An Application Of The Rational Unified Process® For Requirements Analysis

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ABSTRACT

The Rational Unified Process® (RUP)[2] is an effective implementation technique for object oriented systems development. The RUP® approach allows for flexible process modification and a customization of artifacts to meet the needs of the particular situation. Marriott International developed a variation of this process as its standard for its SDLC. This process was implemented in the requirements analysis and design phases of a software project for the Ritz-Carlton subsidiary. A context-level treatment of the RUP® metamodel produced use cases and a supplementary specification that lead to the systems analysis model development by an external vendor.

Keywords: RUP®, Rational Unified Process, Software Requirements Analysis

INTRODUCTION

*I*n the fall of 2006, Donna Rolland[3] wondered to herself if the gift card program development she was managing would ever be completed. She was responsible for completing the feasibility analysis of implementing a store value gift card solution for the Ritz-Carlton subsidiary of Marriott International. Marriott had used an automated stored value solution for its gift cards for many years; however, perceptions of differences in functional requirements had kept Ritz-Carlton from adopting Marriott's solution. As a result, Ritz-Carlton had kept a manual, paper based gift card program in place that was no longer consistent with its image as a highly sophisticated brand.

BACKGOUND

The first Ritz-Carlton hotel was established in Boston in 1927 (Ritz-Carlton, 2008). It was regarded as a private club for the very wealthy. Before booking reservations, guests were checked to see if they were in the Social Register or Who's Who. Dress codes were enforced for all guests, and the restaurants were also stringent with regard to whom they admitted. Women were not allowed to lunch alone in The Café and unescorted women were not allowed to enter The Ritz Bar until 1970. The hotel's motto is "At The Ritz-Carlton Hotel Company, we are Ladies and Gentlemen serving Ladies and Gentlemen." Since 1927, the Ritz-Carlton brand had extended to 68 hotels worldwide with 36 in the U.S. and 32 others in 24 countries. Worldwide it employs over 38,000.

The focus on superior levels of customer satisfaction in its high-end brand has continued at Ritz-Carlton. This concentration has resulted in its being awarded the Malcolm Baldrige National Quality Award twice. However, it has also sensitized the Ritz-Carlton management to any change in service delivery that might impact that quality standard. As a result, acceptance of change came slowly and reluctantly.

In 1995, Marriott acquired the Ritz-Carlton chain (Marriott, 2008). Gift cards had become a significant revenue stream for Marriott International. The gift certificate product represents a $30 million revenue stream. Automating this process with a stored value card solution provides added control while permitting a wider

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[1] The research for this case was performed by the author during a contract for Marriott International.
[2] Rational Unified Process®, Version 2003 Copyright © 1987 – 2003. Rational Software Corporation.
[3] The names of the actual participants have been changed.

marketing capability. The project would establish the requirements necessary for Ritz-Carlton to implement a stored value card solution and allow for the evaluation of vendor product offerings and costs.

The hotel and resort chain had implemented an automated system allowing for credit card type gift cards to be sold and redeemed for most of its hotel brands. The cards were widely available for purchase at hotel properties, retail outlets and online, and redeemable for rooms and services at Marriott locations worldwide. The automated gift cards provided Marriott daily sales, redemption and liability reporting for the product line by property. Detailed tracking of specific sales or redemptions could be provided for audit purposes. The Marriott gift cards could be redeemed for products and services at all of the 15 brands in the Marriott International group, except for the Ritz-Carlton hotel chain.

Donna Rolland worked on the original Project Request and Project Development Plan that were developed in the fall of 2006. These documents outlined the business case and budget for the Ritz-Carlton gift card program. These plans also specified the resources and schedule available to execute the requirements specification process. The most important aspect of these plans was their specification of the stakeholder groups necessary for successful completion of the specification. These stakeholders were solicited for their participation. The participants became organized as a Requirements Steering Committee that was actively involved in contributing functional and subject matter expertise and in reviewing the various process artifacts. Table 1 describes the stakeholder groups represented on the Requirements Steering Committee.

Table 1: Gift Card Project Steering Committee Participants

Global Incentive and Gift Card Marketing
IR Application Services – Finance
IR Application Services – Property Systems Operations and Transformations
IR Enterprise Security
IR Shared Services
Marriott Business Services
MICROS/Fidelio (Marriott Vendor/Partner)
MIFS Accounting
Ritz-Carlton - Accounting
Ritz-Carlton - IR
Ritz-Carlton - Product and Brand Management
Ritz-Carlton - Training Services
Ritz-Carlton – Sales & Marketing

THE RUP® PROCESS

The Rational Unified Process® (RUP) was originally developed by Rational Software in the 1990's. The process, now owned by IBM, is derived from several object-oriented software techniques, including Booch and Rumbaugh (IBM, 2009). It also incorporates the Boehm spiral iterative model techniques. It is designed to provide a "best practices" development framework for customization by software development organizations that can be a systematic and replicable process with several artifacts. RUP® maintains the customizable flexibility required to fit a variety of organizational and topical contexts. The principle constructs are roles, work products and tasks. The underlying model utilizes the Unified Modeling Language (UML) to represent the structure of the process (Leffingwell & Widrig, 2000; Canton, 2001, 2003; Kroll & Kruchten, 2004). UML was developed to unify various object-oriented process implementations into a single standardized representation technique (Jacobsen, 1992: Booch, et. al., 2005). Between 1989 and 1994 more than 50 modeling approaches were developed for implementing object-oriented techniques. The Object Management Group adopted UML as a graphical language standard in 1997 (Booch, 1999). The RUP® technique expands upon the characteristics of UML to unify a set of processes artifacts that assure consistency, reusability and process replicability. Figure 1 describes the requirements management process.

**Figure 1. The Requirements Management Process**
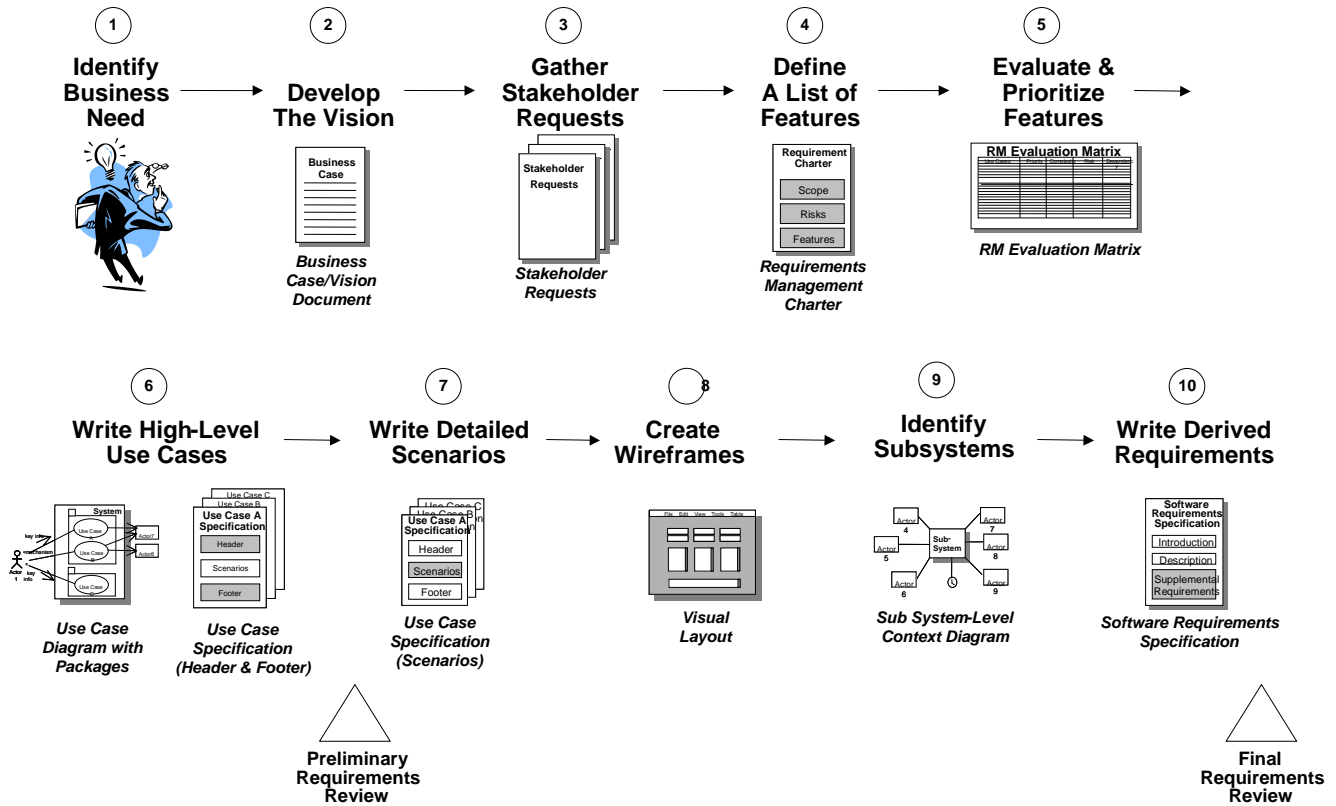
The RUP® The RUP® model is conducive to active incorporation of user requirements. The context level diagram provides an effective way to visualize requirements from the perspective of the actors upon that system (Jacobson, et. al., 1999). Inception and elaboration phases are followed by construction and transition phases

REQUIREMENTS PROCESS IMPLEMENTATION

The requirements process implemented for the Ritz-Carlton gift card program followed the RUP® process closely. Initial artifacts involved producing the context level diagram that would be included in subsequent project documents. This diagram provided a visual confirmation to the stakeholders of the conceptual framework for the effort and an identification of the actors and use cases that will be specified in subsequent artifacts. The context diagram is shown in Figure 2.

Figure 2. Context Level Diagram
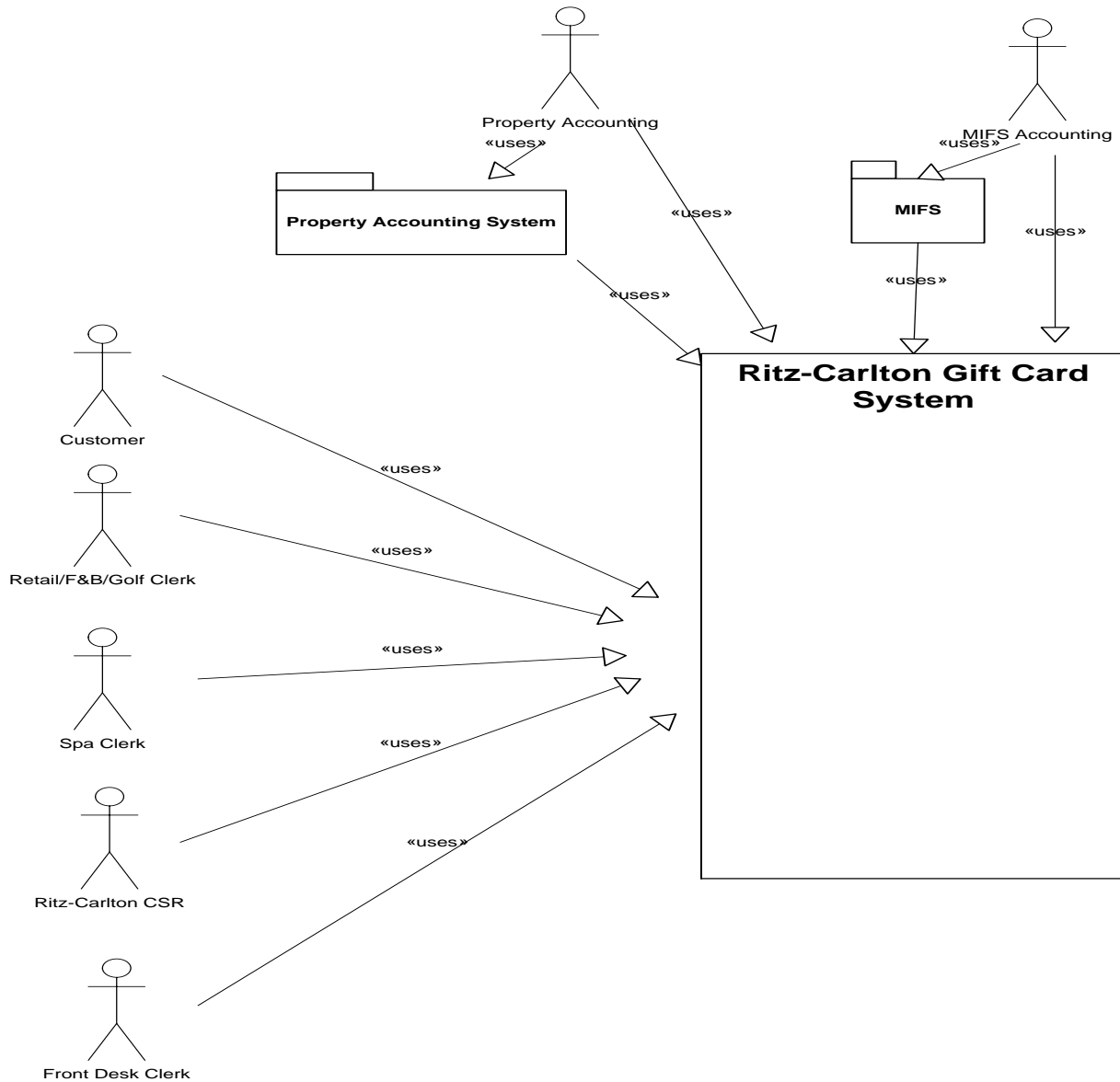
Stakeholder participation occurred at several points during this project. Stakeholder requests were solicited during the requirements gathering and definition steps. The stakeholders were also involved in the review and revision process for the artifacts documenting those requests.

One of the principles of the RUP® architecture is the *separation of concerns* (Balmelli, et. al., 2006). This allows designers to deal with each set of stakeholder concerns independently. This was an important concern in the design of the Ritz-Carlton gift card requirements architecture. It was significant to the acceptance of the analysis for full consideration of all requirements constituencies.

Like most organizations that use the RUP® process, it was not adopted by Marriott as an "as-is" process. Rather, they were treated as a set of "best practices" which were modified to suit the Marriott environment and specific software development projects. Most often this resulted in the elimination of process elements and some artifacts to streamline the process.

The current state definition diagram, developed as part of the RUP®, reflected a paper-based process for the generation and redemption of gift certificates. The certificates are sold at Ritz-Carlton hotel, restaurant and online locations and redeemed at Ritz-Carlton hotel, restaurant, retail, spa and golf locations. These certificates are not automated nor can balances be verified in real time. Tracking of gift certificates is limited to the sequence number assignment of a certificate to a specific property prior to its sale. No pre-established denomination is set.

A management consulting firm performed a preliminary requirements analysis and market survey. This firm surveyed the marketplace and identified 10 potential solution vendors. Each of these vendors was interviewed to establish the conformity to a preliminary set of technical and functional requirements and establish pricing structures. This preliminary set of screening requirements was general and categorical in nature and did not reflect formal requirements, but rather categories of requirements.

The set of requirements used in the survey were:

Technical Requirements
- Real time reporting
- Scalability
- Connectivity between remote locations and discrete centers within location such as restaurants, spas
- Platform- hardware, operating system, DBMS, Compatible with current system
- Architecture- open APIs and the latest XML, Java or web services
- Capacity- current and future volume/growth
- Security
- Ease of Use - UI acceptable for remote users
- Support- adequate and maintenance available?
- License- reasonable costs for current and predicted volume growth, support requirements and future software upgrades
- POS systems integration beyond Micros
- Web integration and development
- Message formats and protocols
- Dynamic currency conversion
- Redeem and reload cards online
- Reporting: online reports, transaction history, reconciliation, and compensation information along with activation, redemption and expiration data.
- Conversion of old gift cards
- Software web-based or server based

Functional requirements
- Gift Card Purchase and Activation
- Balance Inquiry
- Redemption
- Currency conversion
- Card Loading – this section is exclusive to Gift Cards
- Error Handling
- Functional Architecture
- Flexibility and Agility

The requirements list used in the market survey were not a complete nor formally vetted list, but rather a subset of requirements that were used to identify potential vendors that had analogous products. The product of the market search was used for source identification purposes and not as a screening process for specific requirements.

A series of meetings with stakeholder groups were conducted to elicit requirements and to refine their specification. The project team then met to flesh out the implications of each requirement without evaluating how it

is to be implemented. The project team then made an initial prioritization of the requirements into "Mandatory", "Preferred" and "Non-essential" categories and reviewed these with the sponsoring organization. A second set of meetings was then held with the stakeholder groups to assure the completeness of the requirements list and review the priority categorizations and underlying logic for initial classifications. Revisions were then performed to the requirements and priorities and a requirements traceability matrix begun to track each through the development process.

As a result of the requirements collection process and a definition of the roles of all of the actors in the system, use cases were developed. A use case is a sequence of events that describes the collaboration between the system and external actors to accomplish the goals of the system (Jacobsen, et. al., 1999; Balmelli, et. al., 2006;). The use case is a way to specify the behavior of the system and external entities in response to a specific set of stimuli. The use cases for the Ritz-Carlton gift card program involved the activities conducted by the various internal and external actors upon the proposed system. Business analysts familiar with the use case format and UML, constructed draft use cases. These artifacts were reviewed and revised with the review and input of the Steering Committee.

In addition to the functional requirements contained in the use cases, non-function, technical and architectural requirements needed to be memorialized in a system specification or supplemental specification. The Ritz-Carlton Gift Card program solution requirements reflecting the constraints of the Ritz-Carlton technical and applications architecture were captured in a Supplementary Specification. The Supplementary Specification also captured training needs, security, network interoperability and other parametric restrictions on possible solutions. These restrictions include the currently scheduled deployment of new systems and applications and the retirement of some existing architectural elements.

The formulation of the requirements did not presume a specific stored value card vendor solution. While the seamless implementation of any possible solution is important, the requirements will be driven by business, operational and administrative needs that may be met by a variety of vendors in various ways. The evaluation of those potential solutions will be performed in a subsequent project phase.

REQUIREMENTS PROCESS RESULTS

The use of the RUP® process provided a smooth and effective requirements specification and documentation process that was conducted on a tight schedule and with limited resources. Marriott used a modified RUP® process tailored to its highly distributed software development environment.   Sharepoint was used extensively to share and maintain process artifacts both within the project team and with external reviewers.

The Ritz-Carlton Gift Card System was conceived to work with existing hardware and software applications in order to provide an additional capability to already existing systems. Functional and non-functional requirements were captured from the stakeholders and crafted together into a set of documents that presented a clear and unequivocal set of specification for a vendor response. This set of specifications offered the possibility of vendor solutions that are specific and detailed enough for technical and cost responses.

Eleven use cases were produced, each covering the common functional activities of a set of actors. The use cases captured the functional requirements for the system. Each use case identified the primary and secondary actors involved, assumptions, triggering evens and post conditions. The basic flow of events covered in the use case was described, along with alternative flows, exception flows and extension points. The use case also contained a provision of the relevant business rules, GUI specification and other related information.

In addition, a supplementary specification was produced to capture the various non-functional system requirements for integration and interaction with existing systems, architecture and standards.

CONCLUSION

The Rational Unified Process serves as a replicable development system with process artifacts that allow for the communication and transfer of the development process between organizations. It is an effective process for system specification and translation of those specifications to third party developers.

The requirements process generated 62 requirements, 39 must haves, 15 desired and 8 postponed. Each of the 62 requirements identified were preserved and traced throughout the process through the use of a requirements traceability matrix in the Requirements Management Plan (RMP). This is an accepted implementation of RUP® traceability technique (Spence & Probasco, 1998). This artifact tracked the status evolution of each requirement and its incorporation into each of the documents leading to the systems design phase.

The process also produced a number of other artifacts:

- A Current State/Future State Process Diagram
- A Requirements Evaluation Matrix
- A Stakeholder Inventory
- Stakeholder Requests
- Use Case Specifications
- A Supplementary Specification containing non-functional requirements specifications.

A total of 11 use cases were generated encompassing all of the functional requirements in the "must have" and "desire" scope. The Supplementary Specification contained requirements and specifications for performance, security standards, network interoperability, usability, availability, technical architecture, training and support.

The use of the RUP® technique served as an effective and comprehensive method to conduct a requirements process. The formality and artifacts produced did a great deal to overcome reluctance in the stakeholder communities to accept the process results. It also served as the basis for transmittal of the requirements architecture to solution vendors for the systems analysis and design stages of the program. Finally, the process details allow for the effective management and acceptance testing formulations for products generated by this program.

AUTHOR INFORMATION

William Townsend is a Visiting Assistant Professor of Management at Jacksonville University. He has taught and written on management topics for over 25 years. Prior to Jacksonville University, Dr. Townsend has taught at American University, George Washington University and the University of Maryland. He has also been the President and founder of Townsend & Company, a Washington, DC based consulting firm since 1978.

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