Lisbon School of Economics & Management
Universidade de Lisboa

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UNIVERSIDADE DE LISBOA

BUILD AND MANAGE SYSTEMS

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Learning Goals

Students will be able to:

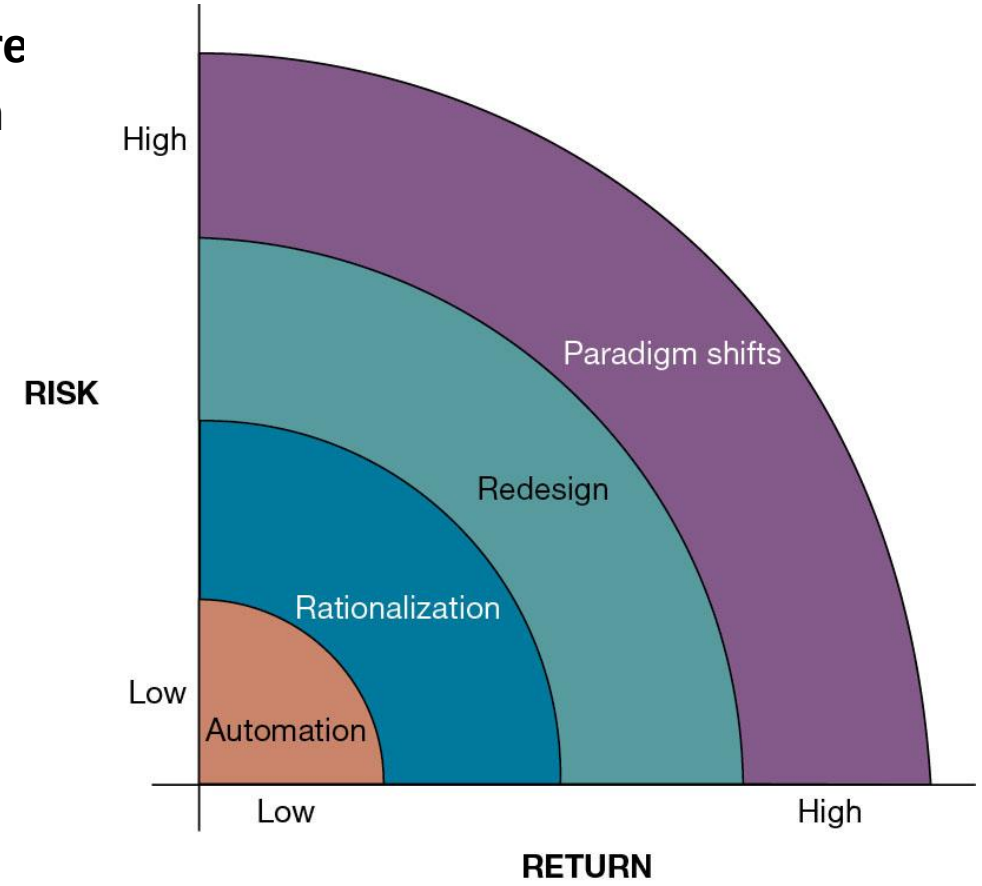
- Describe and analyze IT in the context of society and organizations
- Propose, select, choose and build solutions of IT infrastructure and IT applications
- **Reflect and evaluate IT management and development**

Index

Building Information Systems

How does building new systems produce organizational change?

- Automation
- Rationalization of procedure
- Business process redesign
- Paradigm shifts

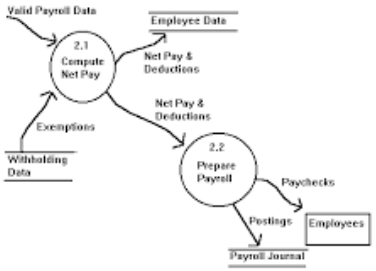


What are the core activities in the systems development process?

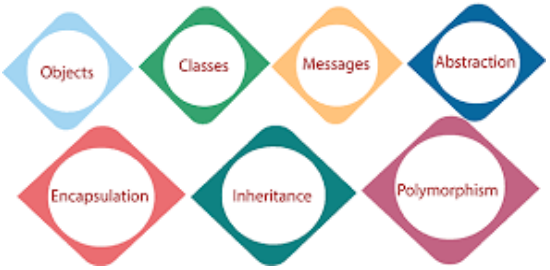
- **Activities that go into producing an information system solution to an organizational problem or opportunity**
- Systems analysis
- Systems design
- Programming
- Testing
- Conversion
- Production and maintenance

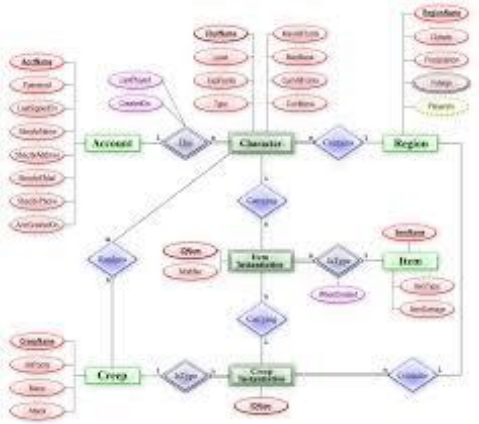
What are the principal methodologies for modelling and designing systems?

- Structured Methodologies



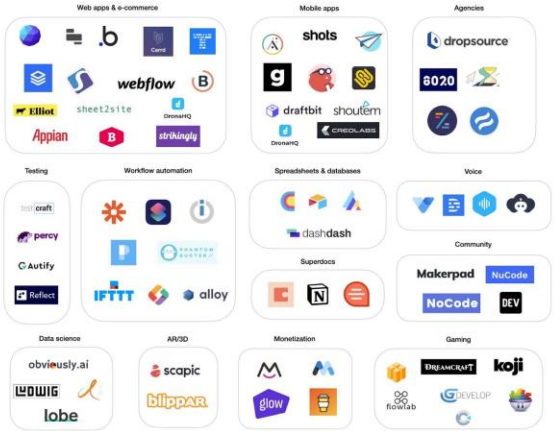
- Object-Oriented Development

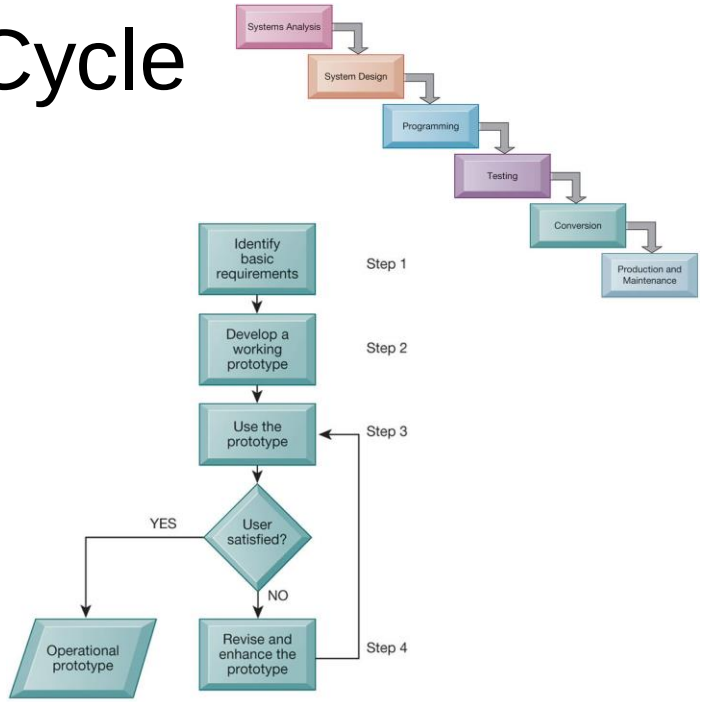




What are alternative methods for building information systems?

- Computer-Aided Software Engineering
- Traditional Systems Life Cycle
- Prototyping
- End-User Development
- No code





Project management methodologies

- **Waterfall**
  - Refers to sequential or linear ordering of phases
- **Agile**
  - take an iterative approach, which means the project processes are repeated often many times during the life cycle of the project.

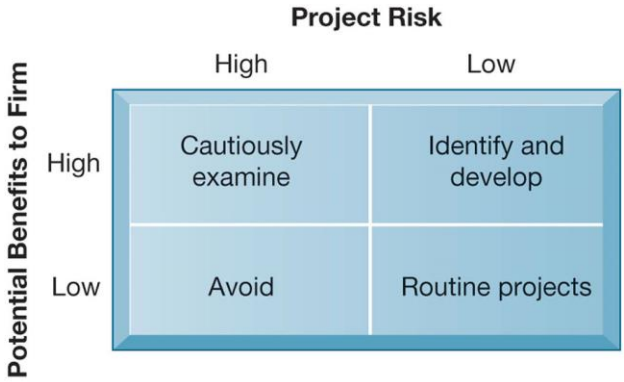
Managing IT Projects

How can firms assess the business value of information systems?

- Cost and Benefits of Information systems
- Tangible benefits are quantifiable
- Intangible benefits that cannot be immediately quantified

What methods can be used for selecting and evaluating information systems projects and aligning them with the firm's business goals?

- Portfolio Analysis
- Scoring Models
- Information System Costs and Benefits
- Capital Budgeting for Information Systems
- Dimensions of Project Risk



Criteria	Weight	E R P System A %	E R P System A Score	E R P System B %	E R P System B Score
1.1 Online order entry	4	67	268	73	292
1.2 Online pricing	4	81	324	87	348
1.3 Inventory check	4	72	288	81	324
1.4 Customer credit check	3	66	198	59	177
1.5 Invoicing	4	73	292	82	328
2.1 Production forecasting	3	72	216	76	228
2.2 Production planning	4	79	316	81	324
(etc.)	(etc.)	(etc.)	(etc.)	(etc.)	(etc.)
Grand Totals			3,128		3,300

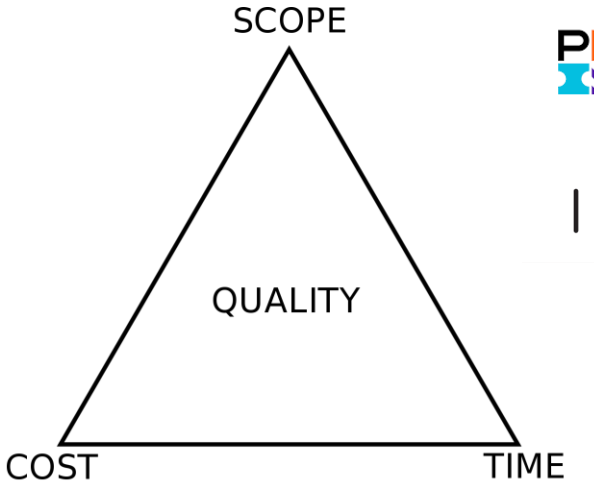
Exercise (Wednesday)

- We need to select among those three characteristics A, B, and C. The criteria are innovation, feasibility, and sustainability with weights of 40%, 30%, and 30%, respectively.
- Project A has scored 8/10 for innovation, 9/10 for feasibility, and 7/10 for sustainability.
- Project B has scored 6/10 for innovation, 8/10 for feasibility, and 9/10 for sustainability.
- Project C has scored 7/10 for innovation, 7/10 for feasibility, and 8/10 for sustainability.

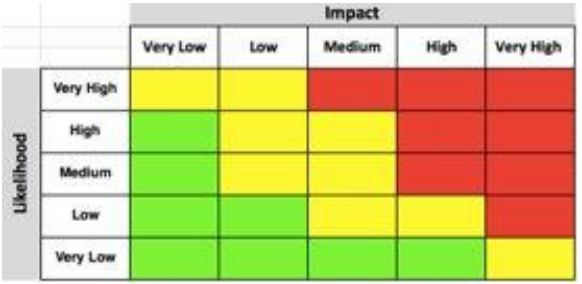
What are the objectives of project management, and why is it so essential in developing information systems?

- Project management Activities include planning work, assessing risk, estimating resources required, organizing the work, assigning tasks, controlling project execution, reporting progress, analysing results

- Five major variables
  - Scope
  - Time
  - Cost
  - Quality
  - Risk



What are the principal risk factors in information systems projects, and how can they be managed?



- risk in a systems development project is determined by
  - project size,
  - project structure
  - experience with technology

- Identification of nature and level of risk of project
- Each project can then be managed with tools and risk-management approaches geared to level of risk
- Managing **technical complexity**
  - Internal integration tools

- **Project leaders** with **technical** and **administrative** experience
- Highly **experienced** team members
- Frequent team **meetings**
- **Securing** of technical experience outside firm if necessary

Data Science Projects: Process

		BA	DE	DS	WD	Risk	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	Tools and Resource
	Business Understanding																				
.1.	Define Business Objectives																				
.2.	Identify ethical values and privacy	A/R				L															meeting
.3.	Assess Situation	A/R				L															meeting
.4.	Define Data Science Goals	A/R				L															meeting
.5.	Produce Project Plan	A/R	R	R		L															WBS, GANTT
	Data Understanding																				
.1.	Collect Initial Data		A/R			H															open data, scraping,
.2.	Describe Data		A/R			L															use Jupyter/python/Pandas
.3.	Explore Data		A/R			M															use Jupyter/python/Pandas
.4.	Verify Data Quality			A/R		H															use Jupyter/python/Pandas
	Data Preparation			A/R																	
.1.	Select Data			A/R		M															Meeting
.2.	Clean Data			A/R		M															use Jupyter/python/Pandas
.3.	Construct Data			A/R		M															use Jupyter/python/Pandas
.4.	Integrate Data			A/R		H															use Jupyter/python/Pandas
.4.	Format Data			A/R		H															use Jupyter/python/Pandas
	Modeling																				
.1.	Select Modeling Techniques			A/R		H															MIT flowchart
.2.	Generate Test Design			A/R		H															use Jupyter/python/Pandas
.3.	Build Model			A/R		M															use Jupyter/python/Pandas
.4.	Assess Model			A/R		H															use Jupyter/python/Pandas
	Evaluation																				
.1.	Evaluate Results, icnluding ethical	A/R		R		H															use Jupyter/python/Pandas
.2.	Review Process	A/R				L															meeting
.3.	Determine Next Steps	A/R				L															meeting
	Deployment																				
.1.	Plan Deployment	A		R	R	H															PowerBI or Flash
.2.	Plan Monitoring and Maintenance	A				M															meeting
.3.	Produce Final Report	A/R	R	R	R	M															PowerBI or Flash
.4.	Review Project	A/R		R		M															meeting

Data Science Projects: Process

- CRISP-DM

Data Science Projects: Organization

		A	DE	DS	WL	Risk	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	Tools and Resource
1	**Business Understanding**																				
1.1.	Define Business Objectives																				
1.2.	Identify ethical values and privacy	/R				L															meeting
1.3.	Assess Situation	/R				L															meeting
1.4.	Define Data Science Goals	/R				L															meeting
1.5.	Produce Project Plan	/R	R	R		L															WBS, GANTT
2	**Data Understanding**																				
2.1.	Collect Initial Data		A/R			H															open data, scraping,
2.2.	Describe Data		A/R			L															use Jupyter/python/Pandas
2.3.	Explore Data		A/R			M															use Jupyter/python/Pandas
2.4.	Verify Data Quality			A/R		H															use Jupyter/python/Pandas
3	**Data Preparation**			A/R																	
3.1.	Select Data			A/R		M															Meeting
3.2.	Clean Data			A/R		M															use Jupyter/python/Pandas
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3.4.	Integrate Data			A/R		H															use Jupyter/python/Pandas
3.4.	Format Data			A/R		H															use Jupyter/python/Pandas
4	**Modeling**																				
4.1.	Select Modeling Techniques			A/R		H															MIT flowchart
4.2.	Generate Test Design			A/R		H															use Jupyter/python/Pandas
4.3.	Build Model			A/R		M															use Jupyter/python/Pandas
4.4.	Assess Model			A/R		H															use Jupyter/python/Pandas
5	**Evaluation**																				
5.1.	Evaluate Results, icnluding ethical	/R		R		H															use Jupyter/python/Pandas
5.2.	Review Process	/R				L															meeting
5.3.	Determine Next Steps	/R				L															meeting
6	**Deployment**																				
6.1.	Plan Deployment			R	R	H															PowerBI or Flash
6.2.	Plan Monitoring and Maintenance					M															meeting
6.3.	Produce Final Report	/R	R	R	R	M															PowerBI or Flash
6.4.	Review Project	/R		R		M															meeting

Data Science Projects: Scheduling

		BA	DE	DS	WD	Risk	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	Tools and Resource
1	**Business Understanding**																			
1.1.	Define Business Objectives																			
1.2.	Identify ethical values and privacy	A/R																		eeting
1.3.	Assess Situation	A/R																		eeting
1.4.	Define Data Science Goals	A/R																		eeting
1.5.	Produce Project Plan	A/R	R	R																BS, GANTT
2	**Data Understanding**																			
2.1.	Collect Initial Data		A/R																	pen data, scraping,
2.2.	Describe Data		A/R																	se Jupyter/python/Pandas
2.3.	Explore Data		A/R																	se Jupyter/python/Pandas
2.4.	Verify Data Quality			A/R																se Jupyter/python/Pandas
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4.1.	Select Modeling Techniques	I		A/R																IT flowchart
4.2.	Generate Test Design	I		A/R																se Jupyter/python/Pandas
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Data Science Projects: Screduling

		BA	DE	DS	WD	Risk	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	Tools and Resource
1	**Business Understanding**																				
1.1.	Define Business Objectives																				
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3.1.	Select Data			A/R		M															Meeting
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3.4.	Integrate Data			A/R		H															use Jupyter/python/Pandas
3.4.	Format Data			A/R		H															use Jupyter/python/Pandas
4	**Modeling**																				
4.1.	Select Modeling Techniques	I		A/R		H															MIT flowchart
4.2.	Generate Test Design	I		A/R		H															use Jupyter/python/Pandas
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6.3.	Produce Final Report	A/R	R	R	R	M															PowerBI or Flash
6.4.	Review Project	A/R		R		M															meeting

Exercise (Tuesday)

The Data Science Project is scheduled to begin on March 15th, 2023 and end on September 30th, 2023, and includes six tasks to be completed: Data Collection and Understanding, Data Cleaning and Preprocessing, Feature Engineering, Data Splitting and Sampling, Model Building and Evaluation, and Model Deployment and Monitoring.

The first task, Data Collection and Understanding, is set to begin on March 15th and will continue until April 30th, 2023, for a duration of 45 days. The next task, Data Cleaning and Preprocessing, will begin on May 1st and end on May 31st, 2023, for a duration of 31 days. The Feature Engineering task will follow, starting on June 1st and ending on June 30th, 2023, for a duration of 30 days. The Data Splitting and Sampling task is scheduled to begin on July 1st and end on July 15th, 2023, for a duration of 15 days. The Model Building and Evaluation task will start on July 16th and end on August 31st, 2023, for a duration of 46 days. Finally, the Model Deployment and Monitoring task is scheduled to begin on September 1st and end on September 30th, 2023, for a duration of 30 days.

The Data Engineer is responsible for completing the Data Cleaning and Preprocessing task, while the Data Analyst is accountable for ensuring its successful completion. The Project Manager will be consulted for input and feedback on this task, and no one else needs to be informed of its progress. The Feature Engineering task is the responsibility of the Data Analyst, while the Data Engineer is accountable for ensuring that it is completed successfully. The Project Manager will also be consulted for input and feedback on this task, and no one else needs to be informed of its progress.

The Data Splitting and Sampling task is the responsibility of the Data Engineer, while the Data Analyst is accountable for ensuring its successful completion. The Project Manager will be consulted for input and feedback on this task, and no one else needs to be informed of its progress. For the Model Building and Evaluation task, the Data Scientist is responsible for its completion, and the Data Analyst is accountable for ensuring that it is successful. The Project Manager will be consulted for input and feedback on this task, and the Data Engineer will be informed about the progress of the task.

Finally, the Model Deployment and Monitoring task is the responsibility of the Data Engineer, while the Data Scientist is accountable for ensuring its successful completion. The Project Manager will be consulted for input and feedback on this task, and the Data Analyst will be informed about the progress of the task.

Waterfall vs. Agile

	Waterfall	Scrum
Approach	Freezes scope, estimates schedule	Freezes schedules, estimates scope
Client Involvement	At beginning and end	Frequent collaboration
Scope	Build everything in the specs	Build what client really needs, by priority
Design	Design all features up front	Emergent design of few features per. Iteration
Development	Linear path across phases	Iterative, incorporate learning
Delivery	Big Bang at the end	Frequent. Small increments
Testing	Separate phases, after development	Continuous functional & unit testing inside iterations
Cost of Changes	High	Low
Requirement	Defined up front, rigid	Allow changes up to last release
Documentation	Up front and exhaustive	Document only what is built, as needed
Team communication	At phase handoffs	Continuous, cross-functional

The Agile Manifesto

Individuals and interactions	over	Processes and Tools
Working Product	over	Comprehensive Documentation
Customer Collaboration	over	Contract Negotiation
Responding to change	over	Following a plan

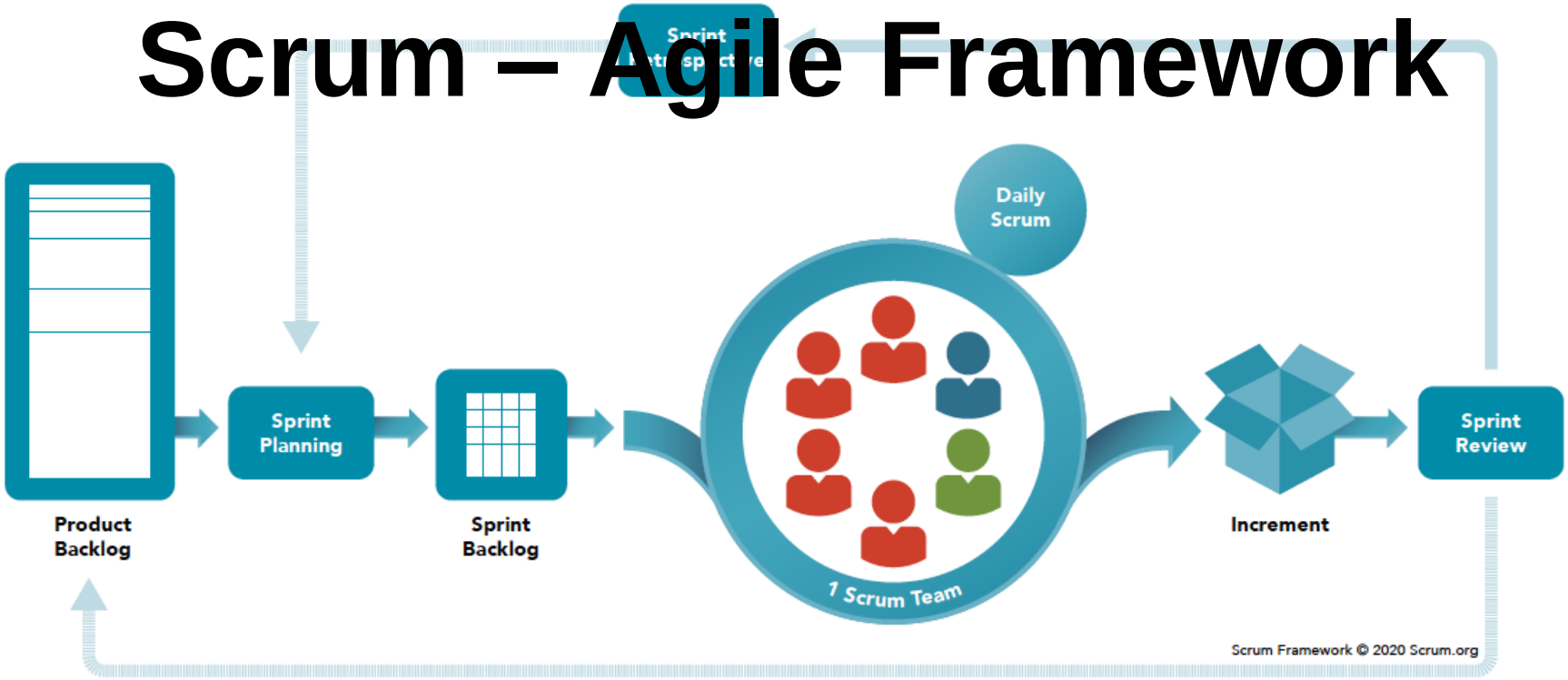
That is, while there is value in the items on the right, we value the items on the left more.

www.agilemanifesto.org

VUCA - decide which project management approach is best for you

- **Volatility**
  - Volatility refers to the rate of change and churn in a business or situation.
- **Uncertainty**
  - refers to the lack of predictability or high potential for surprise.
- **Complexity**
  - refers to the high number of interrelated forces, issues, organizations, and factors that would influence the project.
- **Ambiguity**
  - refers to the possibility of misunderstanding the conditions and root causes of events or circumstances.

Scrum – Agile Framework



- **Product backlog**
  - Central artifact in Scrum, where all possible ideas, deliverables, features, tasks are captured for the team to work on.
- **Sprint**
  - A time-boxed iteration in Scrum where work is done. (1-4 weeks)
- **Daily Scrum**
  - A meeting of 15 or fewer minutes everyday of the Sprint

Scrum Master

- Responsible for ensuring the team lives agile values and principles
- Responsible for ensuring the team follows the processes and practices that team agreed to
- Responsible for sharing information to the larger project team
- Responsible for helping the team focus on doing their best work

Product Owner

- Responsible for maximizing the value of the product and the work of the team
- Responsible for the inventory of work and has final say on how to prioritize the work

Development Team

- Responsible for how a team will deliver the product

Kanban Methodology

- **Kanban** provides transparent visual feedback (Kanban Board)
- In Kanban task are limited

to what team can actually handle (Work-in-progress)

XP Methodology

- Pair Programming
- Continuous Integration and Continuous Refactoring
- Avoid big design up front
- Write tests, not requirements

Lean Methodology

- Define value
- Map value stream
- Create flow
- Establish pull
- Pursue perfection

DevOps

- Combines software development and IT operations
- An organizational and cultural movement that aims to increase software delivery velocity, improve service reliability, and build shared ownership stakeholders

Product Manager

- Answer to these 4 questions is necessary:

1) Will the user buy this?
2) Can the user figure out how to use it?
3) Can your engineer build it?
4) Can the stakeholders support it?

Managing Global Systems

What major factors are driving the internationalization of business?

- Global economic system and global world order driven by advanced networks and information systems
- The growth of international trade has radically altered domestic economies around the globe
- For example, production of many high-end electronic products parcelled out to multiple countries
  - For example: Apple iPhone's global supply chain

What are the alternative strategies for developing global businesses?

Business Function	Domestic Exporter	Multinational	Franchiser	Transnational
Production	Centralized	Dispersed	Coordinated	Coordinated
Finance/accounting	Centralized	Centralized	Centralized	Coordinated
Sales/marketing	Mixed	Dispersed	Coordinated	Coordinated
Human resources	Centralized	Centralized	Coordinated	Coordinated
Strategic management	Centralized	Centralized	Centralized	Coordinated

What are the challenges posed by global information systems and management solutions for these challenges?

- Agreeing on common user requirements
- Introducing changes in business processes
- Coordinating applications development
- Coordinating software releases
- Encouraging local users to support global systems

What are the issues and technical alternatives to be considered when developing international information systems?

- Computing platforms and systems integration
  - How new core systems will fit in with existing suite of applications developed around globe by different divisions
  - Standardization: Data standards, interfaces, software, and so on
- Connectivity
  - Internet does not guarantee any level of service
  - Many firms use private networks and VPNs
  - Low penetration of PCs, outdated infrastructures in developing countries

What are the issues and technical alternatives to be considered when developing international information systems?

- Software
  - Integrating new systems with old
  - Human interface design issues, languages
- Software localization
  - Converting software to operate in second language
- Most important software applications:
  - TPS and MIS
  - SCM, EDI, and enterprise systems
  - Collaboration tools, e-mail, videoconferencing

Discussion

- If you want to design a company culture roadmap for the software development company, in your opinion what are the important things?