SLIIT
Discover Your Future

BSc (Hons) in Software Engineering
Year 3

Assignment 1 - Case Study 2
Procurement for Construction Industry

SE3070 – Case Studies in Software Engineering 2020 Semester 2,

Procurement for Construction Industry

This case study deals with the difficulties faced with the procurement procedures within the construction industry due to its inherently distributed environment. It is specifically targeted at small and medium sized site works.

In this case study, your teams are bidding to SLIIT Software Development unit, for the contract to develop software to provide mobile procurement systems in the construction industry.

- The first stage of bidding is to develop a design for your software that offers both functionality to address the complexity of on-site material procurement, and offers high levels of usability for both site managers and back office staff handling orders.
- In the second round of the contract competition a team of software developers will use your designs to develop, test and evaluate a simulator for your software platform that demonstrates both the usability features and the flexibility of the system to be configured for the needs of different procurement contexts.

In the first phase, you are required to demonstrate your understanding of the domain by creating a software functional design (using UML) and user interaction designs for the software.

About the case study

The primary objective of this application is to enable site managers to control their procurement of goods directly and independently, without the industry common practice of being reliant upon office based staff to make orders, which can result in "lost in translation" issues. Currently, a site manager manages the demand for the goods required on his site from suppliers by using a mobile phone to initiate the chain of events that result in the creation of a purchase order. This normally means that a third party from the procurement department of the construction company has to raise the actual purchase order for the site manager.

One of the significant disadvantages of this process is that staff in the procurement department often do not possess the technical skills to understand the items being ordered, which can lead to misunderstandings and problems with orders placed. Furthermore, a site manager authorized to raise purchase orders needs to contact the procurement department to verify details of orders that have been placed on their behalf or to raise queries.

The aim of this project is to create a web or standalone application and provides the site manager with direct access to a company's purchase order system in order to:

- Generate and place purchase orders.
- Make enquiries about previously placed orders.
- Note the delivery for ordered goods so that invoices can be paid when all the goods have been delivered.

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Background

The primary elements of the construction process involve the organization and scheduling of large quantities of labor and materials. These elements represent 75% of a main contractor's turnover. It is therefore of vital importance that these processes are administered correctly. The management of cost for items that are procured is a key issue for all successful construction companies. Procurement departments manage this through negotiating pre-agreed prices for commonly purchased items. To aid with the accounting function of the business, purchase orders are then generated for the purchase of supplies and goods to the business. This provides suppliers with confidence, simplifies job costing, as well as making the checking of invoices simple. As purchase orders have a unique sequential reference and the documents need to be readily available to the accounts department they are generally raised centrally.

The management of procurement within the industry has a number of issues because of the nature of the industry's environment. These include:

- Most materials are heavy so handling/moving them is expensive.
- Generally, materials are bulky and require substantial areas to store them.
- Materials for the internal finishing of a building are usually expensive and/or perishable so can only be delivered when secure storage is available.
- The dynamic nature of a building site means that there is often no purpose made storage facilities.
- Space for the storage of materials is often very limited.

For the above reasons contractors often attempt to operate a Just-In-Time approach to the supply and delivery of materials to sites. Failure to receive materials however is costly as labor is underutilized and progress impeded. Procurement, therefore, is a vital component of any construction project. As the construction industry is highly distributed because of its very nature this can make the management and control of procurement more difficult when compared to a manufacturing operation where the procurement department would be situated on the same site. However, three distinct stakeholders can be identified:

Site Manager

This person will be the user of the mobile application - creating purchase orders and logging deliveries.

Procurement/Accounting Staff

These users are the source of the pricing and product information for the application and need to have access to details of the raised purchase orders and delivery advice information.

Management

These stakeholders are less obvious than the others. However, they consume all the information produced by the system as well as setting out all the policies and procedures that relate to these activities and by which the other stakeholders are obligated to adhere to.

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The Procurement Process

There are number of key stages to any procurement as outlined below:

Requisition

This is the process by which an authorized employee makes a request to purchase items on behalf of the organization. This can be limited to pre-approved suppliers, or to a restricted items catalogue, dependent upon the policies of the organization. A suitable account to take the funds for the purchase is typically identified at this stage too.

Approval

The purchase requisitions are now considered by a more senior member of staff (e.g. a supervisor, line manager, etc.). Some systems apply different approval hierarchies to this stage of the process. For example, employees may be able to purchase goods under a limit of Rs. 100,000 without requiring approval. Or, regardless of the overall value of the requisition, certain items may always require approval. Some organizations may instigate approval by multiple managers. These types of rules vary and are organization specific. The point is, however, that different organizations have different hierarchies and rules for the approval of requisitions.

Order

Once the requisition has been approved a purchase order is raised and sent to the Supplier to be fulfilled. This will normally contain a standard set of information, e.g.

- Company details
- Supplier details
- Delivery address details
- A unique purchase order reference
- The date by which the goods are required
- The quantity, description and agreed price of the items

The purchase order reference is used to track the purchase and the supplier is asked to quote this reference on all deliveries and documents that relate to this order.

Goods Receipt

At this stage the supplier delivers or supplies the goods, usually with a delivery advice note. This document should have the purchase order reference on it. The goods are checked upon receipt to ensure their condition and the quantity is correct with the delivery advice note. The person that takes delivery of the goods signs the delivery advice note as acceptance of receipt. The delivery is then compared against the purchase order to ensure that the required goods have been received. There can be multiple deliveries to make up the total quantities requested on a purchase order, so it is important that as each delivery arrives, the goods are checked and matched against the lines of the purchase order.

Invoice and Payment

The supplier then provides invoices for the goods supplied. Each invoice states the order reference that it is related to. The previous stages are used to ensure that only invoices for goods that have been ordered and delivered in full are approved for payment. This process can also include obtaining credit notes for goods that have been returned.

Additional background

List of possible features were formulated as below:

- View the status of purchase orders, e.g. ”Pending”, “Approved”, “Declined”, “Placed”, etc.
- Amend a purchase order / requisition once created
- Delete / void a purchase order once created
- Hold purchase orders that contain unpriced items for updating before placing
- Process potential orders as requisitions for approval by another member of staff
- Incorporate a status for the purchase order, e.g. 'Waiting for Approval', 'Approved', 'Declined', 'Partially Approved', 'Referred', 'Returned to Originator'
- View the purchase orders by site manager and Suppliers
- Only create a purchase order when a signal to the device is available
- Handle multiple depots for the same supplier
- Display the site contact details on purchase orders which are sent to the suppliers
- Add comments on an order requisition for the approver
- Request approval for a purchase order / requisition
- Note / log product deliveries against orders placed - including partial deliveries
- Save part created purchase orders as draft orders for completion later
- Provide a list of sites to select from when creating a purchase order
- Order only from a list of available suppliers

Existing Systems

In addition to the context provided, it might be useful to research and examine other procurement systems to get a wider understanding of the general area. A list of some possible avenues to explore includes:

- Purchase Order by Aspring Investments Corp
- Digital Purchase Order by digitalpurchaseorder.com
- Purchase (iTunes App Store)
- StoreHubbr.net
- Purchasecontrol.co.uk
- Cloud-purchasing.com
- SAP

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For you information

The information in this document is typical of what you might expect to get from a client in industry when developing software systems, i.e. incomplete, possibly ambiguous, and certainly vague.

You are also encouraged to talk to the module delivery team during tutorials to clarify any queries you might have as you design (and then implement) a working system.

Remember, your clients will rarely be computer savvy and it is your job as practicing software engineers/computer scientists, to interpret the English language musings into formal designs and ultimately a software package. If the client could do this, they wouldn't need us.