



# Enhancing Systems Analysis with Workflow Modeling

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## ABSTRACT

*Workflow modeling has received more attention in recent years since the publication of standards by Workflow Management Coalition in 1995. In this paper, we give a brief introduction to what workflow is then discuss how workflow analysis may help facilitate standard analysis methodologies such as traditional analysis and the object-oriented analysis. An example is given to illustrate the usefulness of the workflow as an added system analysis tool.*

## INTRODUCTION

In any serious software projects, system analysis is a must-performed piece of work by the system development team. System analysis provides development team information and understanding of the system in question and thus allows developers to prescribe a better implementation solution.

There are many system analysis methodologies developed over the past three decades. In essence, these methods may be classified into three categories: *process-centered*, *data-centered*, and *object-oriented approaches* to systems analysis. Process-centered approach, also referred to as functional approach, is the earliest of three. A represented technique used in process-oriented analysis is the data flow diagrams. The data-centered approach puts emphasis on building data that serve as the foundation for all applications. Techniques used in data modeling are extensively used. The object-oriented approach receives more attention in recent years partly because more complete analysis methods are developed and more software tools for analysis become available. Among many approaches, the unified modeling language primarily developed by Booch, Rumbaugh, and Jacobson (1999) and also adopted by the Object Management Group and the software tool Rational Rose are wide spread in use today.

Regardless of approaches, system analysts must deal with workflow in the underlying business applications. Since the concept of workflow is process-centered it is easy to see the relevancy between the two. For the data-centered approach, process analysis remains a vital part therefore it involves workflow study. What about the object-oriented approach? Anyone who has developed use cases would find "workflow" an essential part of the case content.

In what follows, we will explain what is meant by workflow? How is workflow related to process-centered analysis and use case analysis? What are the differences between the workflow analysis and system analysis? How could workflow analysis enhance system analysis in general? Examples. Conclusion.

## WHAT IS WORKFLOW?

To get a good understanding about the concept of workflow, one may simply start from the web site of the Workflow Management Coalition (WfMC): [www.wfmc.org](http://www.wfmc.org). This site contains information such as books, research papers, presentations, and standard specifications, many of them are viewable and downloadable in their entirety. The concept of workflow as defined by WfMC as:

"The automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules."

Some clarifications are in order. For example, what is a business process? A WfMC white paper (1998) defines a business process as "a set of one or more linked procedures or activities which collectively realize a business objective or policy goal, normally with the context of an organizational structure defining functional roles and relation-

ships." For example, "getting a loan" and "course registration" are business processes. A business process may have sub-processes. Each process/sub-process consists of activities, and that in turn, consists of work items. An activity that may be manual or machine dependent is considered as a logical step in the process, (e.g., filling out an application,) and normally is handled by workflow participants. After completion (may be partial completion), work items are passed to another participant or a process. Workflow specifies the order of activities that must be performed in a business process. Naturally, "workflow" is a part of business information system.

## WHAT IS A WORKFLOW MANAGEMENT SYSTEM?

It is useful to look at the defining concept of the workflow management system (WfMS) because it helps to explain the difference from a business application system. The defining concept of a workflow management system as found in Allen is:

*A system that defines, creates and manages the execution of workflow through the use of software, running on one or more workflow engines, which is able to interpret the process definition, interact with workflow participants and, where required, invoke the use of IT tools and applications.*

Notice that a WfMS is software. Because of different applications many types of WfMSs have been developed and are in use today. Allen (2001) classifies WfMS by production, autonomous workflow engines, embedded workflow, administrative, collaborative, and ad-hoc categories. One important feature of a WfMS is the inter-operability between the WfMS and other systems used in the business process.

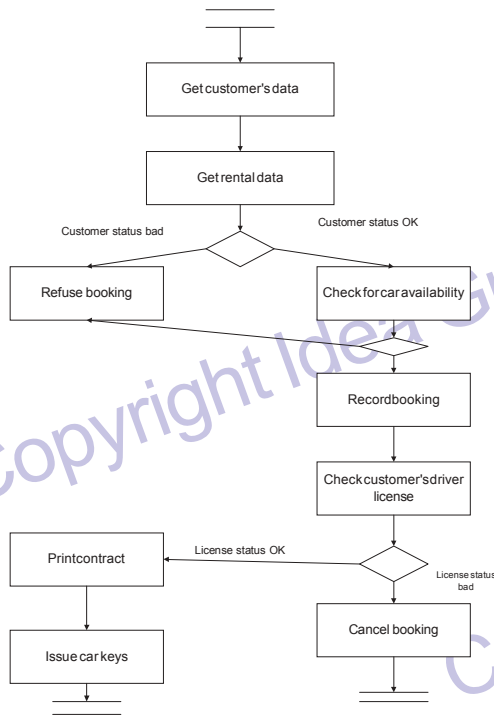
Generally, a WfMS provides an automated service for managing workflow of a business process. As information technology on the network and particularly on the Internet advances rapidly, more traditional systems with many workflow and process steps such as loan applications, insurance applications, course registration, have been entirely automated. More complex application systems, e.g., the supply chain management system, involving multi-process, and multi-workflow are also being developed. This clearly suggests that systems analysts must have the concept of workflow and be able to applying during the requirement analysis. In other words, workflow analysis is an integral part of system analysis.

## AN EXAMPLE: A CAR RENTAL PROCESS

Very often examples serve a great deal of illustrative purpose. Here our example is adapted from the example of (Casati, Ceri, Pernici, and Pozzi, 1997) which in turn is from a case study by (Model Systems & Brian Wilsons Ass., 1994). Briefly described, a car rental process begins with a customer call by phone or books in person with a clerk at a rental office. The clerk enters customer's personal data if not found in database, credit card data, and the driver license number. Next, the clerk records the rental period, the requested car type, and

the return branch. In the mean time customer background check is initiated to determine if the status is good. A bad status will result in a rejection. When the status is good the clerk would check to see if a car is available for the selected time period. If a car is available then the booking is recorded, refused otherwise. On the beginning date of the rental period, the clerk validates customer's driver license. If the driver license is invalid the rental will be refused, otherwise a contract will be printed and car keys will be issued to the customer. The rental may be canceled if customer does not show up two hours after the scheduled time or customer wishes to cancel the booking. A slightly simplified workflow diagram of the rental process based on (Casati, Ceri, Pernici, and Pozzi, 1997) is given in Figure 1.

Figure 1: A workflow diagram for a car rental process



## WORKFLOW AND SYSTEMS ANALYSIS

### An Effective Communication Tool

The workflow diagram of figure 1 shows step-by-step in the form of a workflow how a car rental process works. Each step here is a task to be performed by a worker, software, or a machine. The details of how to complete a task are not critical at the workflow analysis stage. The important idea is that each work/task should be clearly identified along with its finished outputs. The approach to workflow analysis is quite natural in the sense that it conforms to the intuitive logic of how people carrying out their business tasks. The diagram is much easier to understand than a DFD, hence it should serve as a more effective communication tool between the analysts and users.

### An Analysis Schema

Since the details of each task step are not of major concern analysts can focus on higher-level activities, decisions and processes that are required for completing a business process. Thus, the resulting workflow diagram includes information of all aspects needed for accomplishing a business process. The fact that it has all tasks, decisions and execution orders all in one place qualifies the diagram being as a

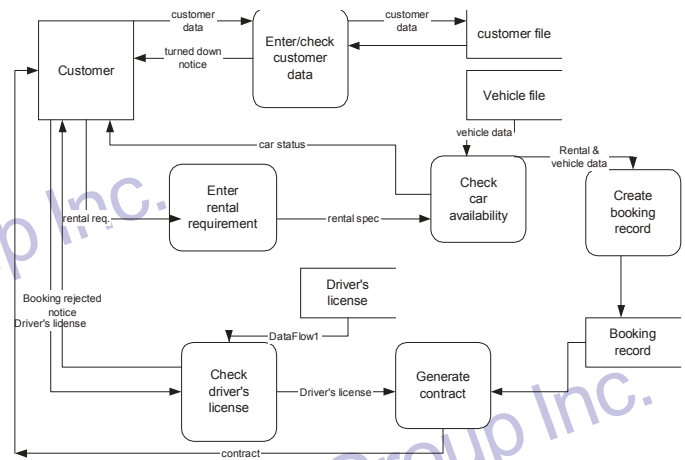
schema for systems analysis. In systems analysis the goal is to single out the information related elements from a workflow context, regardless of the approaches of analysis methodologies.

The other obvious usefulness of the workflow diagram is in the area of system improvements and re-engineering. This is because the workflow diagram has a broader and more complete coverage of "work" necessary to achieve a business goal. Workflow analysis also plays a key role in studying supply chain systems.

### Relation with DFD

Based on the workflow diagram of Figure 1, a data flow diagram of the car rental process could be easily derived as shown in Figure 2.

Figure 2: A DFD for a car rental process



### Relation with Use Cases

With the aid of the workflow diagram, analysts may identify all use cases in the car rental process. A use case diagram is shown in Figure 3. The description of one use case follows.

#### Use case 1 - Book a rental car

Actors: customer and clerk

Trigger: customer calls or visits the clerk for car rental

Process:

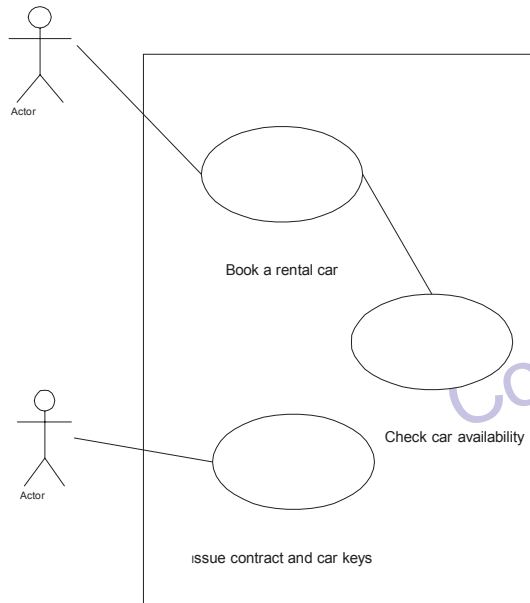
1. Identify customer. Search for customer record if the record exists, otherwise create one. The clerk enters customer's personal data if not found in database, credit card data, and the driver license number.
2. Check customer status. If the customer is not on the blacklist then process next step otherwise reject the booking.
3. Enter customer requirements. The clerk records the rental period, the requested car type, and the return branch.
4. Check customer credit. If customer credit is good then invoke use case 2, otherwise reject the booking.

Use case 2 (- Check for car availability) and Use case 3 (- Issue contract and car keys) are not stated here since use case 1 is sufficient for illustrative purpose.

## CONCLUSION

As we have discussed, workflow analysis has its own values. For system analysts, beginning with workflow analysis as a first step before performing other standard analysis techniques would make analysis easier and more focused. Consequently, we recommend that workflow analysis be made as an indispensable part of systems analysis.

Figure 3: Use case diagrams for the car rental process



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