

# **INF319 Systems Analysis and Design**

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- Software Engineering Department, MIU.
- Assistant Professor of Information Systems.
- **PhD** in Computer Science from University of Leicester, UK.
- Leicester Award for **Online Networking** and **Employability**.
- NASA Space Apps Cairo **Judge**.

## 2010: Toys R Us double billed the customers

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- Nov. **2010**: Toys R Us (double billing shoppers on Black Friday).
- Black Friday: fourth Thursday in November, the beginning of Christmas shopping in the West.





# Dec. 2014: Amazon 1p price

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- some Amazon's third-party retailers in the UK has found their wares reduced to just 1p each.
- an hour-long pricing software glitch.
- Eagle-eyed shoppers had a field day, but scores of small businesses were left having to absorb heavy losses.
- It is still unclear what compensation, if any, they will receive from Amazon.



# June 2015: 600,000 RBS payments go missing

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- Payments failed - including wages and benefit.
- took several days to come through.
- A “technology fault meant we could not ingest a file from a third-party provider”, said the banker in cheif.
- **In 2012:** 6.5 million RBS customers affected (batch scheduling software). The bank was fined £56 million.





# 2010: In military, mistakes could be serious

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- A US Navy drone (unmanned aerial vehicle) reportedly flew into restricted air space near Washington DC when operators lost control for about 20 minutes due to software issue.



# Healthcare: Veterans Affairs (VA) Hospital Scheduling System (2010s) & (2023)



The VA implemented a new scheduling system that resulted in widespread appointment delays, patient frustration, and even increased veteran mortality rates. (Source: <https://www.gao.gov/products/gao-24-107112> )

## System Analysis & Design Failures:

- **Insufficient User Involvement:** Clinicians and patients were not adequately involved in the system design and testing phases.
- **Inadequate Requirements Gathering:** The system failed to accurately capture the complex scheduling needs of the VA healthcare system, including multiple appointment types, specialist referrals, and patient travel distances.
- **Poor Testing and Implementation:** The system was not thoroughly tested in a realistic environment before widespread deployment, leading to unforeseen issues and cascading problems.

## Impact:

- Significant **delays** in patient appointments, impacting access to critical care.
- Increased patient **frustration** and dissatisfaction with VA services.
- Reports of increased veteran **mortality** rates linked to delayed care.
- **Negative** impact on VA employee morale and productivity.

# Financial: The \$440 Million Software Glitch at Knight Capital (August 1, 2012)

## Knight Capital Group

- An American global financial services firm engaging in market making, electronic execution, and institutional sales and trading.
- In 2012 Knight was the largest trader in U.S. equities with a market share of around 17 percent on the New York Stock Exchange (NYSE) as well as on the Nasdaq Stock Market.
- Knight's Electronic Trading Group (ETG) managed an average daily trading volume of more than 3.3 billion trades, trading over \$21 billion ... daily.

## Problems with Knight's trading:

- software sent bogus, rapid-fire trades into the market for a period of 45 minutes on 1 August, 2012, leaving the firm with heavy losses on numerous stocks it bought at inflated prices.
- Many of its major customers, including TD Ameritrade, Vanguard and Fidelity Investments, stopped routing orders through the group, raising the prospect that the group will either be sold or face bankruptcy.
- New trading software contained a flaw that became apparent only after the software was activated when the New York Stock Exchange (NYSE) opened that day.
- The errant software sent Knight on a buying spree, snapping up 150 different stocks at a total cost of around \$7 billion, all in the first hour of trading.

■ Sources: <https://www.henricodolfing.com/2019/06/project-failure-case-study-knight-capital.html>  
<https://www.theglobaltreasurer.com/2012/08/03/knight-capital-suffers-us440m-trading-loss-from-software-glitch/>



# **INF319 Systems Analysis and Design**

## **Chapter 1: Systems Analyst and Information Systems Development Lifecycle**

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# Chapter 1 Outline

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- The systems analyst.
- The Systems Development Life Cycle (SDLC).
- Information system project identification and initiation.
- Feasibility analysis.

# INTRODUCTION

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- The **systems development life cycle (SDLC)** is the process of determining how an information system (IS) can support business needs, designing the system, building it, and delivering it to users.
- The key person in the SDLC is the **systems analyst**, who analyzes the business situation, identifies the opportunities for improvements, and designs an IS to implement the improvements.



# What Is a Computer Systems Analyst?

## A Spotlight on These Behind-the-Scenes Tech Pros



# THE SYSTEMS ANALYST

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- The systems analyst plays a **key role** in IS development projects.
- The systems analyst **works closely with all project team** members so that the team develops the right system in an effective way.
- Systems analysts must **understand how to apply technology** in order to solve problems.
- Systems analysts may serve as **change agents** who **identify** organizational improvement needed, **design** systems to implement those changes, and **train** and motivate others to use the systems.

# Systems Analyst Skills

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- **Technical** – Must understand the technical environment, technical foundation, and technical solution.
- **Business** – Must understand how IT can be applied to business situations.
- **Analytical** – Must be problem solvers.
- **Interpersonal** – Need to communicate effectively.
- **Management** – Need to manage people and to manage pressure and risks.
- **Ethical** - Must deal fairly, honestly, and ethically with other project members, managers, and systems users.



# Systems Analyst Roles

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- **Business analyst** - Focuses on the business issues surrounding the system.
- **Systems analyst** - Focuses on the Information System issues surrounding the system.
- **Infrastructure analyst** - Focuses on technical issues.
- **Change management analyst** - Focuses on the people and management issues surrounding the system installation.
- **Project manager** - Ensures that the project is completed on time and within budget, and that the system delivers the expected value to the organization.

The **Business Analyst** provides an input information for the System Analyst

The Business Analyst gathers and documents the business requirements



The **System Analyst** writes technical requirements from the business requirements



| Business Analyst in IT  
Requirements Analyst  
Functional Analyst  
Functional Architect

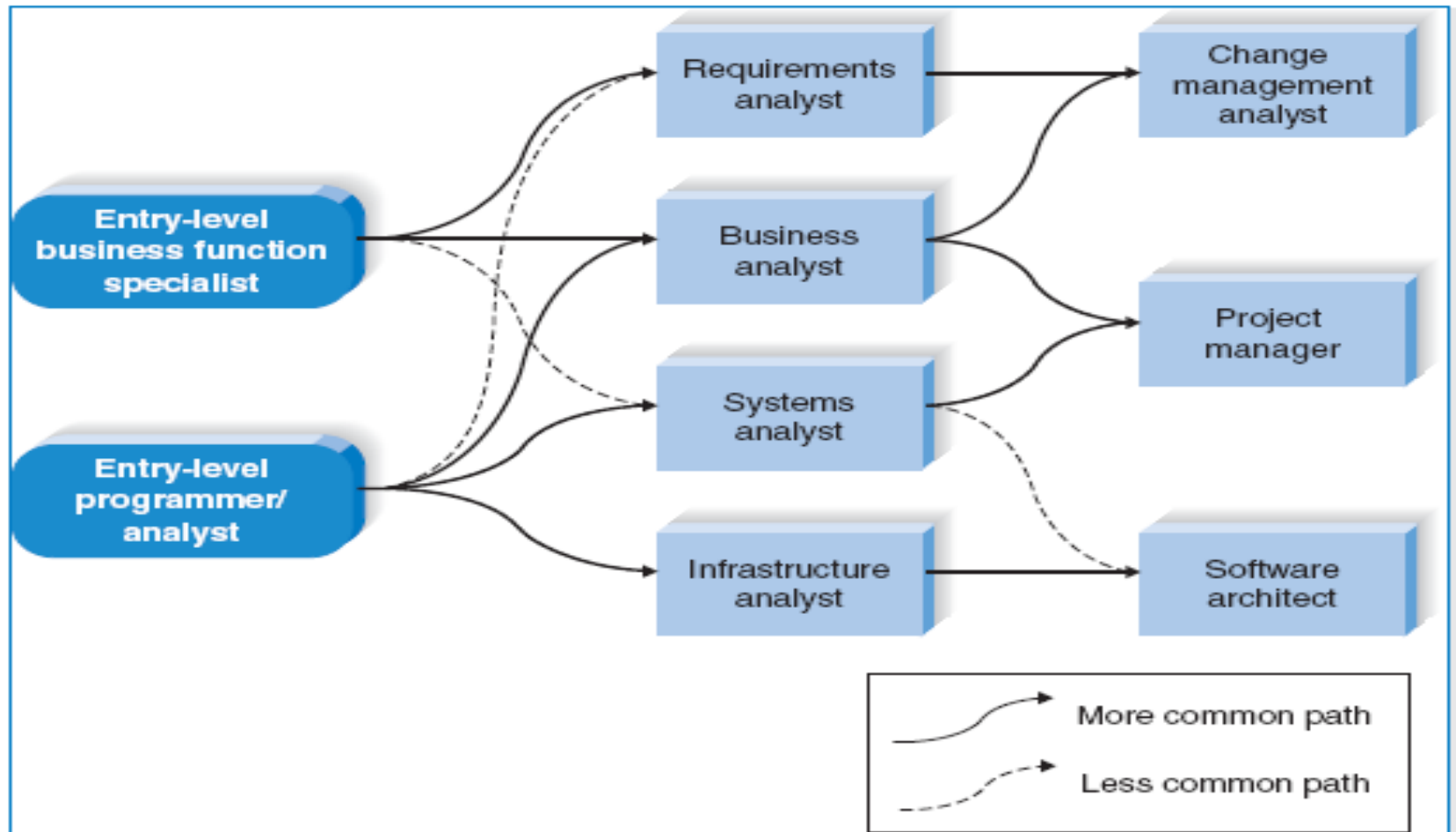


| Business Analyst  
Business Consultant  
Business Architect  
Business Processes Analyst



| System Analyst  
System Architect

# Career Paths for Systems Analysts





# External Links

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- **Data Analyst vs. Business Analyst | Which Is Right For You?**

<https://www.youtube.com/watch?v=G4syHs3M82E>

- **Business Analyst vs. System Analyst**

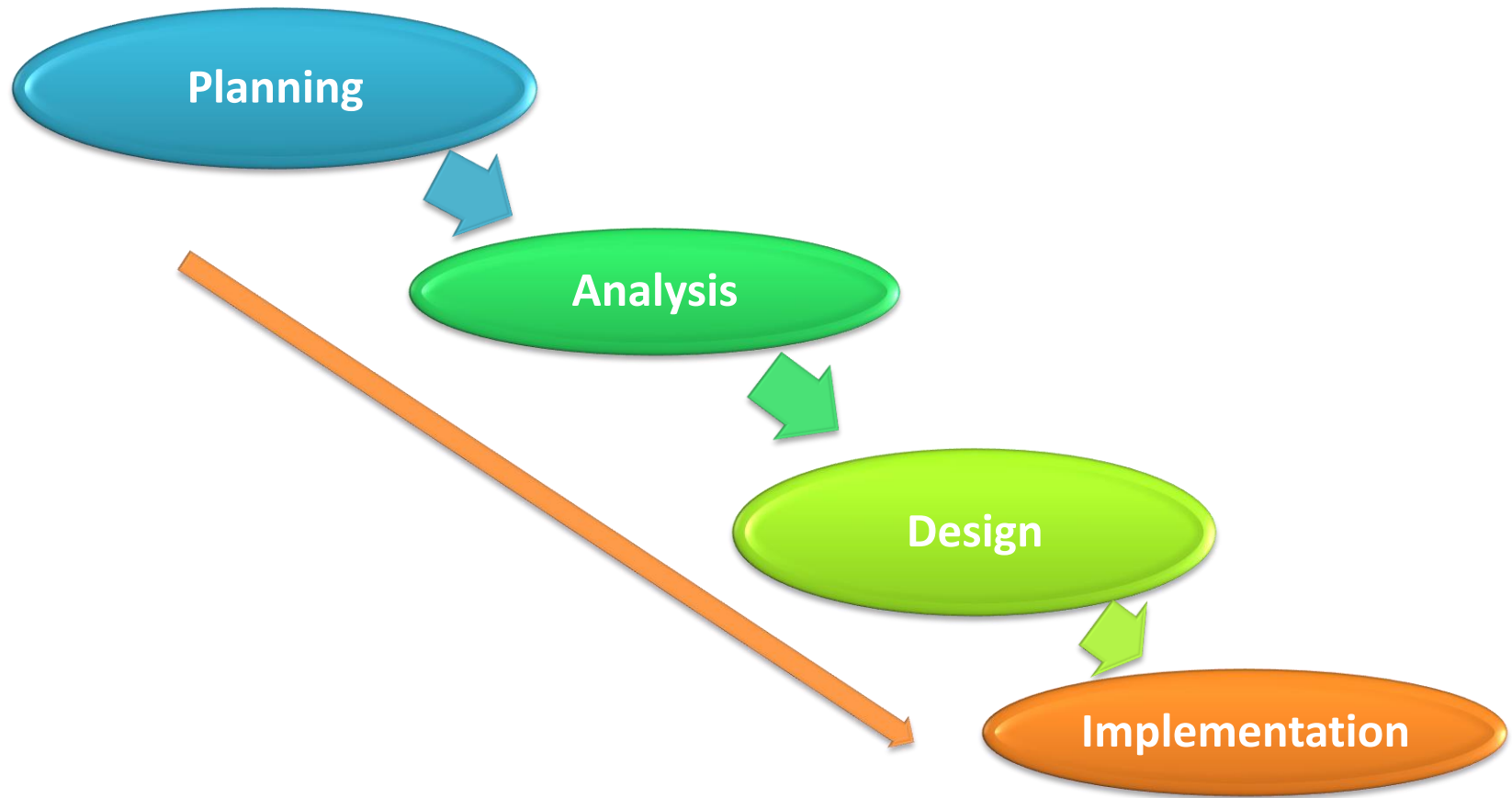
<https://www.youtube.com/watch?v=UiUYVCXGQNw>

- Discussion: What are the differences between business analyst, system analyst and data analyst?

<https://www.quora.com/What-are-the-differences-between-business-analyst-system-analyst-and-data-analyst>

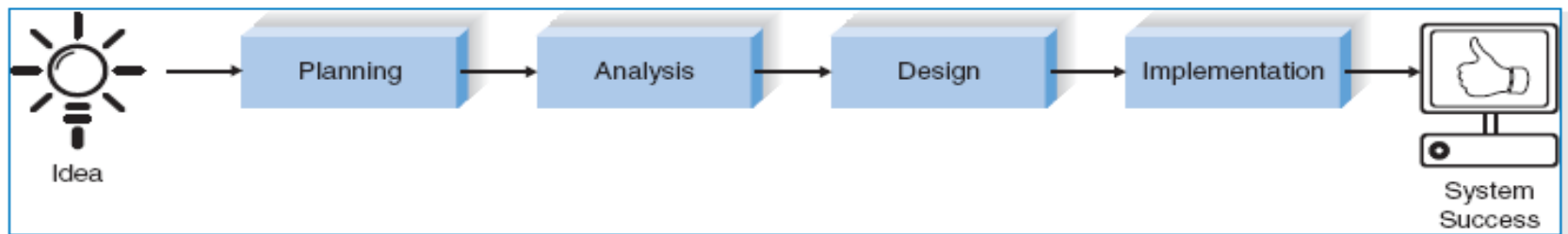
# THE SYSTEMS DEVELOPMENT LIFE CYCLE (SDLC)

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# SDLC ...

- The **SDLC** is composed of four fundamental phases:  
**Planning, Analysis, Design, Implementation**
- Each of the phases is composed of steps, which rely on techniques that produce *deliverables* (specific documents that explain various elements of the system).



**FIGURE 1-2**  
The Systems Development Life Cycle



# Planning

- This phase is the fundamental process of understanding *why* an information system should be built, and determining *how* the project team will go about building it.



# The planning phase has two steps:

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1. During **project initiation**, the system's business value to the organization is identified (How will it lower costs or increase revenues?).
2. During **project management**, the project manager creates a work plan, staffs the project, and puts techniques in place to help the project team control and direct the project through the entire SDLC.

# Analysis

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- The analysis phase answers the questions of *who* will use the system, *what* the system will do, and *where* and *when* it will be used.
- During this phase the project team investigates any current system(s), identifies improvement opportunities, and develops a concept for the new system.



# The analysis phase has three steps:

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1. **Analysis strategy:** This is developed to guide the projects team's efforts. This includes a study of the current system and its problems, and envisioning ways to design a new system.
2. **Requirements gathering:** The analysis of this information leads to the development of a concept for a new system. This concept is used to build a set of analysis models.
3. **System proposal:** The proposal is presented to the project sponsor and other key individuals who decide whether the project should continue to move forward.

# Design

- The design phase decides *how* the system will operate, in terms of the hardware, software, and network infrastructure; the user interface, forms, and reports that will be used; and the specific programs, databases, and files that will be needed.



# The design phase has four steps:

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1. **Design Strategy:** This clarifies whether the system will be developed by the company or outside the company.
2. **Architecture Design:** This describes the hardware, software, and network infrastructure that will be used.
3. **Database and File Specifications:** These documents define what and where the data will be stored.
4. **Program Design:** Defines what programs need to be written and what they will do.



# Implementation

- During the implementation phase, the system is either developed or purchased (in the case of packaged software) and installed.
- This phase is usually the longest and most expensive part of the process.



## The implementation phase has three steps:

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1. **System Construction**: The system is built and tested to make sure it performs as designed.
2. **Installation**: The old system is turned off and the new one is turned on.
3. **Support Plan**: Includes a post-implementation review as well as a systematic way for identifying changes needed for the system.

# PROJECT IDENTIFICATION AND INITIATION

## PROJECT INITIATION

Follow these six steps to start your project off right

## PROJECTMANAGER



# PROJECT IDENTIFICATION AND INITIATION

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- A project is identified when someone in the organization identifies a *business need* to build a system.
- A need may surface when an organization identifies unique and competitive ways of using IT.
- To leverage the capabilities of *emerging technologies* such as cloud computing, RFID, Web 2.0

# Business Process Management (BPM)

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- Recently, IS projects grow out of BPM.
- BPM is a methodology used by organizations to continuously improve end-to-end business processes.

## ■ BPM Process

- Defining and mapping the steps in a business process.
- Creating ways to improve on the steps in the process that add value
- Finding ways to eliminate or consolidate steps in the process that do not add value
- Creating and adjusting electronic workflows to match the improved process maps.

# BPA, BPI and BPR

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- **Business process automation (BPA)** – technology components are used to complement or substitute manual process.
- **Business process improvement (BPI)** – creating new, re-designed processes to improve the workflows, and/or utilizing new technologies enabling new process structures.
- **Business process reengineering (BPR)** – changing the fundamental way in which the organization operate.



# Project sponsor

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- The **project sponsor** is a person (or group) who has an interest in the system's success
- The project sponsor will work throughout the SDLC to make sure that the project is **moving in the right direction** from the perspective of the business.
- The project sponsor serves as the **primary point of contact** for the project team.
- The size or **scope** of the project determines by the kind of sponsor that is involved.

# Project Sponsor Responsibilities



Providing requirements



Maintaining ongoing communication



Reviewing deliverables



Monitoring the progress and budget



Managing risks



# Project Sponsor and Business Value

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- The project sponsor has the insights needed to determine the **business value** that will be gained from the system.
- **Tangible** value can be quantified and measured easily (reduction in operating costs).
- An **intangible** value results from an intuitive belief that the system provides important, but hard-to-measure benefits to the organization.

# System Request

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- The document that describes the **business reasons** for building a system and the **value** that system is expected to provide.
- The **business requirements** of the project refer to the business capabilities that the system will need to have.
- The **business value** describes the benefits that the organization should expect from the system.
- **Special issues** are included on the document as a catchall category for other information that should be considered in assessing the project.

# Example System Request

SYSTEM AUTHORIZATION ACCESS REQUEST (SAAR)			
<b>AUTHORITY:</b> <b>PRINCIPAL PURPOSE:</b> Executive Order 13455, 50CFR, and Public Law 109-474, the Computer Fraud and Abuse Act. <b>ROUTINE USER DISCLOSURE:</b> To record names, signatures, and other identifiers for the purpose of validating the trustworthiness of individuals requesting access to Department of Defense (DoD) systems and information. NOTE: Records may be maintained in both electronic and/or paper form. <b>DISCLOSURE:</b> None. Disclosure of this information is voluntary; however, failure to provide the requested information may impede, delay or prevent further processing of this request.		<b>PRIVACY ACT STATEMENT</b> To record names, signatures, and other identifiers for the purpose of validating the trustworthiness of individuals requesting access to Department of Defense (DoD) systems and information. NOTE: Records may be maintained in both electronic and/or paper form.	
<b>TYPE OF REQUEST</b> <input type="checkbox"/> INITIAL <input type="checkbox"/> MODIFICATION <input type="checkbox"/> DEACTIVATE <input type="checkbox"/> USER ID			<b>DATE (YYYYMMDD)</b>
<b>SYSTEM NAME (Platform or Application)</b>			<b>LOCATION (Physical Location of System)</b>
<b>PART I (To be completed by Requester)</b>			
1. NAME (Last, First, Middle Initial)		2. ORGANIZATION	
3. OFFICE (BUREAU/DEPARTMENT)		4. PHONE (DOD or Commercial)	
5. OFFICIAL E-MAIL ADDRESS		6. JOB TITLE AND ORGANIZATION	
7. OFFICIAL MAILING ADDRESS		8. CITIZENSHIP <input type="checkbox"/> US <input type="checkbox"/> FW <input type="checkbox"/> OTHER <input type="checkbox"/> MILITARY <input type="checkbox"/> CIVILIAN <input type="checkbox"/> CONTRACTOR	
9. AUTHORIZING AND MONITORING CERTIFICATION REQUIREMENTS (Complete as required for user or functional level access.) <input type="checkbox"/> I have completed Annual Information Awareness Training. <b>DATE (YYYYMMDD)</b>			
10. USER SIGNATURE			11. DATE (YYYYMMDD)
<b>PART II - ENDORSEMENT OF ACCESS BY INFORMATION OWNER, USER SUPERVISOR OR GOVERNMENT SPONSOR (If individual is a contractor - provide company name, contract number, and date of contract expiration in block 14.)</b>			
12. JUSTIFICATION FOR ACCESS			
13. TYPE OF ACCESS REQUESTED: <input type="checkbox"/> AUTHORIZED <input type="checkbox"/> REVOKED			
14. USER REQUEST ACCESS TO: <input type="checkbox"/> UNCLASSIFIED <input type="checkbox"/> CLASSIFIED (specify category) <input type="checkbox"/> OTHER			
15. VERIFICATION OF NEED TO KNOW I certify that this user requires access as requested. <input type="checkbox"/>		16. ACCESS EXPIRATION DATE (Contractors must specify Company Name, Contract Number, Expiration Date - Use Block 17 if created.)	
17. SUPERVISOR/ORGANIZATION (Print Name)	18. SUPERVISOR'S SIGNATURE	19. DATE (YYYYMMDD)	
20. SUPERVISOR'S ORGANIZATION/DEPARTMENT	21. SUPERVISOR'S E-MAIL ADDRESS	22. PHONE NUMBER	
23. SIGNATURE OF INFORMATION OWNER/SP	24. PHONE NUMBER	25. DATE (YYYYMMDD)	
26. SIGNATURE OF SAC OR RPPORTER	27. ORGANIZATION/DEPARTMENT	28. PHONE NUMBER	29. DATE (YYYYMMDD)

# System Request ...

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- The completed system request is submitted to the **approval committee** for consideration.
- The committee **reviews** the system request and makes an initial determination of whether to investigate the proposed project or not.
- If so, the next step is to conduct a **feasibility analysis**.



# FEASIBILITY ANALYSIS

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- Feasibility analysis guides the organization in determining whether to proceed with a project.
- Feasibility analysis also identifies the important risks associated with the project that must be managed if the project is approved.



# Types of Feasibility Analysis

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- As with the system request, each organization has its own process and format for the feasibility analysis, but most include techniques to assess three areas:
  - Technical feasibility
  - Economic feasibility
  - Organizational feasibility
- The results of evaluating these three feasibility factors are combined into a **feasibility study** deliverable that is submitted to the approval committee at the end of project initiation.

# Technical Feasibility “Can we build it?”

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- Technical feasibility (**technical risk analysis**) is the extent to which the system can be successfully designed, developed, and installed by the IT group.
- Risks can endanger the successful completion of a project.
  - Users’ and analysts’ should be familiar with the application.
  - Familiarity with the technology.
  - Project size.
  - Compatibility of the new system with the technology that already exists.

# Economic Feasibility “Should we build the system?”

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- Economic feasibility analysis ([cost-benefit analysis](#)), identifies the costs and benefits associated with the system.



# Cash Flow Analysis and Measures

- IT projects involve an initial investment that produces a stream of benefits over time, along with some on-going support costs.
- Cash flows, both inflows and outflows, are estimated over some future period.

	Year 0	Year 1	Year 2	Year 3	Total
Total Benefits		45,000	50,000	57,000	152,000
Total Costs	100,000	10,000	12,000	16,000	138,000
Net Benefits (Total Benefits – Total Costs)	(100,000)	35,000	38,000	41,000	14,000
③ ④ Cumulative Net Cash Flow	(100,000)	(65,000)	(27,000)	14,000	

# Organizational Feasibility “If we build it, will they come?”

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- Organizational feasibility of the system is how well the system ultimately will be accepted by its users and incorporated into the ongoing operations of the organization.
- There are many organizational factors that can have an impact on the project, and seasoned developers know that organizational feasibility can be the most difficult feasibility dimension to assess.
- In essence, an organizational feasibility analysis is to answer the question

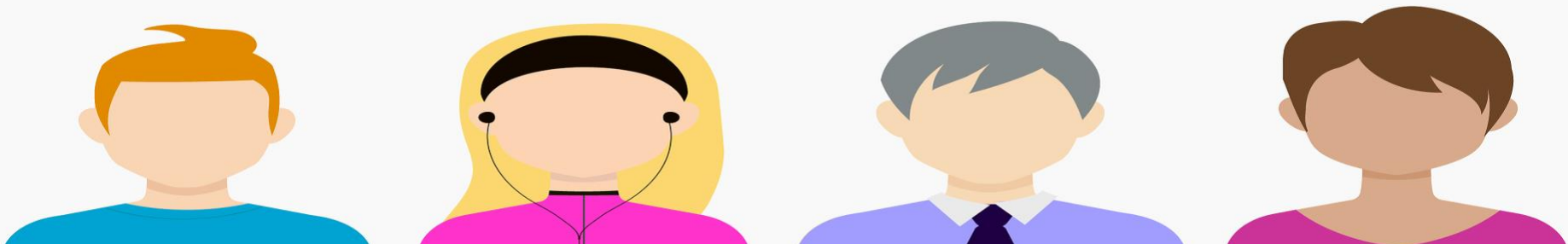


# (cont'd)

- Ways to assess the organizational feasibility:
  - to understand how well the goals of the project align with the business objectives and organizational strategies.
  - to conduct **stakeholder analysis**.
- A **stakeholder** is a person, group, or organization that can affect a new system (Project champion, System users, Organizational management, .. Etc.).

## Stakeholder Analysis

METJI DIGITAL



# SUMMARY

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- The **Systems Analyst** is the key person in the development of information systems.
- **The Systems Development Lifecycle** consists of four stages: Planning, Analysis, Design, and Implementation.
- **Project Identification and Initiation** recognize a business need that can be satisfied through the use of information technology.
- **System Request** describes the business value for an information system.
- A **Feasibility Analysis** is used to provide more detail about the risks associated with the proposed system.