

¹ISE 564: PERFORMANCE ANALYSIS

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SUMMARY

This course defines performance measurement and analysis within an organizational context. The organizational context is at multiple levels of production units, processes and individual workstations (or workers).

COURSE DESCRIPTION

Industrial and systems engineers need to develop a keen awareness of how planning and measurement of performance affect short-term and long-term productivity of an operational unit. This course focuses on creating a knowledge base for measuring the performance of production or service organizations. The students learn to do this by class discussions, class exercises (i.e. homework), team projects and in-class presentations. We also provide a limited exposure to enterprise modeling and business process analysis software.

Course Objectives

Upon successful completion of this course, each student should be able to:

- Have a working knowledge of the taxonomy and definition of system performance and its components,
- Define performance at different levels of an organization,
- Identify core processes of a manufacturing or service operation,
- Identify key measurable elements of a work system,
- Engineer a systematic performance measurement system
- Identify studies relevant to the topics of performance and productivity using a variety of resources, analyze and critique emerging research, and interpret research findings,
- Be able to navigate through an enterprise modeling and business process analysis software.

¹ Students who violate University standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the University. Please familiarize yourself with the Academic Integrity guidelines found in the current SCampus and other University documents. Also, any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor as early in the semester as possible.

Teaching Philosophy

This course is a collection of concepts and tools. We combine both the “Cooperative Learning” and traditional teaching concepts. You will learn minimum if you do not work with your teammates outside the class. The time that you spend with your team outside the class with team discussions, integrated papers, and project applications is as important as the time you spend inside. The instructor sets and presents class concepts, and will welcome ideas, questions and feedback from the students. This is a multi-disciplinary subject. Based upon the principals highlighted in the class, the students should be able to develop their own knowledge sources and apply them to their homework and article presentations. In addition, with this approach, we are trying to foster creativity both at the student and the team levels.

Student’s Roles and Responsibilities

The student’s role is to:

- View the instructor as a “*manager*” not a teacher.
- Participate in class discussions, contribute individual experiences when relevant to the topic so that others can benefit and learn.
- Take individual responsibility for completing assignments. Late deliverables will not be accepted. The final responsibility for the audio/visual equipment rests upon the team.
- Complete assignments/papers/presentations in a professional manner, without spelling or grammatical errors, and using a technical format used in IE publications.
- Manage and perform individual studies independently and perform team studies interdependently.
- Follow the USC Guidelines for student integrity and honesty.

The TA’s role is to provide the students with additional information about course material and providing a communication support between the student teams and the instructor. It is expected that the majority of the communication efforts with the instructor will be managed through the team leaders with the TA’s support. In those cases where individual team members need immediate support, the TA will provide the assistance quickly and efficiently. The TA will also be involved in the grading of the papers and presentations, and the recording of the grades in a template spreadsheet. The final grading responsibility is with the instructor.

Texts and Material:

Rummler, G.A., and Brache, A.P. (1995). *Improving Performance: How to Manage the White Space on the Organization Chart* (2nd Edition). San Francisco, California: Josse Bass Publishers.

Omar A. El Sawy (2001). *Redesigning Enterprise Processes for E-Business*. McGraw-Hill

Course Reader: Obtain from the USC Bookstore. You are responsible for the entire Reader, even if we do not discuss some sections in class. You are expected to study the Reader before the class sessions. Note: Some sections in the Reader have missing pages. This is intentional to reduce Reader volume and save trees.

Software: (inside El Sawy's book)

You are required to:

- Have access to e-mail at all times and check your e-mail and Blackboard regularly
- Use MS Word and PowerPoint for your documents
- Participate in all team-related activities, discussions, writings and presentations
- Schedule and set-up the required audiovisual equipment before your class presentation

COURSE SCHEDULE

Week	Session Topics, Lectures, Demos	Readings and Assignments	Actions and Deliverables
1 8/27	<ul style="list-style-type: none"> • Introduction: Class Org., Requirements, Expectation • Team Finalization • The "Systems Thinking" 	<ul style="list-style-type: none"> • Class Syllabus • Read Kratylus article from Reader 	Preparation for all Project Assignments and Team Selections
2 9/03	<ul style="list-style-type: none"> • Input-Output Model and Performance Measurement • Objective Hierarchy 	Ch. 2,(Rummler and Brache)	Team leaders initiate their team activities for Homeworks and Projects
3 9/10	<ul style="list-style-type: none"> • Systems Design: Three Levels of Performance <ul style="list-style-type: none"> • Organization Level • Process Level • Job Level 	<ul style="list-style-type: none"> • Ch.3 • Ch.4 • Ch.5 • Ch.6 (Rummler and Brache)	
4 9/17	Measures of Performance: Sink and Tuttle	<ul style="list-style-type: none"> • Planning and Measurement in your Organization of the Future by Sink and Tuttle (I and II) • Productivity Measurement, A Guide to Managers and Evaluators by Brinkerhoff and Dessler 	
5 9/24	Principles and tactics of Process Redesign	Ch. 3 (El Sawy)	
6 10/01	Group Presentation (1)		HW1 presentation (10 min.), no papers, participation of all team members is recommended

7 10/08	<ul style="list-style-type: none"> • Mid-Term • Performance Matrix 	All inclusive material (Open book, Open Reader, Closed Notes)	First Peer Evaluations , sealed and placed in instructors mailbox before 5:00pm
8 10/15	Scoping and Enterprise Process	<ul style="list-style-type: none"> • Chapter 4 (El Sawy) • Redesigning the Customer Support Process for the Electronic Economy 	
9 10/22	Process Modeling and Analysis	Chapter 5 (El Sawy)	
10 10/29	Guest Lecture: Dr. El Sawy <ul style="list-style-type: none"> • Process Redesign • Software Workshop: Workflow BPR 	Chapter 6 (El Sawy)	
11 11/05	<ul style="list-style-type: none"> • Data Variability • Human Performance Variability, Task Analysis 	<ul style="list-style-type: none"> • Evaluation of Human Work by Wilson and Corlett <ul style="list-style-type: none"> • Subjective assessment • Task analysis 	
12 11/12	Group Presentation (2)		HW2 presentation (10 min.), no paper, participation of all team members is recommended
11 11/19	<ul style="list-style-type: none"> • Multi-Dimensional Performance Matrix 	Planning and Measurement in your Organization of the Future by Sink and Tuttle (III)	
14 11/26	Integrated Projects: in class preparation with Instructor and TA		
15 12/03	Final Project Presentation		<ul style="list-style-type: none"> • Integrated Project Papers and Presentations (15 min., all team members) • Second Peer Evaluations
16 12/10	FINAL EXAM	Non-comprehensive material (Open book, Open Reader, Closed Notes)	

- The readings are to be completed *before* the class sessions indicated. Additional items may be assigned as needed.
- Deliverables are due at the class session indicated. Instructor reserves the right to assign a **zero** to any late item, unless accompanied by a written notice (a doctor's letter) before the assigned session. In case of an A/V malfunction, you need to present using manual slides.

Note: Any scheduled item in this class may be revised to accommodate the content and the pace of the class learning process. All revisions will be announced in the class.

COURSE GRADING

*Homework (I and II)	Team	20% (10% for each homework) (Instructor/TA evaluate each homework)
*Integrated Project	Team	20% (10% Presentation, 10% Paper) (Instructor/TA evaluate the final presentation and paper)
Midterm Exam	Individual	25%
Peer Evaluation	Individual	10% (5% for midterm; 5% for final)
Final Exam	Individual	25%

* See the grading sheets on Blackboard

TEAM DESIGN AND TEAM PERFORMANCE EVALUATION

The teams are formed at the end of the first session. The process outlined below will be used for team selection.

- Team membership and team leaderships are voluntary
- Only the team leader will be allowed to negotiate between the team and the manager (i.e. instructor). We follow the rules for a semi-autonomous team structure. This means that the instructor defines certain aspects of the team structure as it pertains to the goals and the objectives of the course. The instructor will allow the internal team processes to organize the team activities to achieve these goals. All team members must participate in the presentations. The area worked on by each team member is decided by team consensus.
- The instructor's approach to each team's activity is non-intervention. The instructor will only intervene when one or more of the team members deviate from acceptable norms of team behavior and participation. As a team, you need to develop and implement a strategy to manage your team conflicts and complete your team projects on time.

Peer Evaluation for Each Member of your Team

Members of each team will evaluate each other using the following peer evaluation form. You must return these forms to the TA (or place in instructor mailbox) at the specified date on the class schedule.

Rater's name: (first, last)

Date:

Team Number:

Please place a value between 0 to 100 in each cell of this table, one for each team member. Do not rate yourself.

	Criterion	Name	Name	Name	Name	Name
1	Willingness to volunteer					
2	Ability to communicate verbally					
3	Listening/attentiveness					
4	Background preparation					
5	Ability to work towards consensus					
6	Courtesy, Tact, Sense of Humor					
7	Open-mindedness					
8	Ability to offer/accept constructive criticism					
9	Ability to facilitate group process.					
10	Technical/scientific contribution					
	Total Points					
	Final Score (Total Points/10)					

All peer evaluations in this class will be kept *strictly confidential*. The mean sum value for each student will be entered into a spreadsheet for the final grade calculation (see the Grade Assignment section for grade distribution). Please be honest and truthful in your evaluations of other students.

Note: Any late evaluation will be assigned a **zero**.

Note: Assigning a score of 100 to all team members lead to **grade inflation**.

Class Project

There are two different categories of projects. One category is called the “Industry Project” and the other is called “Research Project”. The teams with members working in local industry are required to choose the Industry Projects.

1. Industry Projects

This project includes two homeworks and a final integrated paper. Each homework is designed to examine and apply the concepts (models, frameworks, etc.) presented in your textbooks and class sessions. Follow the description below to the extent possible.

If information presented in our class is not of sufficient degree of detail for your application, you should search other resources (e.g. library, Internet, etc.) for more detailed information, and add to the content accordingly. You must list all resources used in your papers. The homeworks are designed with two objectives in mind:

- To exercise the concepts presented in class
- To provide an industrial application leading to the final Integrated Project.

Read this section in its entirety before starting your first homework, so you have a feel for the connections between the homeworks and the overall requirements for the Integrated Project. Discuss the requirements of the projects with your team members and make sure that you understand the requirements, the constraints, time limitations, core competencies, interpersonal communication skills, etc. If needed, the TA/Instructor are always here to help you explain the requirements.

The homeworks are due at the dates indicated on the class schedule (including their presentations). Each homework has the following deliverables: A presentation without any papers. The final Integrated Paper is mandatory.

Time allotted for the homework presentations are short. Present only the important highlights of your work.

The front page of all papers should list the team number, homework number, title, student names (alphabetical listing), organization’s site, and date of delivery to the instructor. NO PLASTIC COVER; only staple the upper left corner.

There are two peer evaluations for this course. Use the form provided in this syllabus to rate your teammate’s performance, once mid-term and once at the end. Distribute your grades fairly. Do not use a score of 100 for all team members – it may result in grade inflation.

A. Homework 1²

1. Select and define an “organization” as a system. This organization could be a company division, department, small business, store, restaurant, professional society, virtual or Internet commercial unit, government office, or a business unit within USC. With special permission from your instructor, you may apply these homeworks to a start-up company or a fictitious organization. Your team leader needs to have a deep understanding of the organization before proceeding to the next step.
2. Define a vision/mission/guiding principle for the company. Do this for the entire company and repeat it for any sub-unit for which these items are available.
3. Limit your homework activities to a “subsystem” within this organization. Note: It is advisable to define the boundaries, and limit yourself to a small set of system elements that can be studied in a short period of time.
4. Define the goals, objectives and strategies for the system and its components. Clearly define the objective hierarchy for the system and its internal components. You should do this having in mind that you will need to link this hierarchy to the performance of the unit, later on in your project.
5. Develop a Relationship Map for this system. Use the drawing capabilities of any software (e.g., Visio, FlowCharter, Workflow BPR).
6. On the graph, show how the goals of this system may or may not be related to or supported by each system component. Indicate the goal, objectives and strategies for each of the sub-systems and sub-sub-systems.
7. Identify the major disconnects between the system components based on the analysis you just performed under 6. Explain how these disconnects affect the unit relationships. Remember, disconnects must be explained in relationship to the goals and objectives at each level of the organizational hierarchy.

B. Homework 2

1. Consider the organization system in Homework 1. Identify the “core process” that is critical to the production of goods or services in this organization or unit. Develop a flow diagram as a Process Map for this process, connecting all the functional units such as manufacturing, finance, suppliers, customers and other value-added transformations. Note: sometimes it is easier to start from the customer/outcomes backward through suppliers/inputs. Identify the system components holistically - that is, only those elements that are critical (value-laden) to the organization and the ones that impact process goals of the system.
2. Identify the process disconnects in this organization using a pictorial representation. Indicate these disconnects on the map itself with clear reference to the appropriate objective hierarchy which they should serve.
3. For each process disconnect, explain how the productivity is affected by the sub-units immediately before and after it. You must define a quantitative productivity measure for each process and its sub-processes.

² All requirements in A, B, and C may not be applicable to all projects. This is just a guideline to give you an understanding of an ideal situation.

4. Prepare a Performance Matrix:
5. This part is designed for teams to identify performance measures for various levels of your operation. Use the example provided in class as a template. The teams would identify measures for a number of domains in their organizations. Each team should justify the domains identified. Then, the team would identify the measures for the domains at the three levels of hierarchy. This development will be synchronous to the levels of performance measures that are discussed in the Rummler and Brache's text. Most teams use the seven categories of Sink and Tuttle (see the reader).
6. For each process in the map, identify a set of quantitative performance measurement system. The performance indicators must be based on the organizational and process goals set forth earlier in Homework 1 and the Performance Matrix indicated above. Try to be as quantitative as possible.
7. Select an employee, a machine, a work cell, or a team as a unit of production or service in one of the process levels above. Make sure that this job is critical to the performance of the process step. Explain why you chose this job/person/activity. Provide a role/responsibility matrix (Rummler and Brache, p. 70) and write how these activities are directly related to the project goal and the overall goal of the system.
8. Define the employee's activities using an operation/activity diagram or a task analysis method (from your Reader) that best applies to this job. This step is needed to define the best performance set for each task the individual is expected to accomplish.
9. Develop a measurement system to track one or more employee's performance over several periods of time (e.g. days, weeks, etc.). Use the Performance Matrix results to identify the employee's performance measures appropriate for this study. Develop a scoring system for these measures. Map the performance indicators of your system in a time series graphic format. Then, analyze and interpret the performance of the job/task/machine/employee using this analysis.
10. Draw a set of visual indicators (e.g. time series chart) to track the performance of all the elements of the project based on job/person/activity.
11. Which dimension of this performance set is increasing or decreasing. Use statistical inferences to justify your results.
12. Generate items 5 through 9 using the Workflow BPR software in your book.

C. Integrated Project

The Integrated Projects are considered as the *continuation* of the homework activities, culminating in a final comprehensive product delivered at the end of the semester. The following guidelines help the teams to complete the integrated project:

1. Using the contents of your previous homeworks, identify one component of the system/process for continuous improvement. The level of detail should commensurate with the level of detail for your measurement system. It is recommended that projects include at least two levels of measures at the process and person/job/activity) to the extent that your organizational system allows. Again, refer to the visual maps in your previous homeworks to make this identification. Explain why this should be the area of concentration for your Integrated Project.

2. For this process, identify one improvement objective. Assume that your team has been assigned to implement this improvement, based on the objective you identified in HW1.
3. Identify a single metric (a realistic operational performance measure) as a “driver” for this objective. That is the performance driver should be directly impacted (in the direction of improvement) as a result of implementing the objective in this component of the work system.
4. Identify and explain 2-3 tactics at the Process and Activity levels to address the improvement of this objective. Assume that your team has a reasonable amount of resources it needs, then explain how you would improve this performance metric using the resources given to you.
5. Use any deployment tools and techniques (e.g. ISE tools) necessary to show how such improvement can be followed analytically in the future days, weeks, etc. A deployment tool is an improvement strategy based on the organizational and process goals identified earlier. For example, the El Sawy’s book uses simulation to accomplish this step.
6. Identify and discuss barriers your team has encountered in using these deployment tools and techniques to improve this process.
7. (Add other items as necessary to improve the project)
8. Your final project should contain a one-page Conclusion section explaining the significant findings and what you have learned in this project. Try to integrate rather than repeating the material from homeworks 1 and 2. Note: Any pages over 20 will not be read.

The final integrated paper should be typed on a letter-size paper, stapled in upper left-hand corner (no plastic cover). Note: the first page should include the project name, the name of the team members (alphabetical), the organization’s name, and the project delivery date.

2. Case Study Project

This project is recommended only for a team that does not have a team member located in a company. Basically the same steps (homeworks and final project) must be accomplished to fulfill the requirements for this project. The Case Project will be distributed to the teams during the first session of the class.

A. Homework 1

Use the same outline as the ones in the HW1. in Industry Project.

B. Homework 2

Use the same outline as the ones in the HW2. in the Industry Project.

C. Integrated Project

Use the same outline as the ones in the Industry Project.

Organization of the IP Paper

Use the following outline, which is followed by most IE-related publications:

Title page (title, team names, date of delivery)
Abstract followed by keywords for indexing
Body of literature review
References (authors names, year, title, publisher, page numbers)
Tables (each with number and title)
Figures (with numbers and captions)
Appendices (if needed)

SOME USEFUL PUBLICATIONS

Books: (Check the libraries for your specific topic)

Academic-Oriented Journals:

You may want to use the following journals as references in your papers and projects.
Most of these journals exist in the USC library system.

IEEE Transactions on Engineering Management
Journal of Quality Management
Organizational Dynamics
Sloan Management Review
Cybernetics and Human Knowing: A Journal of Second Order Cybernetics and Cyber semiotics
Systems Journal
Technological Forecasting & Social Change
Organizational Behavior and Human Performance
Journal of Manufacturing Systems
Organizational Learning
Intelligent Manufacturing Systems

Practitioner-Oriented Journals:

Quality Progress
Industrial Engineering Solutions
Industrial Management
Harvard Business Review
National Productivity Review
Engineering Management Journal
Journal of Quality and Participation