TYPES OF REQUIREMENTS
(LESSON 04)

PHÂN TÍCH YÊU CẦU PHẦN MỀM (SOFTWARE REQUIREMENTS)

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- **CMM/CMMi and Process Areas of Requirements**
  - **Requirements Management (REQM)**
  - **Requirements Development (RD)**
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- **Definitions and Specifications of Requiments Types**

STUDENT BOOK
2021

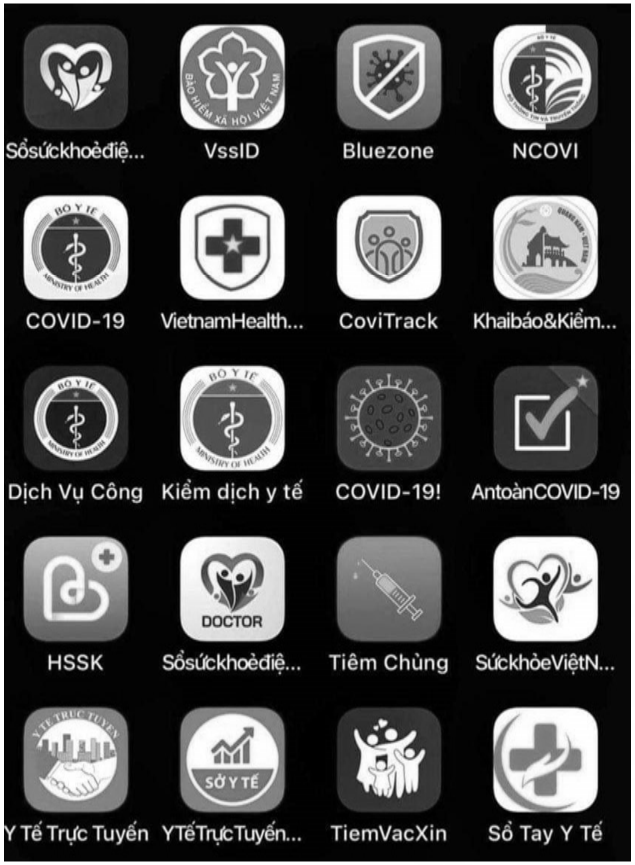
LƯU HÀNH NỘI BỘ
(TÀI LIỆU TRÍCH LỌC)

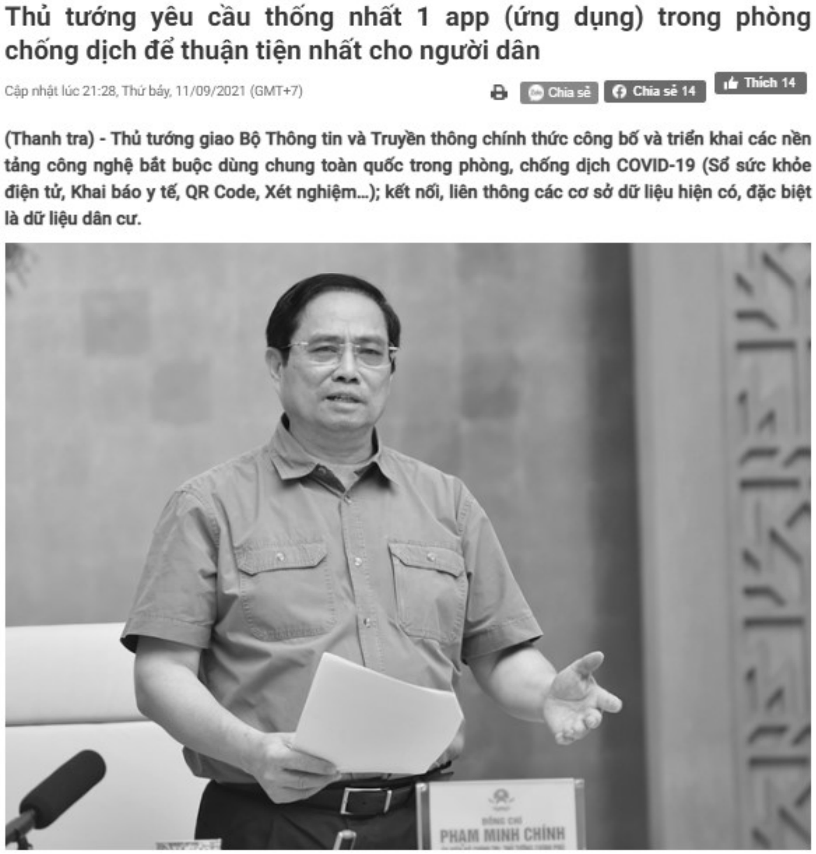
PHÂN TÍCH
YÊU CẦU PHẦN MỀM
(SOFTWARE REQUIREMENTS)

AUGUST 12

COLLEGE OF INFORMATION
TECHNOLOGY
& COMMUNICATION
Authored by: Collection Team

REQUIREMENTS (RELATED TO COVID-19)



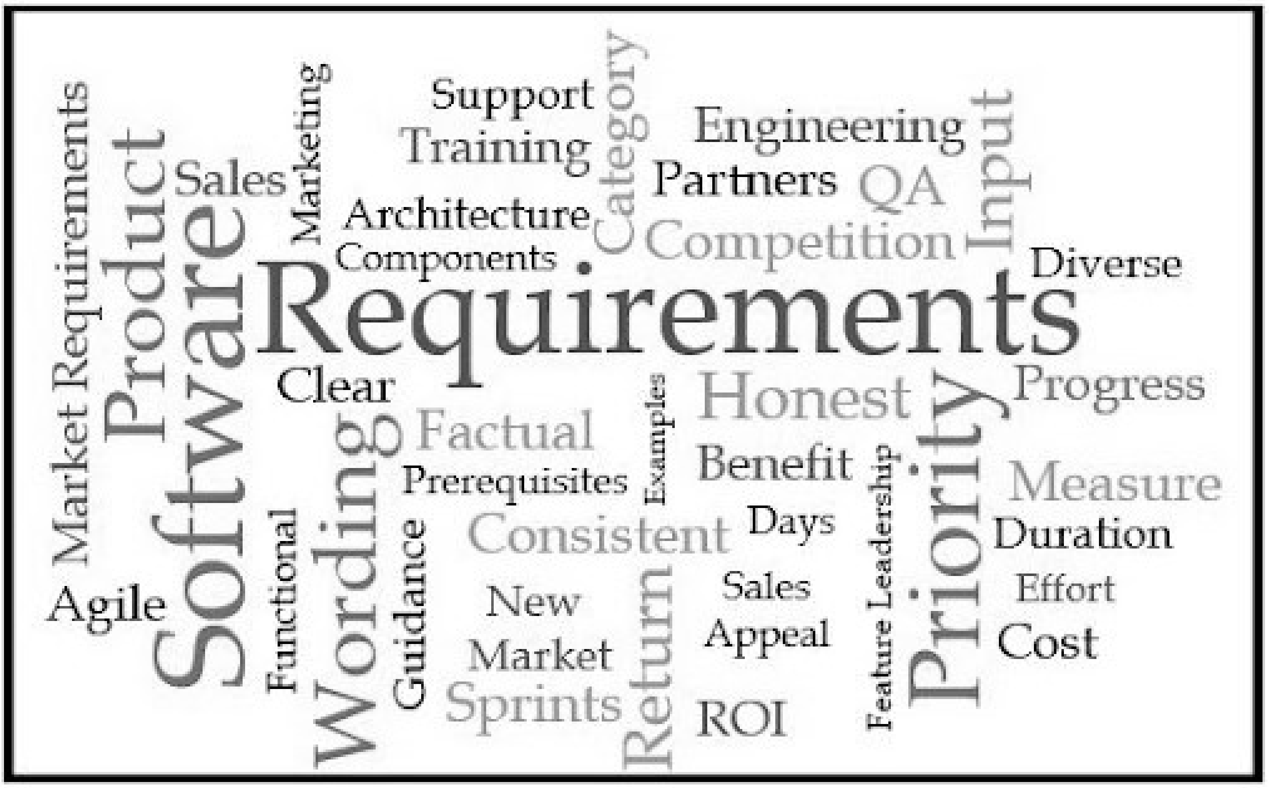


Thủ tướng yêu cầu thống nhất 1 app (ứng dụng) trong phòng chống dịch để thuận tiện nhất cho người dân

Cập nhật lúc 21:28, Thứ bảy, 11/09/2021 (GMT+7)

(Thanh tra) - Thủ tướng giao Bộ Thông tin và Truyền thông chính thức công bố và triển khai các nền tảng công nghệ bắt buộc dùng chung toàn quốc trong phòng, chống dịch COVID-19 (Sổ sức khỏe điện tử, Khai báo y tế, QR Code, Xét nghiệm...); kết nối, liên thông các cơ sở dữ liệu hiện có, đặc biệt là dữ liệu dân cư.

REQUIREMENTS



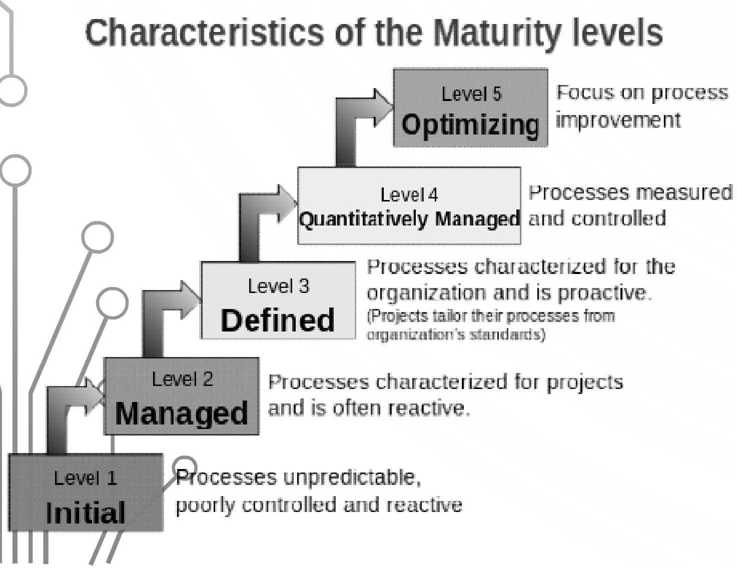
CMM VS CMMI

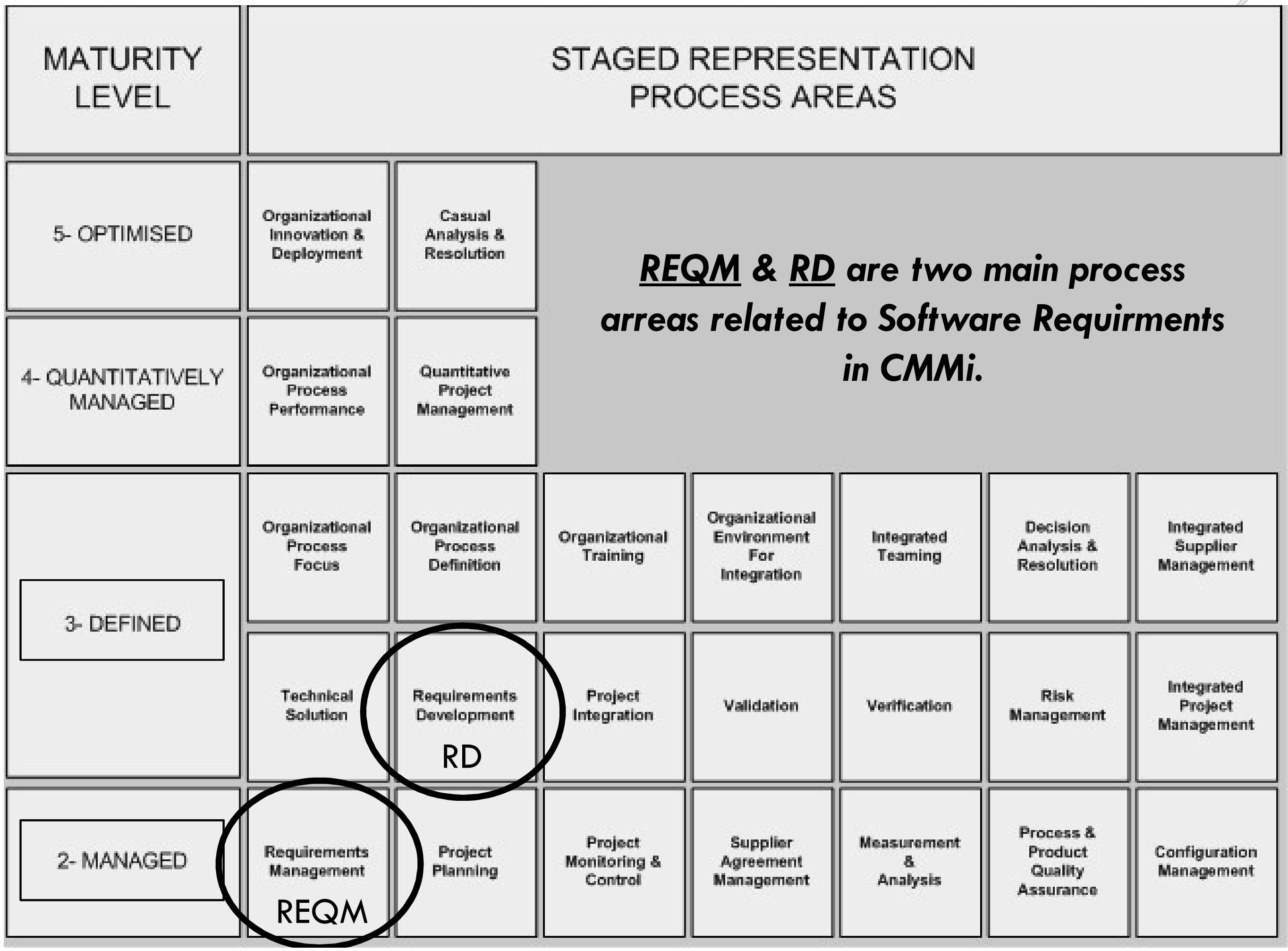
CMMI® (Capability Maturity Model® Integration) models are collections of best practices that help organizations to improve their processes. These models are developed by product teams with members from industry, government, and the Software Engineering Institute (SEI).

Parameters of Comparison	**CMM**	**CMMI**
Definition	CMM stands for Capability Maturity Model.	CMMI stands for Capability Maturity Model Integration.
Meaning	It is a behavior model developed to measure an organization's software development process.	It is a successor of the CMM model and is more effective and task-oriented.
Developed in	The year 1990	The year 2006
Purpose	To evaluate the process maturity levels in software.	To combine many software models into one and to overcome the drawbacks of CMM.
Stages	This model has five stages: Initial, Repeat, Defined, Managed, Optimized.	This model has five stages, too: Initial, Managed, Defined, Quantitively managed, Optimized.
Efficiency	Less effective one	More effective one

CMMI STAGED REPRESENTATION PROCESS AREAS

http://www.cmmi.co.uk/cmmi/cmmi.html


Characteristics of the Maturity levels
Level 5
Optimizing
Focus on process improvement
Level 4
Quantitatively Managed
Processes measured and controlled
Level 3
Defined
Processes characterized for the organization and is proactive.
(Projects tailor their processes from organization's standards)
Level 2
Managed
Processes characterized for projects and is often reactive.
Level 1
Initial
Processes unpredictable, poorly controlled and reactive

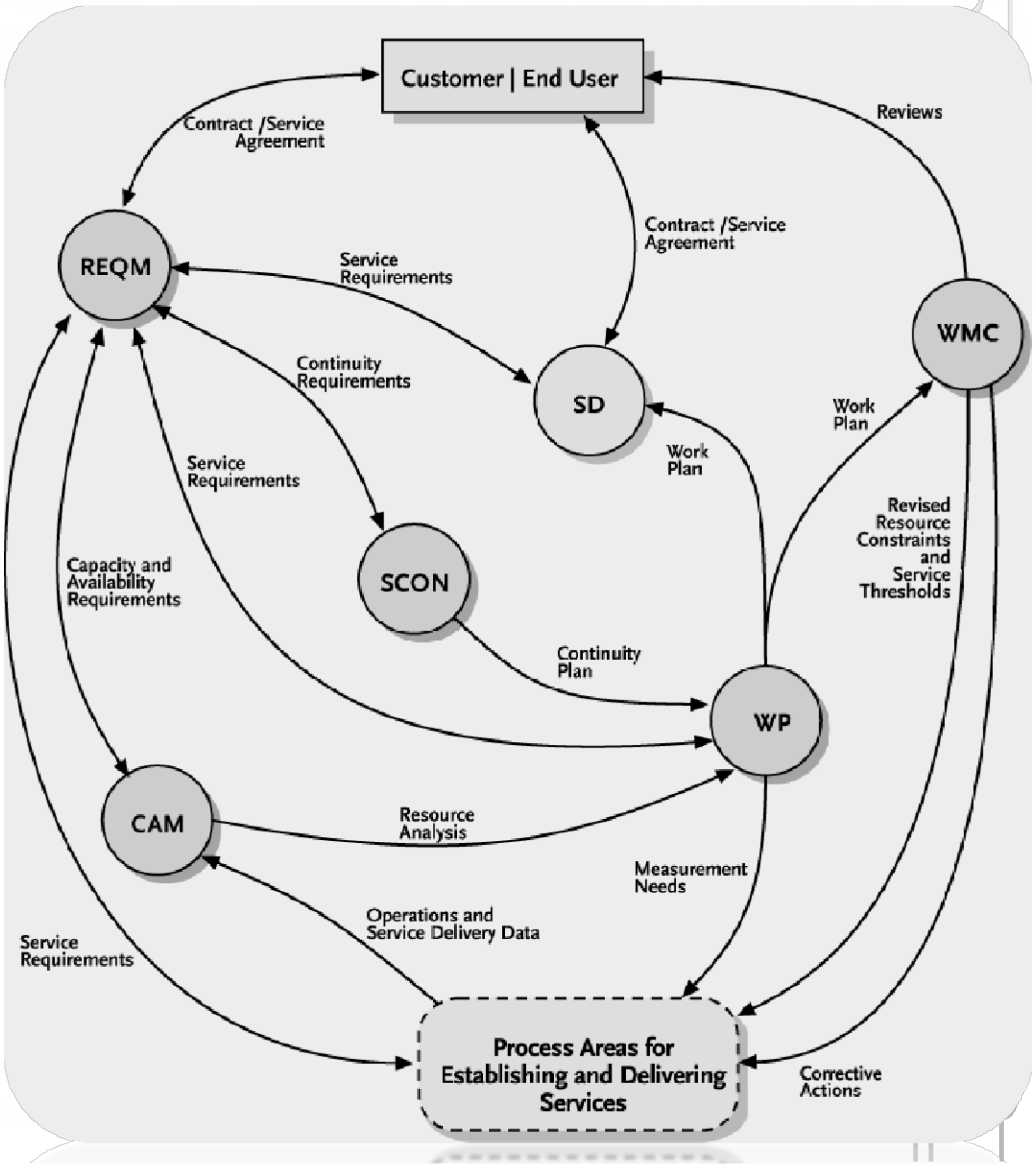


MATURITY LEVEL	STAGED REPRESENTATION PROCESS AREAS						
5- OPTIMISED	Organizational Innovation & Deployment	Casual Analysis & Resolution					
4- QUANTITATIVELY MANAGED	Organizational Process Performance	Quantitative Project Management					
3- DEFINED	Organizational Process Focus	Organizational Process Definition	Organizational Training	Organizational Environment For Integration	Integrated Teaming	Decision Analysis & Resolution	Integrated Supplier Management
	Technical Solution	Requirements Development RD	Project Integration	Validation	Verification	Risk Management	Integrated Project Management
2- MANAGED	Requirements Management REQM	Project Planning	Project Monitoring & Control	Supplier Agreement Management	Measurement & Analysis	Process & Product Quality Assurance	Configuration Management

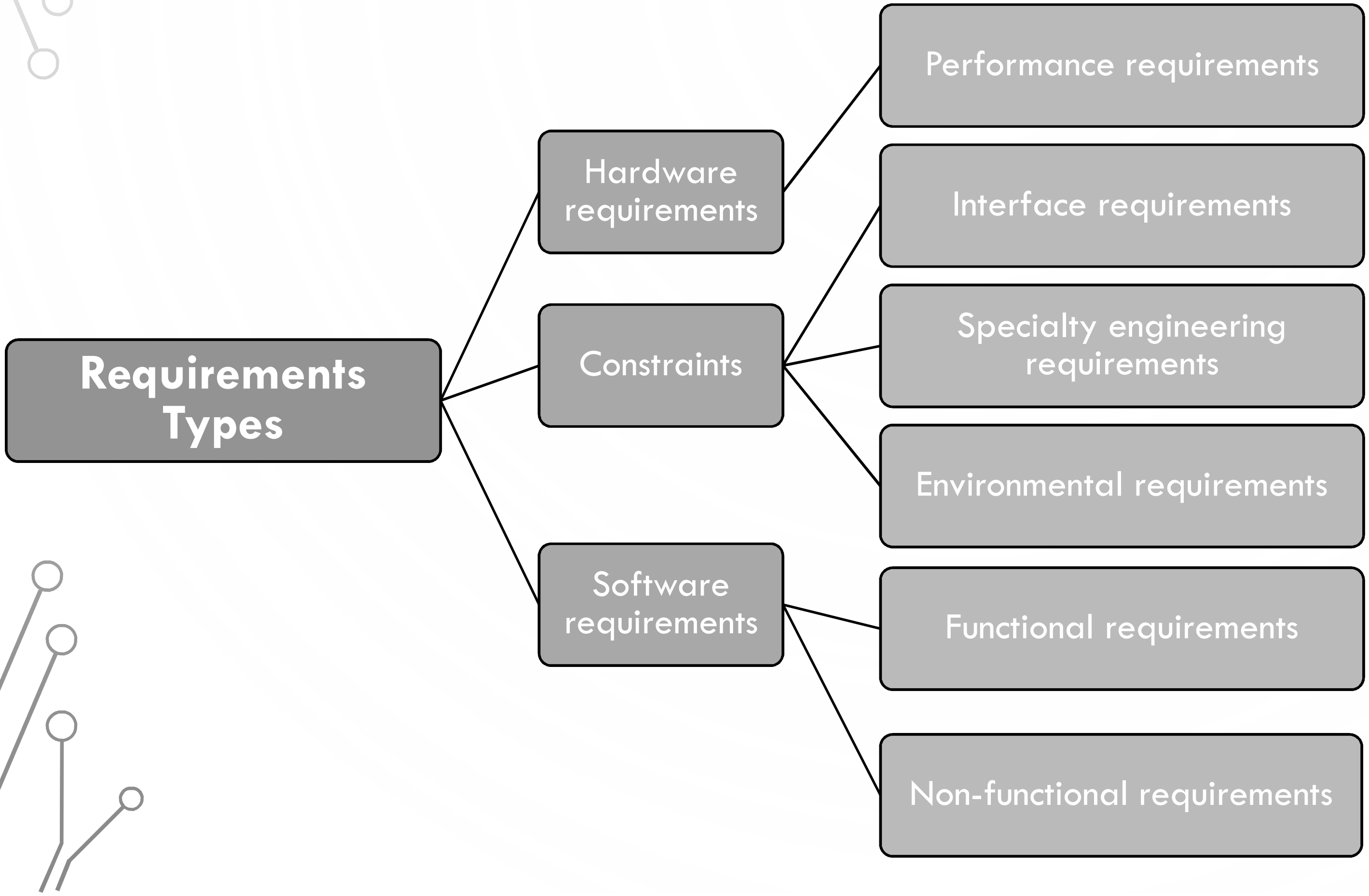
REQM & RD are two main process areas related to Software Requirments in CMMi.

PROJECT AND WORK MANAGEMENT

- Service Continuity (SCON) (CMMI-SVC)
- Capacity and Availability Management (CAM) (CMMI-SVC)
- Work Planning (WP) (CMMI-SVC)
- Work Monitoring and Control (WMC) (CMMI-SVC)
- Supplier Agreement Management (SAM) (CMMI-SVC)
- Integrated Work Management (IWM) (CMMI-SVC)
- Risk Management (RSKM) (CMMI-SVC)
- Quantitative Work Management (QWM) (CMMI-SVC)
- Requirements Management (REQM) (CMMI-SVC)

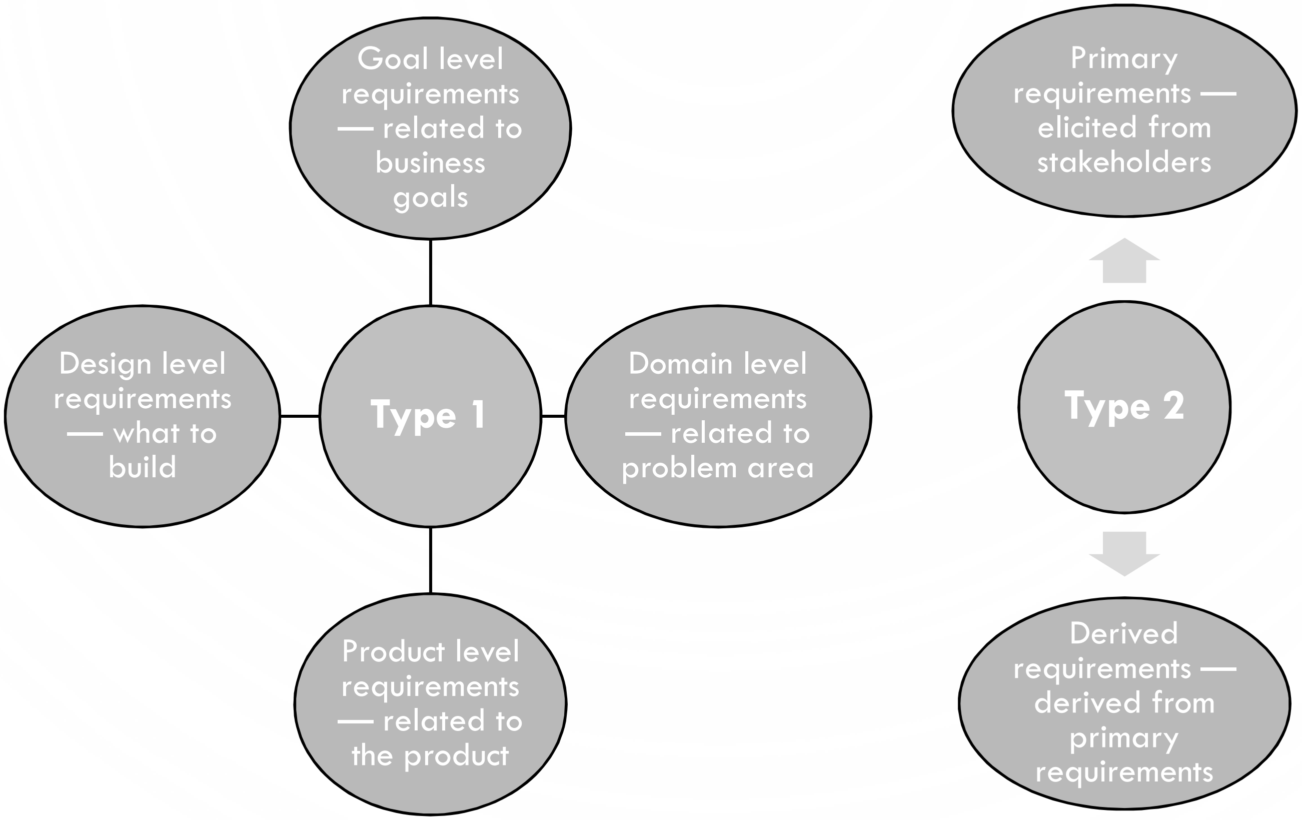

Customer | End User
Contract /Service Agreement
Reviews
REQM
Service Requirements
Contract /Service Agreement
WMC
Continuity Requirements
SD
Work Plan
Service Requirements
Work Plan
Revised Resource Constraints and Service Thresholds
Capacity and Availability Requirements
SCON
Continuity Plan
WP
CAM
Resource Analysis
Measurement Needs
Operations and Service Delivery Data
Service Requirements
Process Areas for Establishing and Delivering Services
Corrective Actions

VIEWS OF REQUIREMENTS TYPES



- **Requirements Types**
  - Hardware requirements
    - Performance requirements — Waiting time; Number of requests, …
  - Constraints
    - Interface requirements — UI/UX requirements
    - Specialty engineering requirements — Speciaty taxonomy; Rules; Policies, …
    - Environmental requirements — Operating system; Devices; Cloud/Hosting; Other platforms; …
  - Software requirements
    - Functional requirements — What the system will do?
    - Non-functional requirements — Constraints on the types of solutions that will meet the functional requirements e.g. accuracy, performance, security, modifiability and ilities.

ANOTHER VIEW OF REQUIREMENTS TYPES


Goal level requirements — related to business goals
Design level requirements — what to build
Type 1
Domain level requirements — related to problem area
Product level requirements — related to the product
Primary requirements — elicited from stakeholders
Type 2
Derived requirements — derived from primary requirements

OTHERS CLASSIFICATIONS

- Business requirements *versus* technical requirements
- Product requirements *versus* process requirements —- i.e. business needs versus how people will interact with the system
- Role based requirements, e.g. customer requirements, user requirements, IT requirements, system requirements, and security requirements

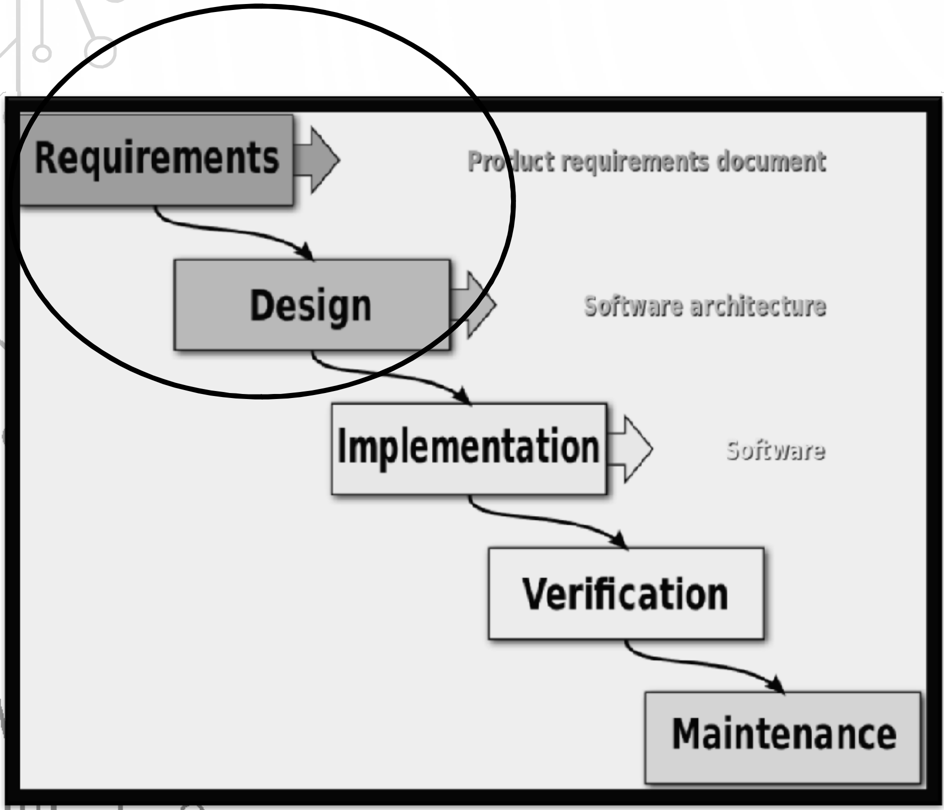
REQUIREMENTS: BUYING VS BUILDING SOFTWARE

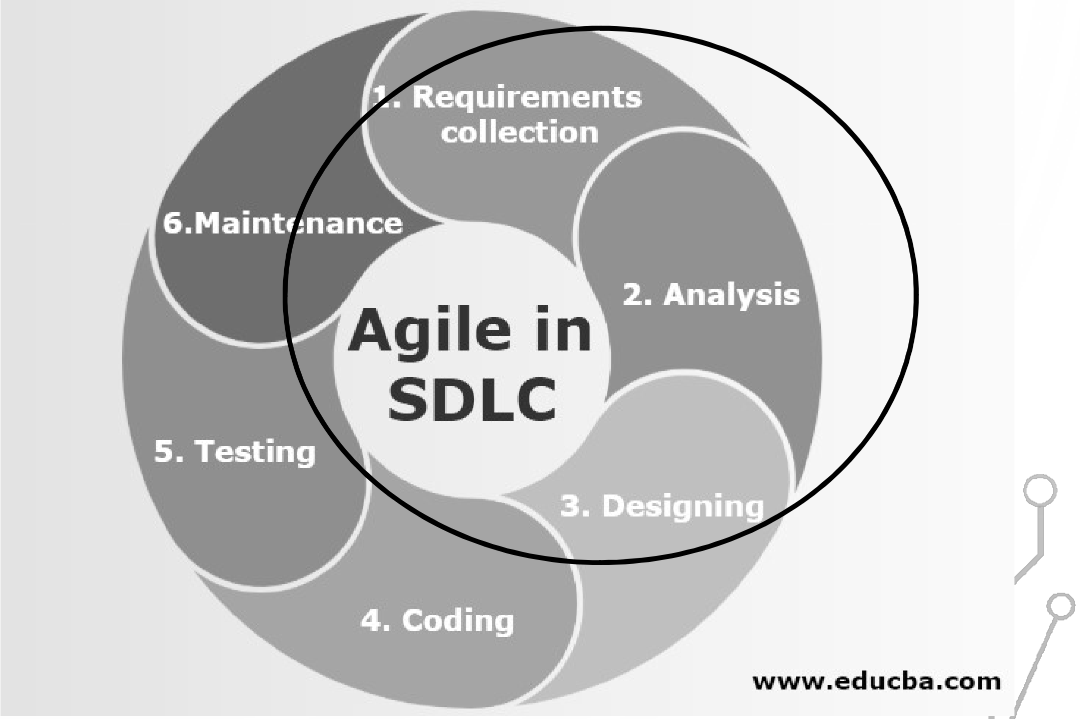
Buying Software	Building Software
Requirements are used to select one product from several existing candidates	Requirements describe how the new software should function
Describe the desired functionality only, and not how that functionality is implemented.	Describe how that functionality is implemented.
Simpler level of requirements	Higher level of requirements

Waterfall Model vs. Agile Model

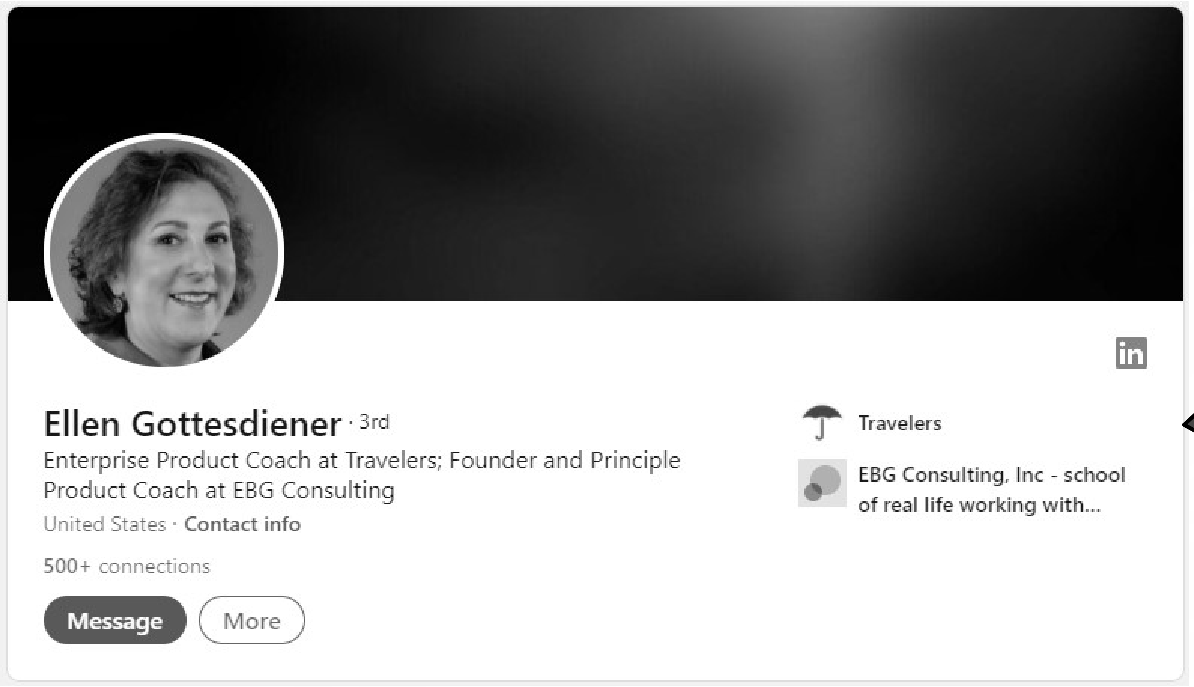
Waterfall is too difficult and too slow for the business.

Agile emerged as a response to these problems and, in part, relies on frequent incremental releases being verified by business users.





RECOMMENDATIONS



Ellen Gottesdiener · 3rd

Enterprise Product Coach at Travelers; Founder and Principle Product Coach at EBG Consulting

United States · Contact info

500+ connections

Travelers

EBG Consulting, Inc - school of real life working with...

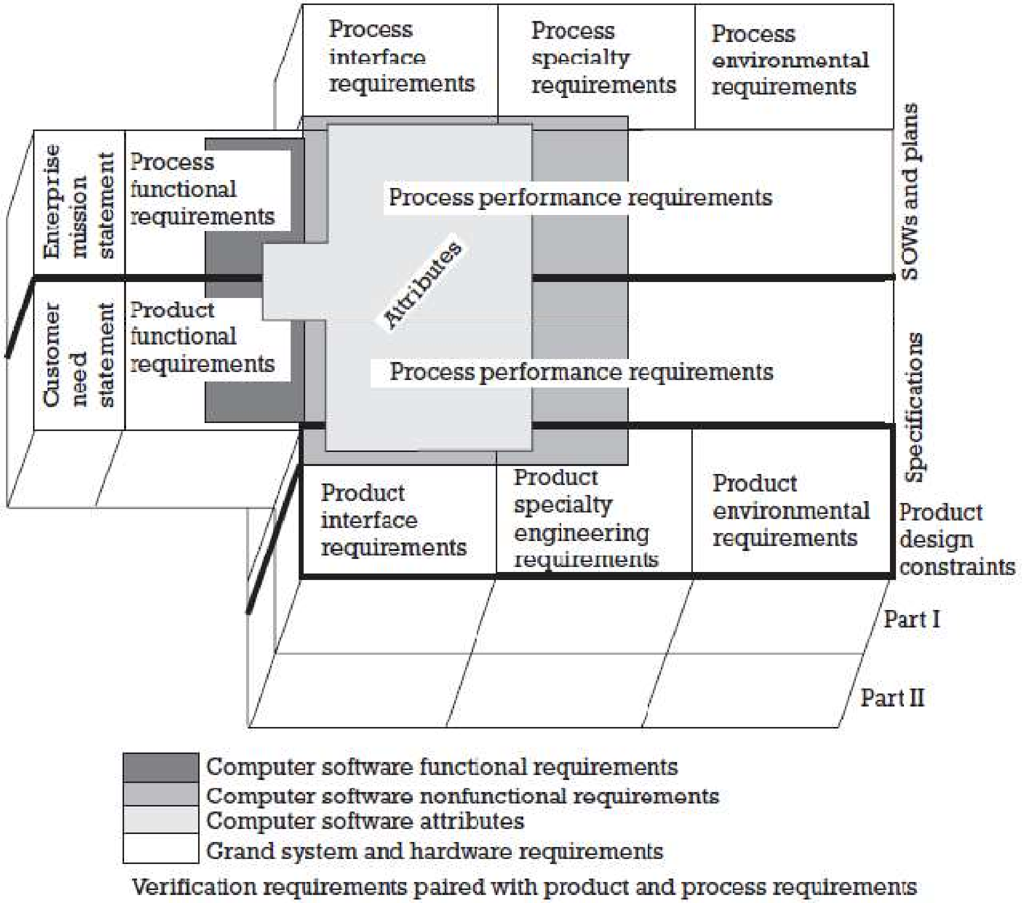
Ms. Ellen Gottesdiener recommends **three or four iterations of requirements development**, each incorporating a formal or informal review by internal and external customers.

TOTAL REQUIREMENTS TAXONOMY

(Source: Jeffrey O. Grady)

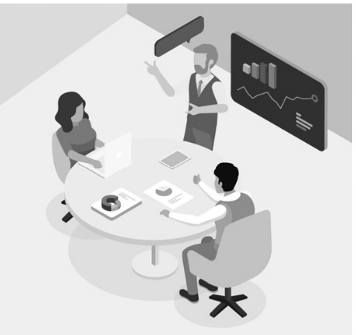
Remarks:

- The requirements are mutually consistent;
- The requirements are prioritized (there is never enough time and money to do everything).


Process interface requirements
Process specialty requirements
Process environmental requirements
Enterprise mission statement
Process functional requirements
Process performance requirements
Attributes
SOWs and plans
Customer need statement
Product functional requirements
Process performance requirements
Specifications
Product interface requirements
Product specialty engineering requirements
Product environmental requirements
Product design constraints
Part I
Part II
Computer software functional requirements
Computer software nonfunctional requirements
Computer software attributes
Grand system and hardware requirements
Verification requirements paired with product and process requirements

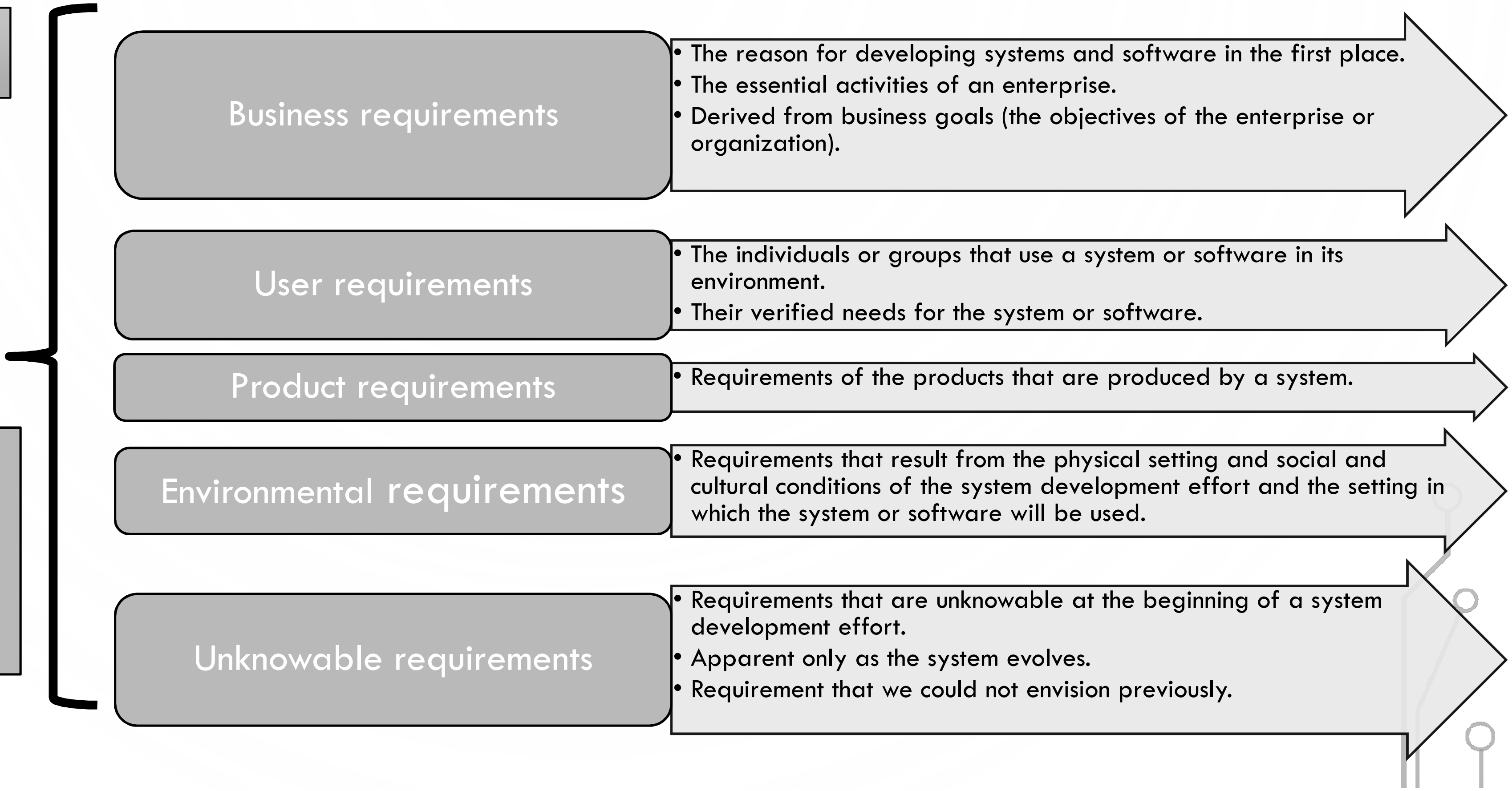
CUSTOMER NEEDS AND EXPECTATIONS

Requirement Analyst
(Requirement Engineer)



Two ways of analysis and description:

- High-level (or system-level) requirements
- Functional requirements (what the system must do)



Business requirements

- The reason for developing systems and software in the first place.
- The essential activities of an enterprise.
- Derived from business goals (the objectives of the enterprise or organization).

User requirements

- The individuals or groups that use a system or software in its environment.
- Their verified needs for the system or software.

Product requirements

- Requirements of the products that are produced by a system.

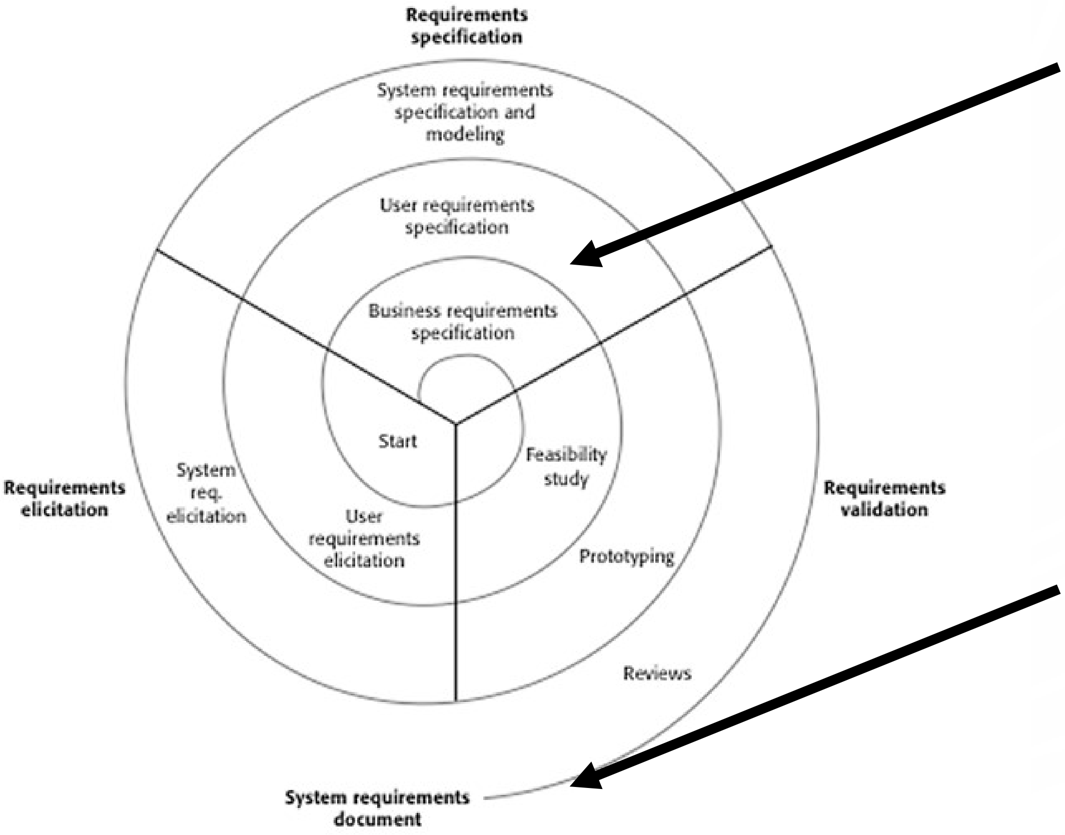
Environmental requirements

- Requirements that result from the physical setting and social and cultural conditions of the system development effort and the setting in which the system or software will be used.

Unknowable requirements

- Requirements that are unknowable at the beginning of a system development effort.
- Apparent only as the system evolves.
- Requirement that we could not envision previously.

PROCESS OF REQUIREMENTS ENGINEERING


Requirements specification
System requirements specification and modeling
User requirements specification
Business requirements specification
Start
Feasibility study
Prototyping
Reviews
Requirements elicitation
System req. elicitation
User requirements elicitation
Requirements validation
System requirements document

Early in the process, most effort will be spent on understanding high-level business and user requirements.

Later in the process, more efforts will be spent on elicitation and understanding detailed system requirements.

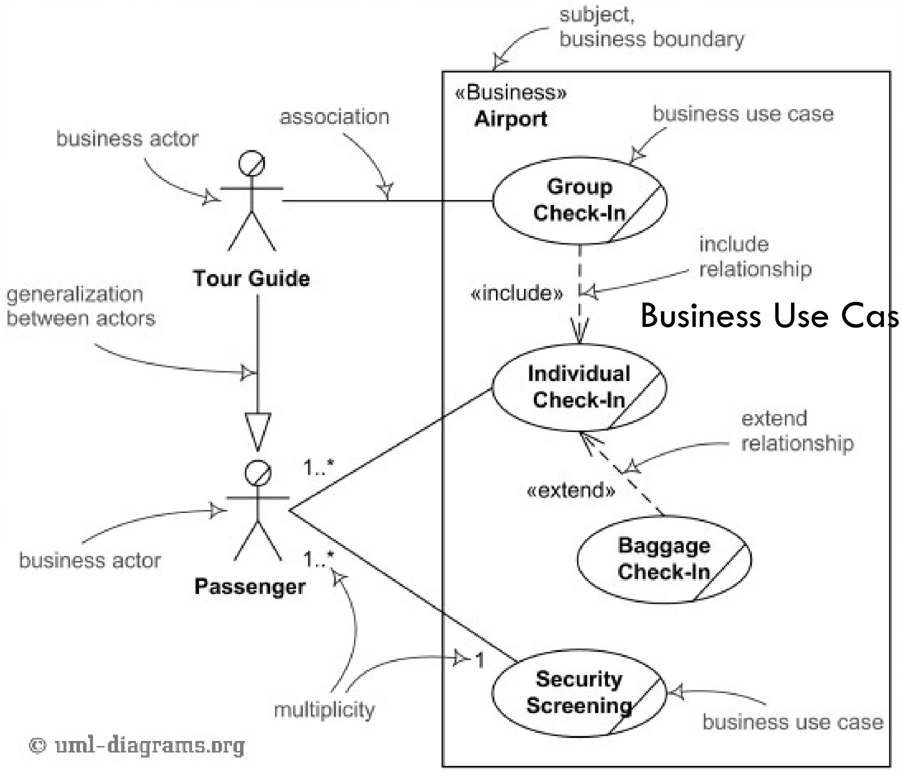
https://medium.com/omarelgabrys-blog/requirements-engineering-introduction-part-1-6d49001526d3

EXAMPES OF TWO WAYS OF ANALYSIS AND DESCRIPTION

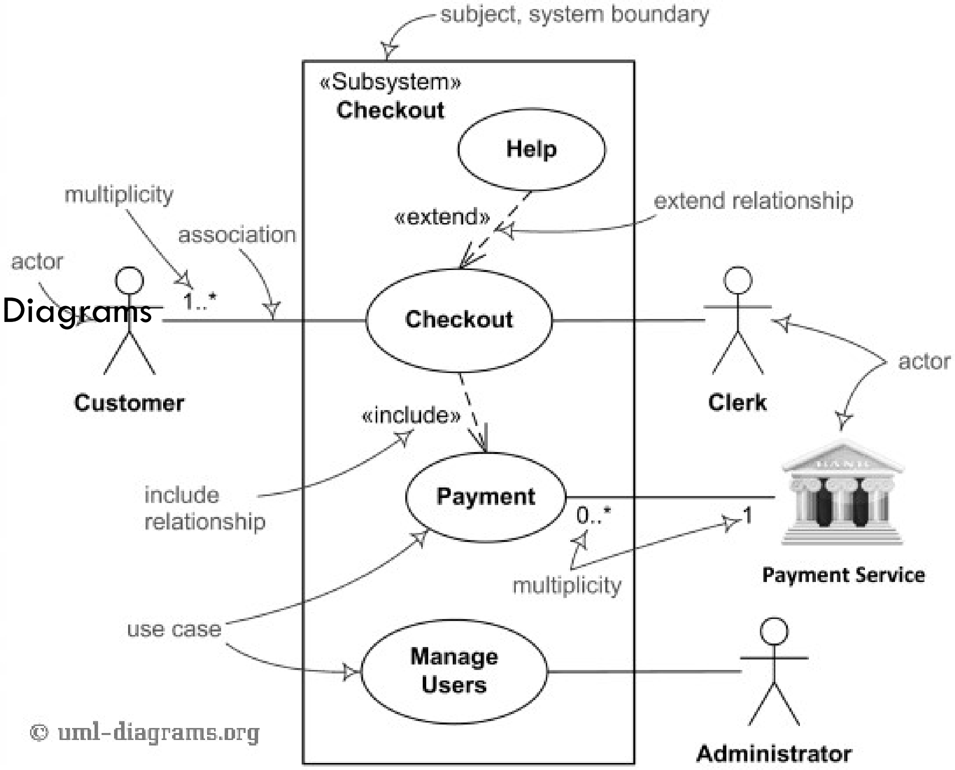
https://www.uml-diagrams.org/use-case-diagrams.html

Business Use Case Diagrams

System Use Case Diagrams



Business Use Case Diagrams



Major elements of business use case diagram - business actor, business use case, business boundary, include and extend relationships.

Major elements of UML use case diagram - actor, use case, subject, include and extend relationships.

ALLOCATION OF SYSTEM REQUIREMENTS

- **Subsystems** (logical groupings of functions);
- **Components of the system** (hardware, software, training, documentation).
- **Checks are done** to ensure the system does what it is supposed to do, incorporating:
  - ✓Verified requirements (Confirms that the requirements can meet the intended objective of what it meant for);
  - ✓Validated requirements (Confirms that a requirement meets the intent of the stakeholder);
  - ✓Qualification requirements.

THE "ILITIES" AND SPECIALTY ENGINEERING REQUIREMENTS

One often hears references to **the "ilities" of a system,** sometimes called **quality attributes**, such as the following:

✓Designability
✓Efficiency
✓Human engineering
✓Portability
✓Reliability
✓Testability
✓Understandability

✓Capacity
✓Degradation of service
✓Maintainability
✓Memory
✓Timing constraints
✓Modifiability
✓Usability.

-ility

➢ **Latin:** a suffix; meaning, ability, **ability to [do something]**

➢ **In systems engineering:** "ilities" are **desired system properties**.

CASE STUDY

- Working by Team:
  - Specific subject: e.g. Shoppe/eLearning/…
  - Type of application: Mobile app/website/SMAC
  - Selecting the specific requirements types
  - **Determining criteria of good requirements (based different principles).**
  - Listing specific requirements

TABLE 4.3(A). HARDWARE/SOFTWARE REQUIREMENTS VIEW EXAMPLES (SATURN PROJECT)

Hardware Requirements	
Software Requirements	

TABLE 4.3(B). MORE DETAILED CONTEXT REQUIREMENT EXAMPLES (SATURN PROJECT)

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	

TABLE 4.3(C) TOTAL TAXONOMY VIEW REQUIREMENT EXAMPLES (SATURN PROJECT)

TABLE 4.3(D) RA VIEW REQUIREMENT EXAMPLES (SATURN PROJECT)

Customer Needs and Expectations (Requirements Analysis Input)	
System requirements	[illegible]
User requirements	[illegible]
Product requirements	[illegible]
Environmental requirements	[illegible]
System Requirements Specifications (Requirements Analysis Output)	
[illegible]	[illegible]
	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

SUMMARY

- There are **a lot of different types of requirements.**
- **Selected types:** Agree within your project team **on the types that will be most useful.**
- Write requirements that **meet the criteria of a good requirement** (Based on the **principles** discussed in Chapter 1).