Exploring the Benefits of Collaboration between Business Process Models and Fact Based Modeling - ORM

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Abstract. Companies are continually striving to reduce issues leading to failed projects and the costs associated with them. The use and collaboration of business process mapping and ORM data modeling can help improve the success rate of a project. This project incorporated lean business practice deliverables such as business process maps along with ORM data models. The output from the two sessions revealed a gap in knowledge around business rules which led to the creation of decision tables. The knowledge gained from the three components (process maps, ORM models and business rules) had numerous benefits including cross-validation of models, increased user involvement, definition of user acceptance tests, and ease in eliciting requirements. The collaboration of business process and data modeling drives accuracy and efficiency in requirements and can reduce or eliminate many of the issues identified as causes of failed projects.

Keywords: Lean Business Process, ORM, Supply Chain, Clinical Device Tracking, Business Requirements Elicitation, User Involvment.

1 Introduction

Many statistics have been presented during numerous professional development courses that indicate the importance of clear, complete, testable requirements and the correlation between poor requirements and project failure. A recent 2010-2011 industry survey identified issues around requirements elicitation and management. The study was conducted by Geneca LLC [1] and asked 600 Business and IT practitioners to answer questions around why teams struggle to meet the business expectations for their projects. According to the study, significant contributing factors to an individual's view on whether their project would be a success include:

Re-work expectations: 80% of the respondents of the Geneca study indicated that they expected to spend at least half of their time completing re-work tasks. The need for re-work can often be linked back to a poor understanding of business needs and lack of requirements documentation.

Quality business involvement: Often the business feels that creation of requirements is an IT task and doesn't understand the criticality of providing comprehensive, detailed

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requirements that clearly define the business need and capture the business' expectations. Without thoughtful participation from the business, the chance of the system meeting business needs and expectations is nominal. The lack of collaboration between IT and the business is often exposed during user acceptance testing when it is found that the acceptance tests have little or no correlation to system requirements.

Synchronicity between members of the business: Often software requirements are defined at the start of the project and the system is designed based on those defined requirements. However, business needs often change and by the time the system is deployed, the initial requirements may no longer be valid. Another issue is the lack of agreement among the members of the business team as to what the requirements really are. It is critical that the business users stay engaged throughout the lifecycle of the project and that they communicate any suspected issues as soon as they are known in an effort to minimize confusion and disappointment at the end of the project.

Clarity around business objectives: Not understanding the underlying business objectives behind the creation of new software can derail a project. This is troubling given that only 55% of the survey respondents felt they understood the business objectives both conceptually and in the details.

Consistent definitions: Less than 20% of survey respondents described requirements as the articulation of a business need, revealing a belief that requirements are system specific rather than expressing a particular business objective. This lack of understanding that a requirement is a representation of the business need feeds and exacerbates all of the issues listed above. It also provides a glimpse into a larger consistent language problem that infiltrates many projects.

All of these issues can be tied back to the requirements definition and management process. Project members need a way to minimize these issues so they can feel confident that their projects will be a success. Eliciting accurate, relevant and complete business requirements at the start of the project can minimize the risks of scope creep, re-work and communication issues that result in over budget, overdue, and poor quality projects that do not meet customer expectations.

2 The Project

This white paper focuses on a project initiated to create a new system that tracks clinical devices once the device leaves the distribution center, allowing internal visibility and reconciliation of clinically labeled investigational devices. The system records transactional information of all movements during the lifecycle of a clinical device such as shipment, receipt, usage and return of the device. In addition, the system provides methods to control the movement of devices based on pre-determined inventory levels and shelf-life dates. The system is known as the Clinical Device Tracking System (CDTS).

For this illustration, we'll be discussing the movement of a serialized device. A serialized device is part of a batch. Multiple batches of the same product may be manufactured; all of these products have the same UPN (universal part number).

3 Project Framework

3.1 Lean Business Process Tools

The project started out with an IS initiative constraint to implement Lean Business Process (LBP) tools in an effort to start with a solid understanding of the business process we were trying to automate. Tools from each of the DMAIC (Define, Measure, Analyze, Implement, Control) phases were selected.

Current state process maps, one of the LBP deliverables, were created by the Business Analyst, utilizing existing documented procedures and work instructions and collaborating with the Business Lead. Swim lanes were included for each functional area involved in the process as well as lanes for data and tools. This provided a quick, clear method of identifying high level or major data components captured in each process and the tools used to create or obtain that data. The information provided on the cross-functional maps could be used by Enterprise Architects to complete their enterprise analysis.

The current state process maps were reviewed by the business during a two day Kaizen Event during which the maps were used to drive a SWOT analysis where the **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats of the current process were identified and then correlated to specific process boxes within the overall process maps.

The next step involved walking through the current state maps end-to-end and identifying changes to create the future state. Each weakness and opportunity identified as part of the SWOT analysis was addressed in the appropriate map. The end result was an expected future state process map (see condensed version in Figure 2).

3.2 ORM Conceptual Data Models

After reviewing the project assessment, the Data/Information Architect recommended holding an ORM session to harvest the detailed data requirements for the device tracking project. The argued benefit was an increased understanding by the business of the system definitions and the relationships between objects. It would provide a common language for the project team to use for the duration of the project. "Object-Role Modeling (ORM) simplifies the analysis and design process by using natural language, intuitive diagrams, and examples, and by examining the information in terms of simple, elementary facts. By expressing the model in terms of natural concepts, such as objects and roles, this fact-oriented method provides a truly conceptual approach to modeling [2]."

Two initial sessions were held via conference call followed by a four day on-site session. Each session was facilitated by the Data/Information Architect and attended by the Business Analyst and Business Users. The previously constructed future state maps were used as the framework during the fact-based modeling sessions. This framework provided a number of benefits including:

Semantics: the sessions provided an opportunity to engage in quality dialogue with the business users, creating a common language understood by all team members and confirming that the object relationship interpretations of IT were correct.
Structure: the maps provided a structure to the fact based modeling discussions. Because scope was previously defined and outlined, the group could focus its time and attention on the data details of the process.
Efficiency: fourteen individual sub process maps were initially created; however the underlying data elements were consistent and the modeling sessions identified commonalities between the process maps.
Validation: stepping through each process map to gather the data components revealed both the validity of the previously created maps and the inaccuracies. Based on discussions held during these sessions, the maps were modified to reflect the exposed discrepancies.
Gap Identification: based on the discussions held during the process mapping sessions and the conceptual data modeling sessions, a gap in knowledge was identified around business rules. This gap led to the creation of decision tables.

3.3 Decision Tables (Business Rules)

While the knowledge gained during the process mapping and data modeling sessions was extensive, further analysis revealed a gap in requirement details. The collaboration of the two analysis techniques uncovered areas where detailed business rules needed to be documented in order to fully understand system functionality. It was understood that the ORM models would need to change once the business rules were established.

The system has two primary functionalities: 1) records each movement transaction that occurs for a device throughout its lifecycle and 2) displays current inventory levels at each inventory location. Examples that illustrate the knowledge gaps that were uncovered within each of these two core functional components are presented below.

Example 1: Device Movement

Devices can be shipped to four types of inventory locations: Distribution Center (DC), Clinical Site, Field Clinical Engineer (FCE), and Stocking Location. Inventory location was a concept adopted by generalizing the four individual location types listed above into one ORM object type because they are executing the same device movement process. However, each inventory location type has a distinct and unique id and is used as an alternate reference scheme (see Figure 1).

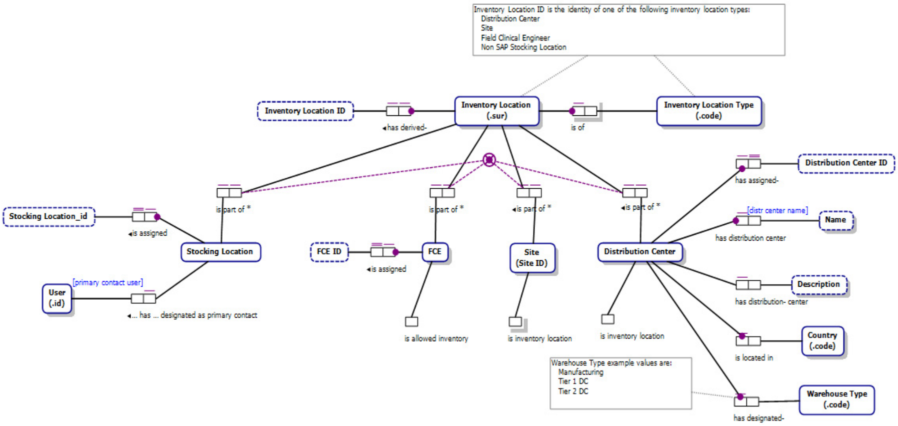

Fig. 1. Inventory Location ORM Model

Process mapping identified nine unique sub process maps involved in the tracking of device movements (Figure 2). The boxes circled in Figure 2 represent four types of device movements modeled during the ORM sessions: DC to DC movement (2.1), transfer (2.6), shipment (2.2, 2.8), and return (2.4). A fifth movement type, in transit, occurs whenever one of the other movement types occurs.

The ORM sessions revealed data commonalities between four of the five movement types, as seen in Figure 3. The DC to DC movement is a unique type of movement that is not consistent with the others (Figure 4).

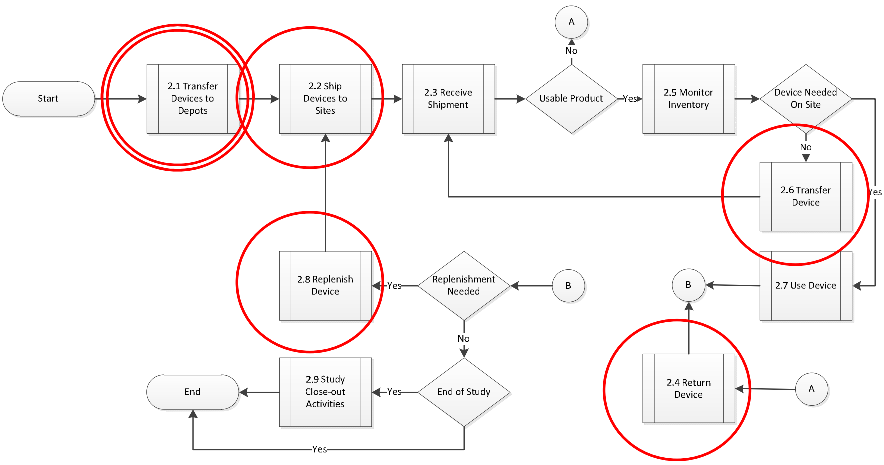

Fig. 2. High Level Tracking Device Process Map

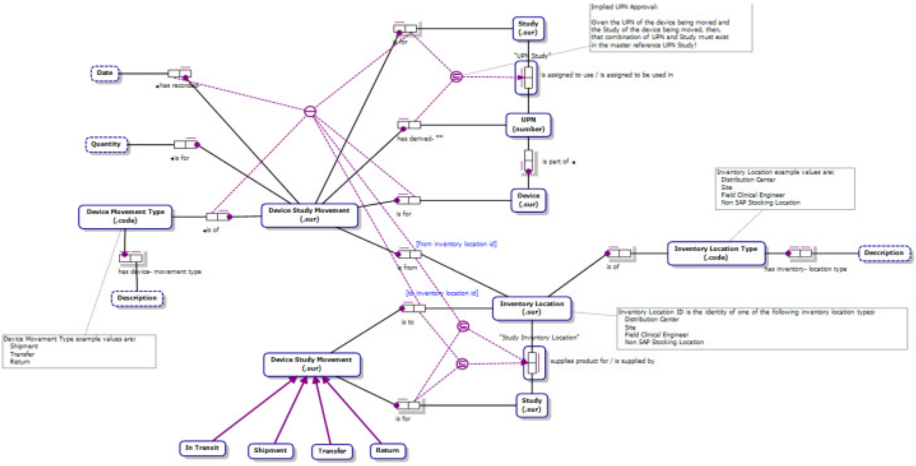

Fig. 3. Device Movement – Shipment, Transfer, Return, In Transit

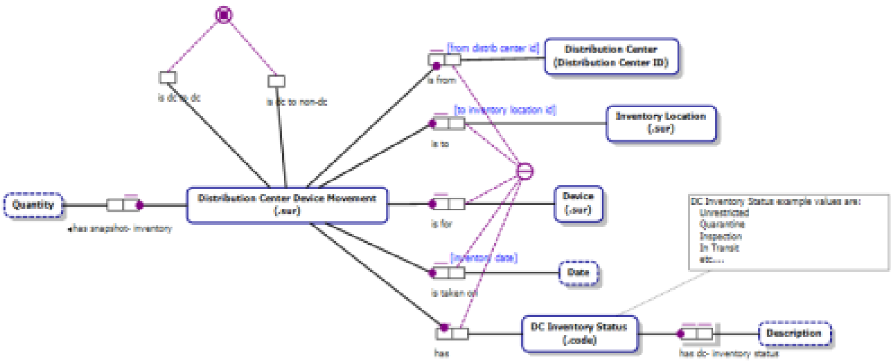

Fig. 4. Device Movement - DC to DC

Analysis of the process maps and data models revealed a need for clear representation of the correlation between each of the four inventory locations and the movement types. Table 1 displays the decision table that was created to visually present which device movement type occurs between two Inventory Locations. In transit movements occur in conjunction with each of the identified movements in the grid below.

Table 1. Device Movement Matrix

	Ship To			
Ship From	**SAP DC**	**Clinical Site**	**FCE**	**non-SAP Stocking Location**
SAP DC	InventorySnapshot	Shipment	Shipment	Shipment
Clinical Site	Return	N/A	N/A	Return
FCE	Return	Transfer	Transfer	Return
non-SAP Stocking Location	Return	Transfer	Transfer	Transfer

Transfer	initiated within CDTS
Shipment	initiated within SAP
N/A	not allowed
InventorySnapshot	snapshot from SAP, update to inventory levels
Return	return to DC or Stocking Location

The above matrix helped align IT and the business with a common language and an understanding of the terminology. This matrix was referenced frequently during the requirements sessions to remind the project team of the definitions of each of the movement types.

Example 2: Inventory Management. During the ORM sessions, several device status categories were identified throughout the business process. After the ORM sessions, it was evident that simplification of the numerous statuses was required; however, business rules needed to be solidified before simplification could occur. The Business Analyst created decision tables around the device statuses that could occur during a device's lifecycle which led to the creation of the Inventory Category and its subcomponents Physical Inventory and Disposition Inventory.

The following process flow illustrates the workflow involved in inventory management that was identified as a result of solidifying business rules and identifying valid inventory categories.

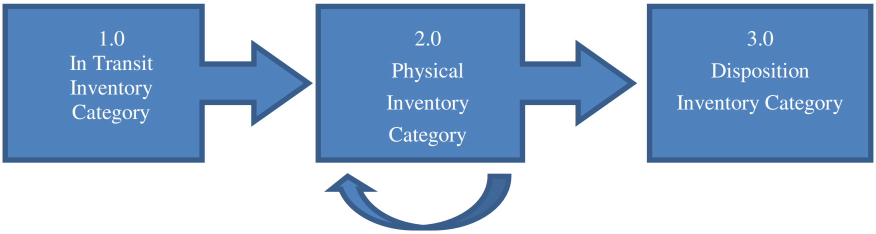

Fig. 5. Inventory Management Workflow

1.0 In Transit (Figure 5)
Upon shipment of a device to the Ship To location, the inventory category is set to In Transit. Once received at the Ship To inventory location, it is assigned to a Physical Inventory category.

2.0 Physical Inventory Category (Figure 5)
The Physical Inventory Category is composed of statuses that indicate that a device is in the physical custody of the inventory location. This is a temporary status during the lifecycle of a device. A device may be assigned to more than one physical inventory category before it is assigned a disposition inventory category.

3.0 Disposition Inventory Category (Figure 5)
The Disposition Inventory Category tells the story of the end of the device. Each device must be assigned a Disposition Category to complete the device lifecycle.

The above workflow revealed the need for additional business rules that documented which inventory categories a device could move to based on its current category. Table 2 displays one example of a complex decision table that was created as a result of the analysis.

Table 2. Allowable Transactions for Physical Inventory

	Increment Inventory													
	Physical Inventory Category								Disposition Inventory Category					
Decrement Inventory	Available	On-hold	Damaged	Expired	Opened/ Used	Explanted	Pending Return	Return Received[3]	Lost in Transit	Discarded	Used[1]	Returned	Transferred[2]	Destroyed
Available	NA	√	√	√	NA	NA	√	NA	NA	√	√	NA	√	NA
On-hold	√	NA	√	√	NA	NA	√	NA	NA	NA	NA	NA	NA	NA
Damaged	√	NA	NA	NA	NA	NA	√	NA	NA	NA	NA	NA	NA	NA
Expired	√	NA	√	NA	NA	NA	√	NA	NA	√	√	NA	NA	NA
Opened/Used	NA	NA	NA	NA	NA	NA	√	NA	NA	√	NA	NA	NA	NA
Explanted	NA	NA	NA	NA	NA	NA	√	NA	NA	√	NA	NA	NA	NA
Pending Return	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	√	NA	NA
Return Received[3]	NA	NA	NA	NA	NA	NA	√	NA	NA	NA	NA	NA	NA	√
exception rules														

[1] Usage is valid only when inventory location = Clinical Site.

[2] Transfer is valid only when inventory location = FCE or Stocking Location.

[3] Return Received is valid only when inventory location = Stocking Location or DC.

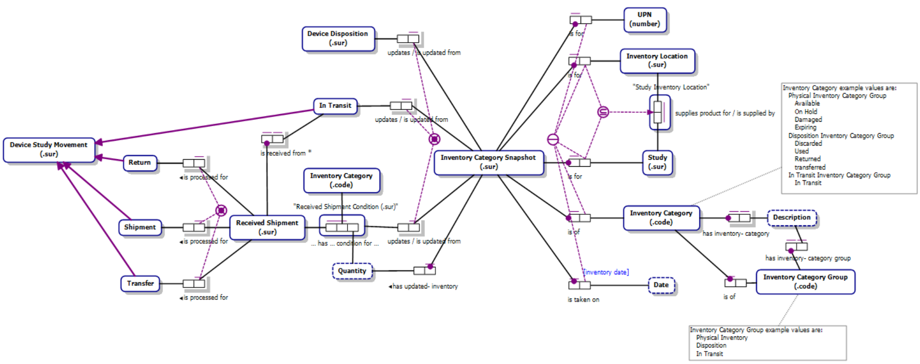

Fig. 6. Inventory Category Snapshot

The final step to the analysis was updating the ORM diagram based on the newly identified business rules. The multiple device status objects that were previously identified were condensed into the Inventory Category. The updated ORM diagram (Figure 6) reflects the fact types of counting inventory category.

The collaboration between process maps and data models revealed a gap in business rule definitions around the increment and decrement of inventory from one category to another. Although the ORM diagrams reflect a simple concept, the rules behind the diagrams are complex and require clear definition and documentation of those rules.

4 Benefits of Methodology

Beginning project discussions by documenting the process and following it with fact based modeling sessions with the business users has numerous benefits.

Multiple discussions, different perspectives: Prior to any formal requirements session, the business users were involved in numerous discussions regarding the project. These sessions forced the business users to thoroughly think and reflect on process, data and business rules and this reflection minimizes the potential for re-work. It allowed a platform for discussions among the user group that resulted in clarification of needs, scope and expectations. It built a solid foundation between members of IT and members of the business to help ensure that everyone was using the same language when discussing the project, which led to improved communication throughout the project and helped minimize misunderstandings between project members.

Stable database framework: The ORM sessions divulged 90% of the system's data components based on *business need* prior to any design or construction of the system. This framework was used to validate future requirements documentation to ensure that no data components were overlooked during requirements sessions.

Efficiency in business process/data gathering: The approach drove efficiencies in the business process maps by teasing out the inaccuracies in the maps through the data modeling discussions. It also drove efficiencies in the ORM sessions by providing an established framework to follow to ensure all processes were discussed. In addition, the process of defining and capturing business rules identified inefficiencies and inaccuracies within the data models which were then re-defined to accommodate the various business rules.

Driver for capturing business rules: A major benefit of the collaboration of methods is the clarity reached around the business rules of the system. This clarity is vital to the understanding and documentation of business requirements.

Framework for user acceptance tests: The process maps provide high level processes that need to be tested and can drive the test script creation process. In addition, conversations from the ORM sessions can be used to guide the testing of business rules.

Each of these benefits supports the requirements definition process. By following the above methodology, project members can feel confident that their projects will be a success. Business Analysts (in collaboration with actively involved business users) will be able to elicit accurate, relevant and complete business requirements and minimize the risks of scope creep, re-work and communication issues that result in over budget, overdue, and poor quality projects that don't meet customer expectations.

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