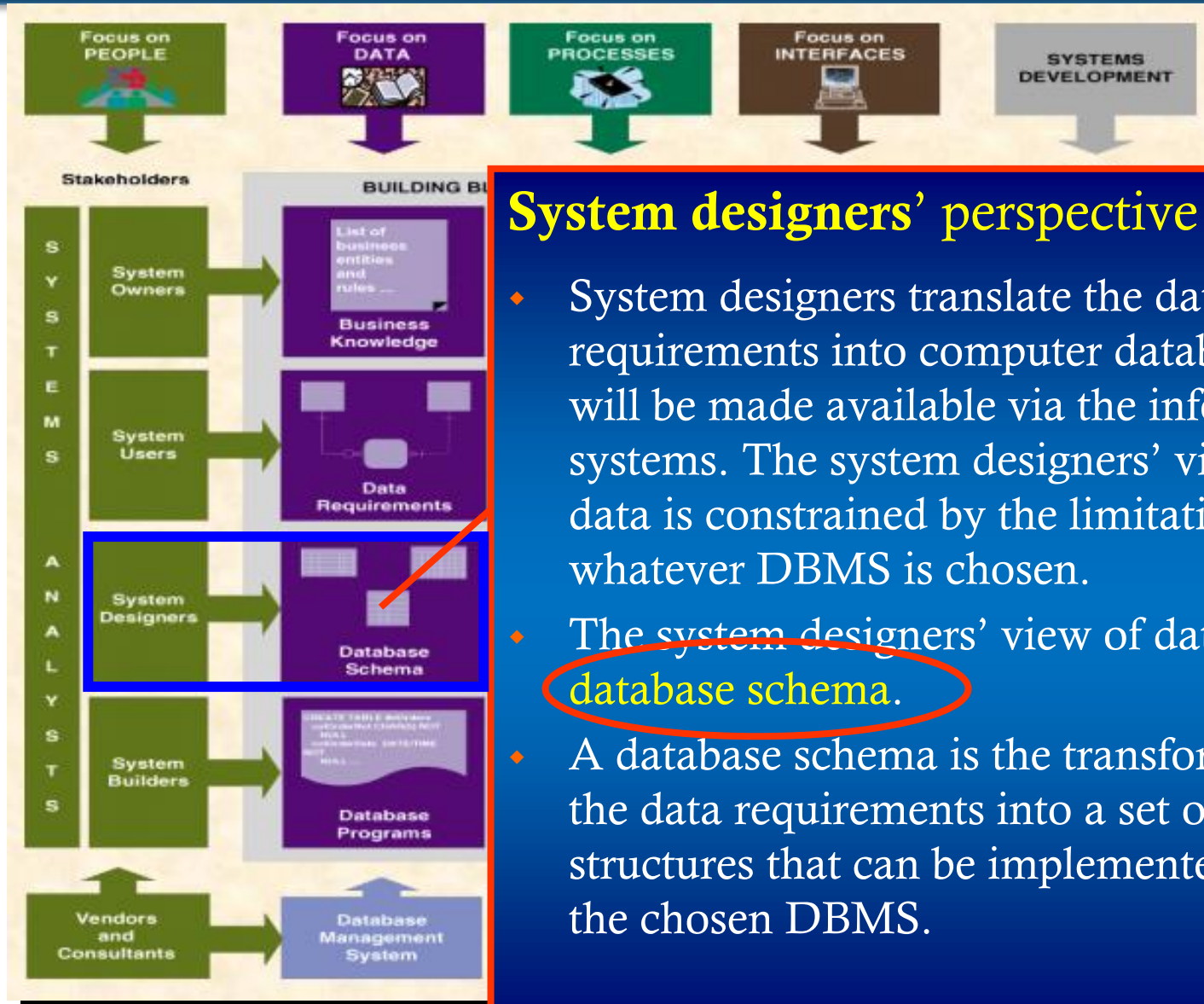
- ♦ Business processes are activities that respond to business events. Business processes are the “work” performed by the system.
- ♦ **Process requirements** are a representation of the users' business processes in terms of activities, data flows, or work flow.
- ♦ A **policy** is a set of rules that govern a business process.
- ♦ A **procedure** is a step-by-step set of instructions and logic for accomplishing a business process.

# System Users' Perspective





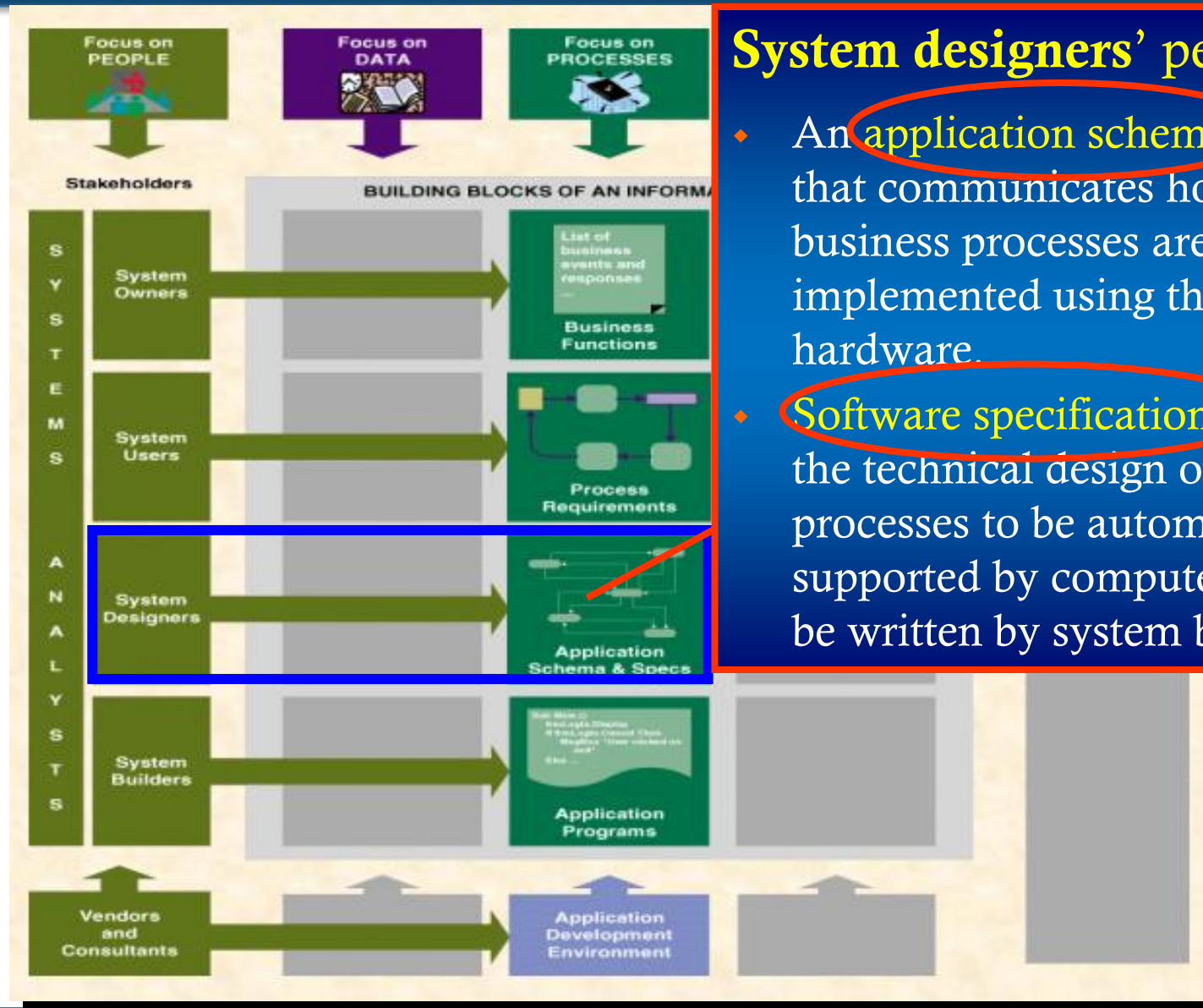
# System Designers' Perspective



## System designers' perspective

- System designers translate the data requirements into computer databases that will be made available via the information systems. The system designers' view of data is constrained by the limitations of whatever DBMS is chosen.
- The system designers' view of data is a **database schema**.
- A database schema is the transformation of the data requirements into a set of data structures that can be implemented using the chosen DBMS.

# System Designers' Perspective



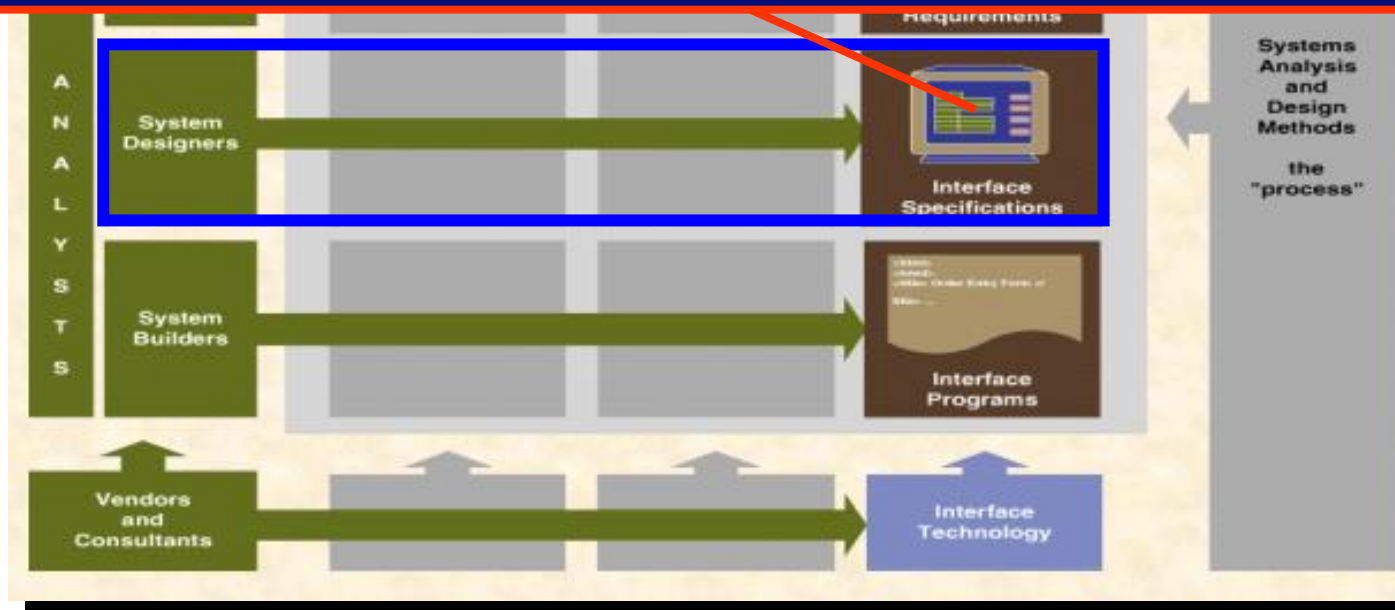
## System designers' perspective

- ♦ An **application schema** is a model that communicates how selected business processes are, or will be, implemented using the software and hardware.
- ♦ **Software specifications** represent the technical design of business processes to be automated or supported by computer programs to be written by system builders.

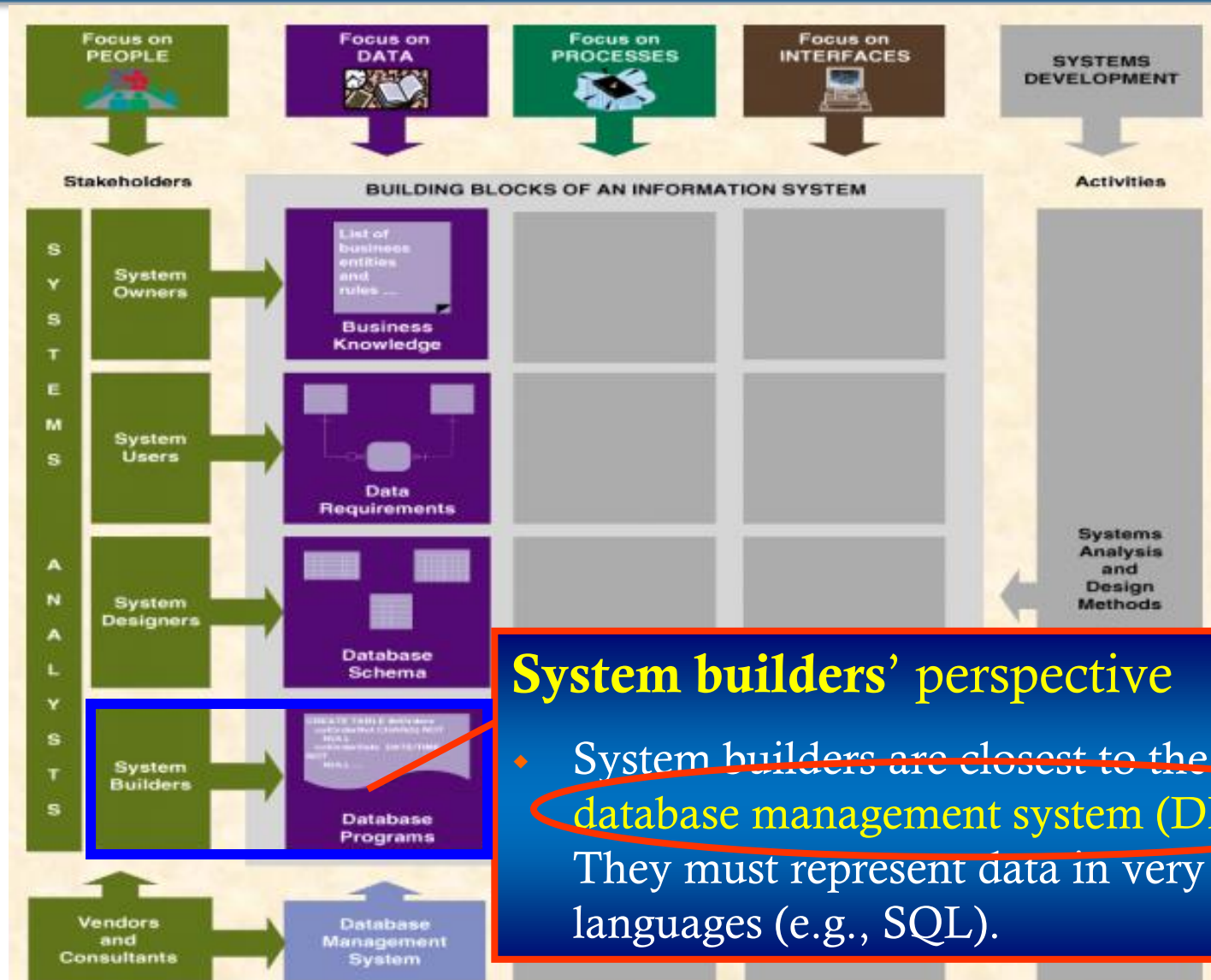
# System Designers' Perspective

## System designers' perspective

- System designers must be concerned with the technical design of both the user and system-to-system interfaces. We call these **interface specifications**.
- **User dialogues** describe how the user moves from window-to-window, interacting with the application programs to perform useful work.



# System Builders' Perspective

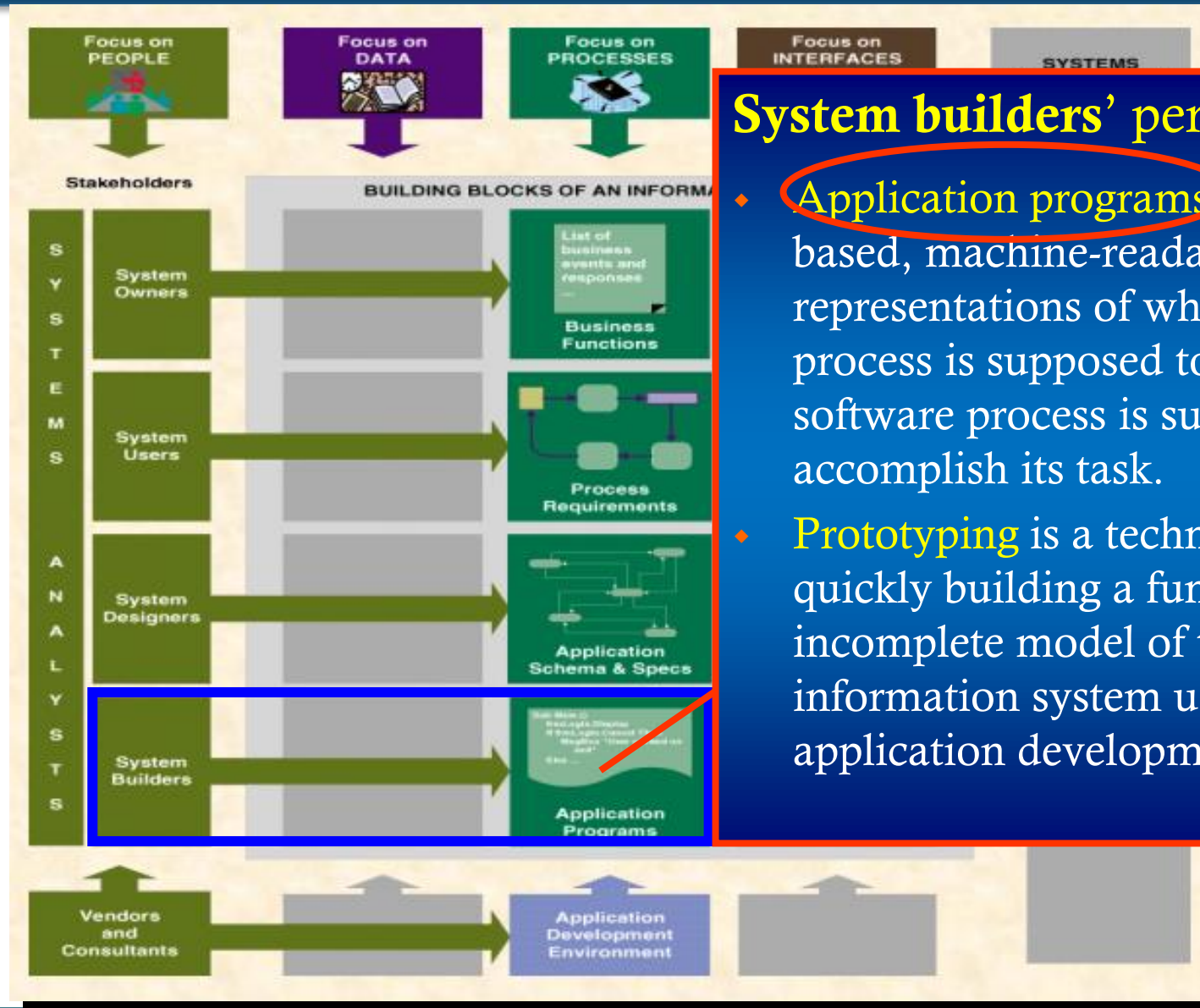


## System builders' perspective

- System builders are closest to the actual database management system (DBMS). They must represent data in very precise languages (e.g., SQL).



# System Builders' Perspective

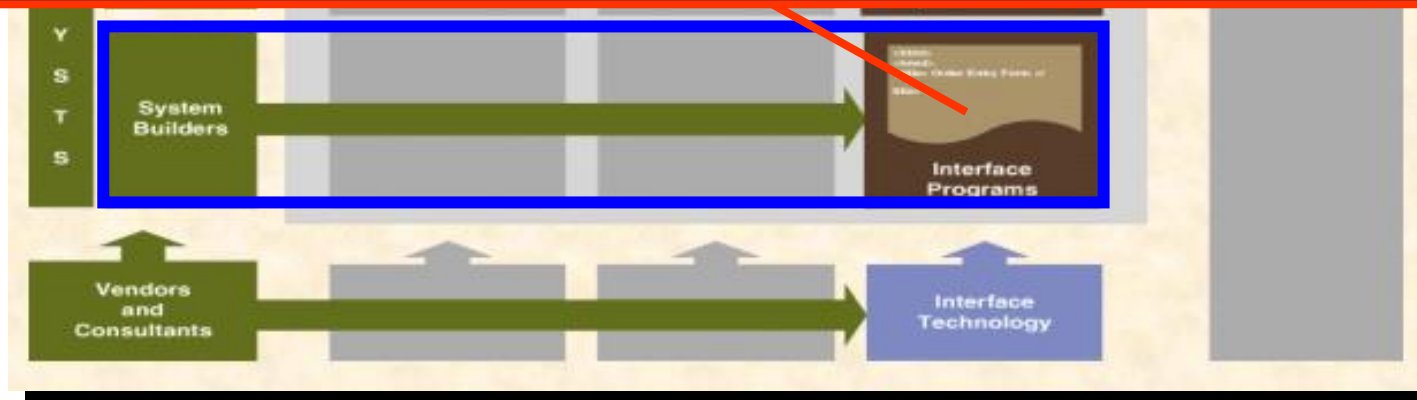


## System builders' perspective

- ♦ **Application programs** are language-based, machine-readable representations of what a software process is supposed to do, or how a software process is supposed to accomplish its task.
- ♦ **Prototyping** is a technique for quickly building a functioning, but incomplete model of the information system using rapid application development tools.

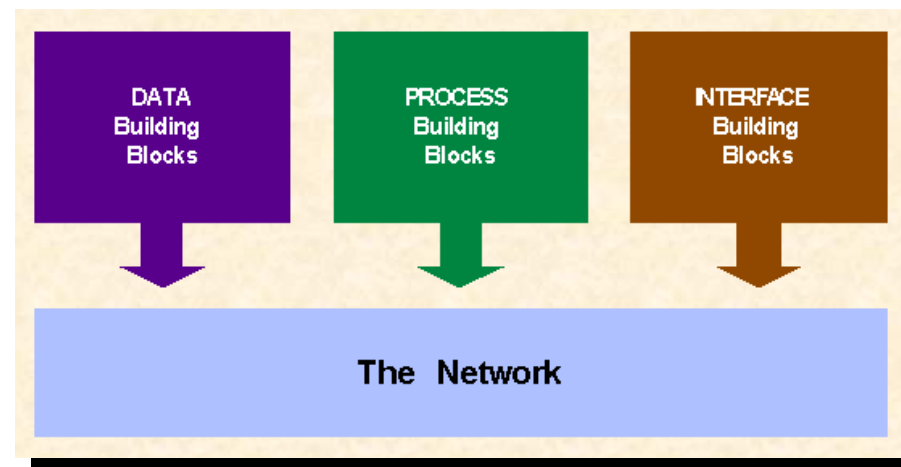
# Sy System builders' perspective

- ♦ System builders construct, install, test, and implement both user and system-to-system interfaces using **interface technology**.
- ♦ The application development environments (ADE) (e.g., VB, Java, or PB) or markup languages (e.g., XML or HTML) are frequently used to develop **user interfaces**.
- ♦ **System-to-system interfaces** are considerably more complex than user interfaces to construct or implement. A technology that is currently popular is middleware.
- ♦ **Middleware** is a layer of utility software that sits in between application software and systems software to transparently integrate differing technologies so that they can interoperate (e.g., ODBC, COBAR, or J2EE).



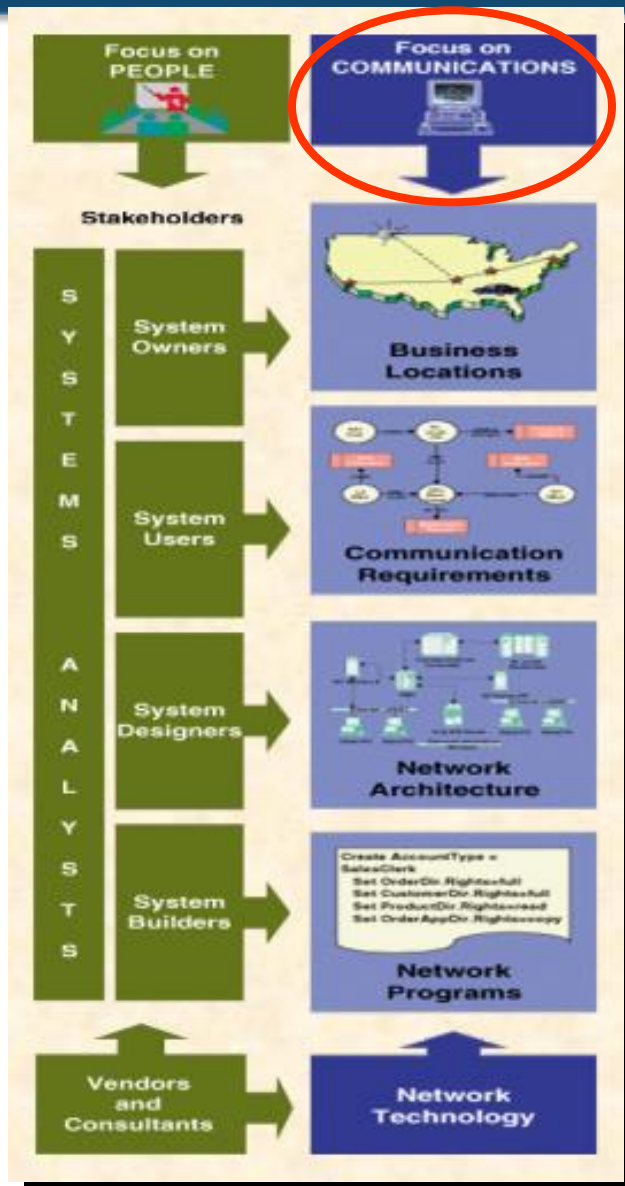
# The Role of the Network in IS

- ❁ Today's information systems are built on networks.
- ❁ A modern high-level information systems framework has **the contemporary layering** of an information systems' Data, Process, and Interface building blocks upon a Network. This clean layering approach allows any one building block to be replaced with another while having little or no impact on the other building blocks.

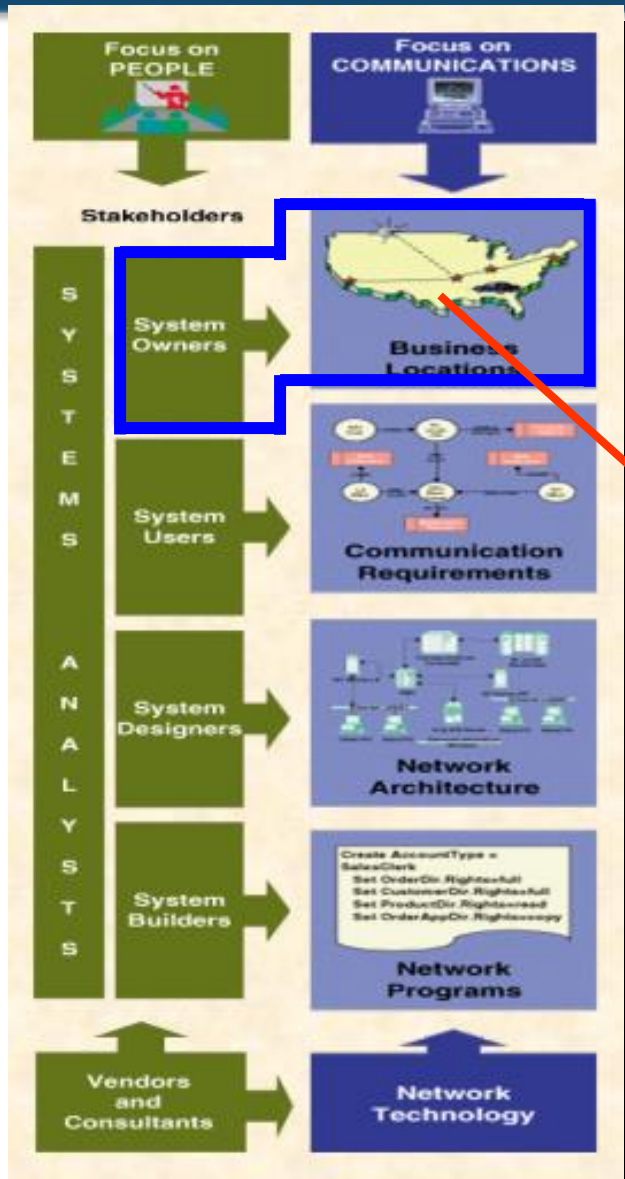




# A COMMUNICATIONS Focus in IS



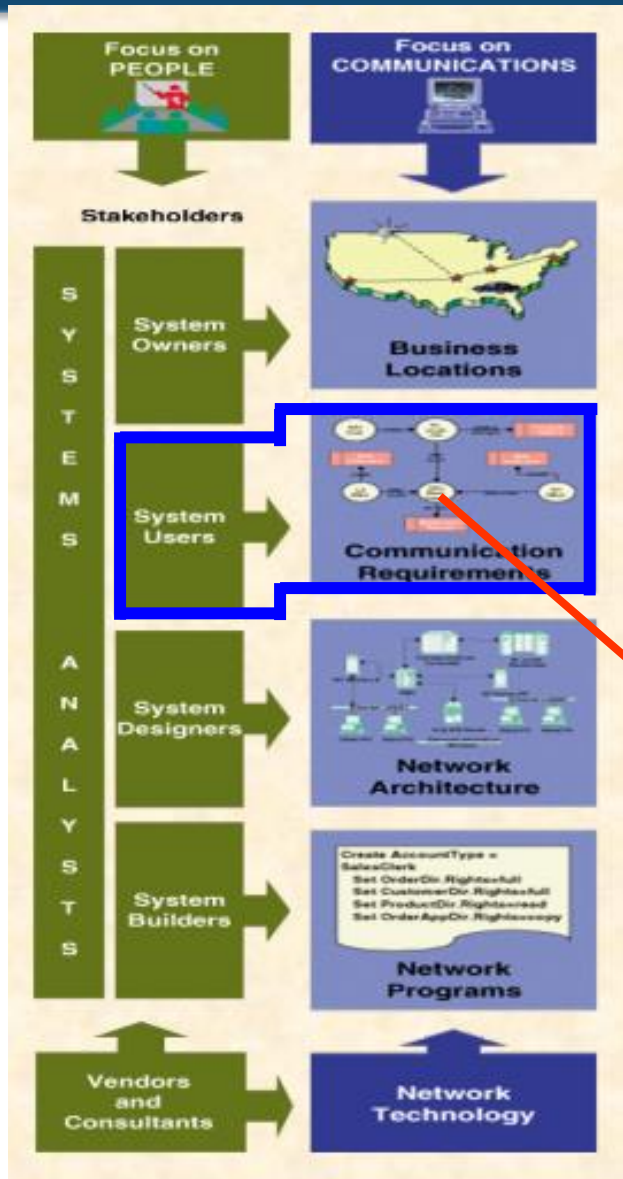
# A COMMUNICATIONS Focus in IS



## System owners' perspective

- ♦ To the system owner, communications is not a technical or networking issue. It is merely a business reality.
- ♦ The system owner views communications in terms of **geography**. Geography includes such as locations as cities, states, and countries. It also includes locations such as campuses, sites, buildings, floors, and rooms.

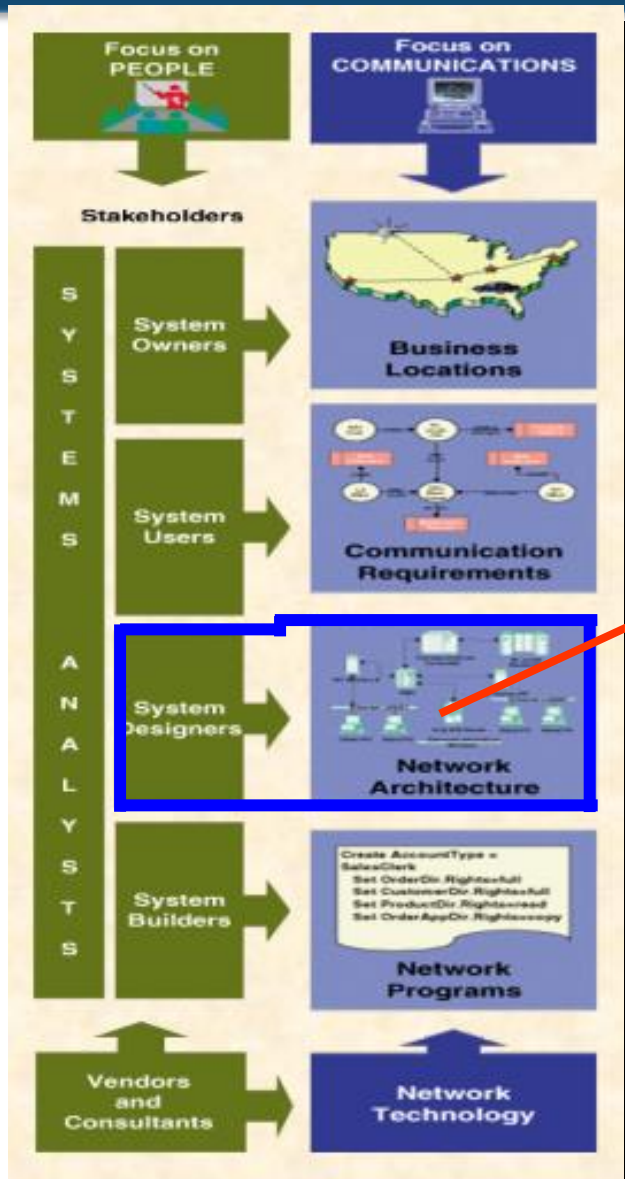
# A COMMUNICATIONS Focus in IS



## System users' perspective

- System users are the experts about the **communication requirements** between and within business locations.
- The communication requirements are frequently expressed in terms of location-to-location data flows and the volume and frequency of those data flows.

# A COMMUNICATIONS Focus in IS

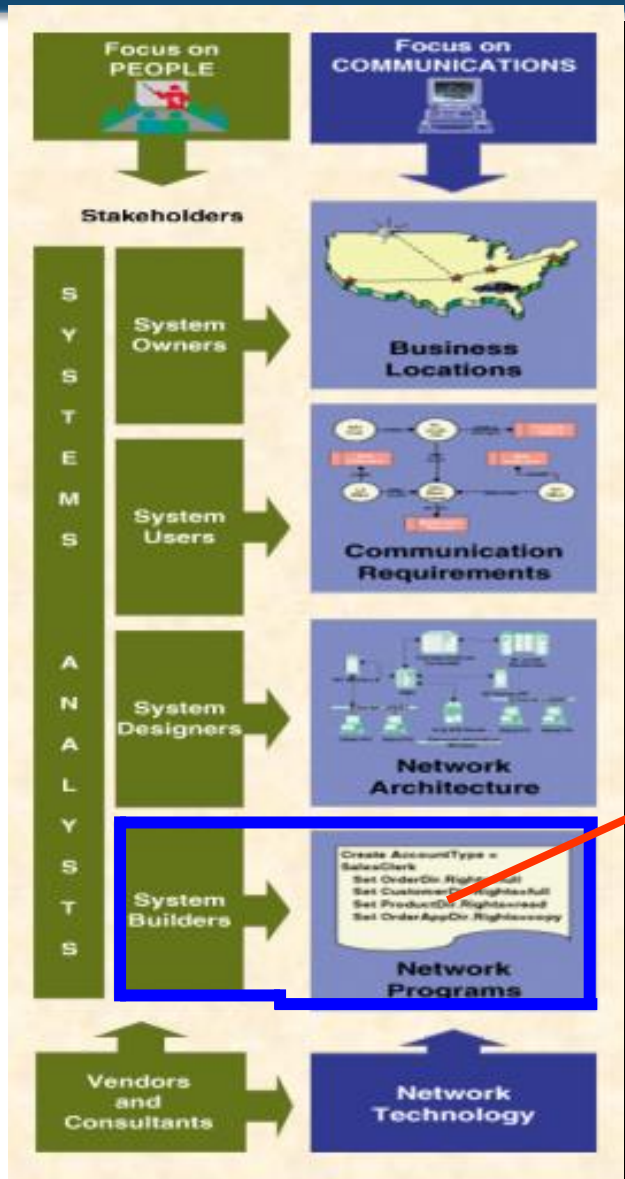


## System designers' perspective

- System designers' view of communications is influenced and/or constrained by the limitations of specific telecommunications and network technologies. The emphasis shifts to specifying a **network architecture** that can support the communications requirements.
- The system designers' view is expressed in terms of physical locations for workstations, terminals, servers, and peripherals and the interconnections between those devices.



# A COMMUNICATIONS Focus in IS



## System builders' perspective

- System builders use **networking software** to customize and optimize networks including node address, protocols, line speeds, flow controls, security, privileges, and other complex, networking parameters. This software is usually purchased and installed, but it must also be configured and tuned for performance.

## 要点与引申

- ❁ 信息系统之间的种类差异在于应用职能不同，这是第一位的。
- ❁ 同一行业中同种信息系统，其体系结构之间是有规律可循的。
- ❁ 本章主要强调了从数据、处理和界面 / 接口等几个角度来分别关注信息系统的组成部件，其主要用意是用系统部件的观点来认识信息系统的构成，以利于信息系统的工业化开发与建设。
- ❁ 但是，这并不意味着这几类组成部件之间是不相关的（它们之间的相关性不是只涉及到通信）。能够在系统部件的边界上体现这样的相关性，是形成系统组成部件的前提。





西安电子科技大学  
XIDIAN UNIVERSITY

# 03

## 系统分析与设计 (SYSTEM ANALYSIS AND DESIGN)

### Information Systems Development

# Content Structure

## ❁ Process of Systems Development

- 系统开发过程的概念；对系统开发过程的管理和控制；系统生存周期；系统开发的方法论和原理。

## ❁ A Systems Development Methodology

- 一种系统开发方法论 – FAST；一种问题求解框架 – PIECES；系统开发过程主要阶段的划分，以及一些跨阶段的开发活动。

## ❁ Alternative Route and Methods

- 几种系统开发路线：模型驱动；快速原型；购置可用商品软件；混合路线；维护与再工程。

## ❁ Automated Tools and Technology

- CASE： ADE工具；过程与项目管理工具。