

Modeling Trading & Procurement Cycle Based on Insourcing and Outsourcing Strategy

Mohamed Laradi

FACULTY OF ENGINEERING AND COMPUTING

Priory Street Coventry CV1 5FB

Coventry University (UK)

laradim@uni.coventry.ac.uk

Dr. Anthony Olomolaiye

FACULTY OF ENGINEERING AND COMPUTING

Priory Street Coventry CV1 5FB

Coventry University (UK)

aa6563@coventry.ac.uk

Abdessamad Douraid

Department of Industrial Engineering (IE)

University of Hassan II Casablanca

Ecole Nationale Supérieure d'Electricité et de Mécanique

ENSEM (Morocco)

abdessamad.douraid@gmail.com

Abstract

In recent decades, the existing market economy and the globalization have encouraged not only the emergence of an unstable industrial environment but also being more competitive. Therefore, outsourcing has become an important approach and it is increasingly used as a competitive weapon in today's economy. External parties can often provide products or services with a better effectiveness and efficiency as well simply because it's their core expertise. These have caused in an increasing awareness of the tradeoff between insource and outsource decisions. In this paper, we focus on the procurement process of oil production equipment within oil sector. However, the good control of procurement is crucial as well it composes an interesting proportion of costs along the whole supply chain. Hence, we proposed one model treating the problematic of insource and outsource decision connected with other three models creating an integrated supply chain; this will present different logistics' flows from the end-user, the distributor, the contractor to the supplier. These conceptual diagrams could be transformed into a simulation model to be run by way of a specialized simulation environment such as Agent Based Model ABM.

Keywords

Insourcing, outsourcing, procurement process, conceptual models.

1. Introduction

Nowadays, outsourcing has become an interesting business approach, and a competitive advantage may be gained as products or services are produced more effectively and efficiently by outside suppliers (Yang, Seongcheol, Changi and Jawon, 2007). Outsourcing allows firms to focus on their own core competences by relocating limited resources to strengthen their core product or service and to strategically use outside suppliers to perform service activities that traditionally have been internal functions (Elmuti, 2004).

A common thinking is that, the use of outsourced formal contracts is expected to improve supplier delivery performance by creating buyer-supplier trust and mitigating supplier opportunism (Goo, Kishore, Rao & Nam, 2009). Bowersox and Closs, 1996 further describe outsourcing as the process by which activities carried out on its own behalf by one organization are transferred and provided by an external contractor.

A good outsourcing contract not only encourage vendor and client organizations to get their desired goal but also motivate them to handle many practical issues that may cause the failure of the outsourcing contract (Lee, M.K.O, 2003) . Matthew K.O. Lee divide the outsourcing contract into pre-contract and post-contract for the best management of contract implementation (Lee, M.K.O, 2003). Contract management has two major parts “control and flexibility” (Lacity, M., et al., 1995) and require more extension, whereas the managerial interest can get the trust of client, which will improve the contract relationship (Gong, H., 2007).

Therefore the main goal of this research is to provide a new modeling approach of procurement procedures, by treating insourcing, outsourcing, operation and contracting issues. For this reason, we have decorticated the concerned contributors and their relationships within the supply chain under study (end-user, distributor, contractor and supplier). The proposed formalism for modeling this system based on the conceptual and unified modeling language (UML) models to be afterward employed for simulation which is a powerful tool to help procurement managers in decision making.

The structure of this paper is organized as follows. Section 2 presents an overview of outsourcing and supply chain modeling and simulation, according to the literature review. Section 3 and 4 afford our approach based on the conceptualization and UML modeling, where we provide detailed flowcharts of end-user, distributor, contractor and supplier; and their dynamic interactions. Finally, section 5 summarizes our contribution and gives outlooks on future researches.

2. An overview of outsourcing in the literature review

2.1 Definitions

Supply chain outsourcing has been the issue of many studies in the literature. (Lee et al., 2002) considered outsourcing decisions in advanced planning and scheduling in manufacturing supply chains. (Kouvelis et al., 2002) proposed a two-stage model to investigate a firm’s outsourcing and capacity decisions with the interplay of demand and supply uncertainty. (Yang et al., 2007) studied a sourcing problem where a firm is faced with stochastic demand and is allowed to order from multiple suppliers with random yields. (Liu et al., 2011) focused on the impacts of exchange rate risk and competition intensity on offshore outsourcing decisions of firms with different risk attitudes. (Nagurney et al., 2011) studied supply chain network design for critical needs products with outsourcing options. For more research regarding global supply chain design and outsourcing decisions, we refer the reader to the review by Meixell and Gargeya (2005).

Nembhard et al (2005) utilized a real options approach to study the optimal supply chain decisions for supplier selection, plant location, and market selection under exchange rate risk. (Cucchiella and Gastaldi, 2006) proposed an individualized framework to select possible options to protect the supply chain firm against various risks. For additional research that uses option valuation models to study supply chain decisions, we refer the reader to the literature review by Cohen and (Mallik., 1997). For more theory and applications regarding real options, see Brando and (Dyer. 2005), (Wu et al., 2009), and (Ross et al., 2009).

2.2 The trend towards Outsourcing

SCM becomes even more complex when companies outsource activities such as logistics, marketing, production and sales, or parts of certain activities to other companies, for example, transportation and information technology. With outsourcing the number of company links in the supply chain increases, thus the coordination of different companies becomes a challenging task for SCM increasing the risk sources a company may face. Outsourcing is the tendency to contract out activities that were previously conducted within the organization (Cranfield, 2002). Organizations outsource because they believe that they are more likely to succeed if they focus on the activities in which they have a differential advantage over competitors.

The main reason that companies are turning towards outsourcing is the need to focus on their core competences and outsource the activities to organizations that provide better performance on certain activities than the company i.e. due to lack of technical experts. Specifically, outsourcing is the function with which organizations are increasingly focusing on their ‘core business’ (functions they perform well and where they have a differential advantage) and the other non-core businesses are outsourced (procured outside the firm) (Christopher, 1998). For example, certain auto-manufacturing companies used to make their own parts yet now only assemble the finished products. The company with outsourcing has more time, expertise and knowledge to specialize on the in-house activities that offer a competitive advantage.

Similarly Quinn (1992) believes it is best for a company to focus on its core activities where it can achieve competitive advantage and outsource the non-core activities where it can achieve cost reduction, quality

improvement, lead time reduction and innovation. Additionally, Stevenson (2005) argues that a company decides to outsource due to a variety of reasons such as the cost of new technology so they can continue manufacturing the part in-house, asset utilization, reduce the company's leverage in the supply chain and whether it would delay or help time-to-market for new products. By concentrating on the core competence activities you can achieve cost reduction and quality improvement of the products, because it is outsourced to a company that has the technology, facilities and know-how to perform that activity much better and cheaper than if it was produced in house.

A company with outsourcing heavily depends on another company to provide the goods or services for the continuity of its business. Thus, companies are something more than just business partners. Most of them engage in long term relationships where common practices and goals become heavily important between the two partners, and especially for the company that outsources the activity. Before outsourcing, company has to think about the associated costs and risks: the unknown and unpredictable costs that may derive from the outsourced activity the company didn't expect, plus the risks if the supplier is not performing to the specific pre-arranged company requirements.

Outsourcing is best achieved when best-in-class suppliers are available (Weele, 2005). The company based on a market analysis needs to identify the most suitable companies to outsource the activities. There is a tendency to outsource activities to low labor cost regions (Stevenson, 2005).

Although companies can benefit from lower labor costs, their risk profile increases significantly due to political and economic instability in some of these regions. Stevenson (2005) advises that further to the usual risk performance metrics, constant monitoring of political and economic conditions must be achieved. This is judicious for companies that are part of supply chains operating in politically, economically and geographically vulnerable countries; they need to be alert to such changes which pose a high threat for the continuity of supply chain operations. The company needs to assess if it is in a position to outsource, and if so, then the company must revise very carefully the advantages versus the disadvantages for outsourcing a function.

2.3 Advantages and Disadvantages of Outsourcing (Weele, 2005)

Advantages:

- Freeing up of cash: investments can be concentrated on core activities.
- Optimal usage of knowledge, equipment and experience of third party.
- Increased flexibility: fluctuations in the workload can more easily be absorbed.
- Easier and more focused primary processes in the organization.
- Input through an independent party's point of view, reducing the risks of introverted short-sightedness in the organization.

Disadvantages:

- Increased dependence on suppliers.
- Continuous follow-up and monitoring of the supplier relationship is necessary.
- Risks of communication and organizational problems during the transfer of activities to a third party.
- Risk of leakage of confidential information.
- Depending on balance of power between parties: inability to execute contractual performance incentives and penalties.
- Risk of losing essential strategic knowledge.
- Risk of exposing the internal strategy to third party.

Outsourcing is very helpful if used when available outsourced parties are capable of performing the activity better than if it was produced in-house and when it adds value to the company's business performance. Outsourcing may be a disadvantage if the company does not have in place plans and actions to protect, for example, sensitive information or are unable to penalize the supplier for not providing the agreed-upon services or goods. A company needs to look into the supplier it is cooperating with (e.g. financial status, credibility, project outcomes, and customer satisfaction) and also determine if the two companies can collaborate and communicate successfully. There is a risk for the supply chain if the contractor turns out to be deficient in his obligations, which can as a result impact on the company's and supply chain's operations. After deciding if it is beneficial to outsource, the type of outsourcing needs to be determined, by comparing the advantages with the disadvantages of each type.

This paper propose innovative model with new strategy that investigate and illustrate the best purchasing decision which will help procurement managers to practice the most efficient purchasing decision that fits their resources.

The proposed model is been validated by number of procurement experts and a simulation process is under investigation using AnyLogic simulation tool to mimic the in-source/out-source procurement process.

3. Proposition of new modeling approach

3.1 End-user model

Procurement process usually required when there is demand for goods or service started with issuing request for quotations (RFQ's) by end user. With the present of technical staff, the requisition can be sent and followed up directly to a suppliers performing what's been called in-house procurement process (in-source), whoever due to lack of technical or financial resources, end user procurement officers are forced to source for a contractor who can perform the complete procurement process on their behalf (outsource).

In this section, we have developed a decision maker model (Fig. 1) which can help procurement managers in taking the right procurement strategy decisions based on their resources availability.

Model description: Referring to the end user model (Fig 1), the request of material requisition is issued by technical officer (1-2) where it should be checked for availability (1-3), whether it is available in stock or not, then the storage data base should be updated (1-4). Stock level can be checked and replenishment accordingly (1-5) & (1-7) otherwise end of process (1-6). In case the requested material is not available in stock (1-3), a parallel checking process starts to perform, funding check (1-8) and technical staff availability (1-13).

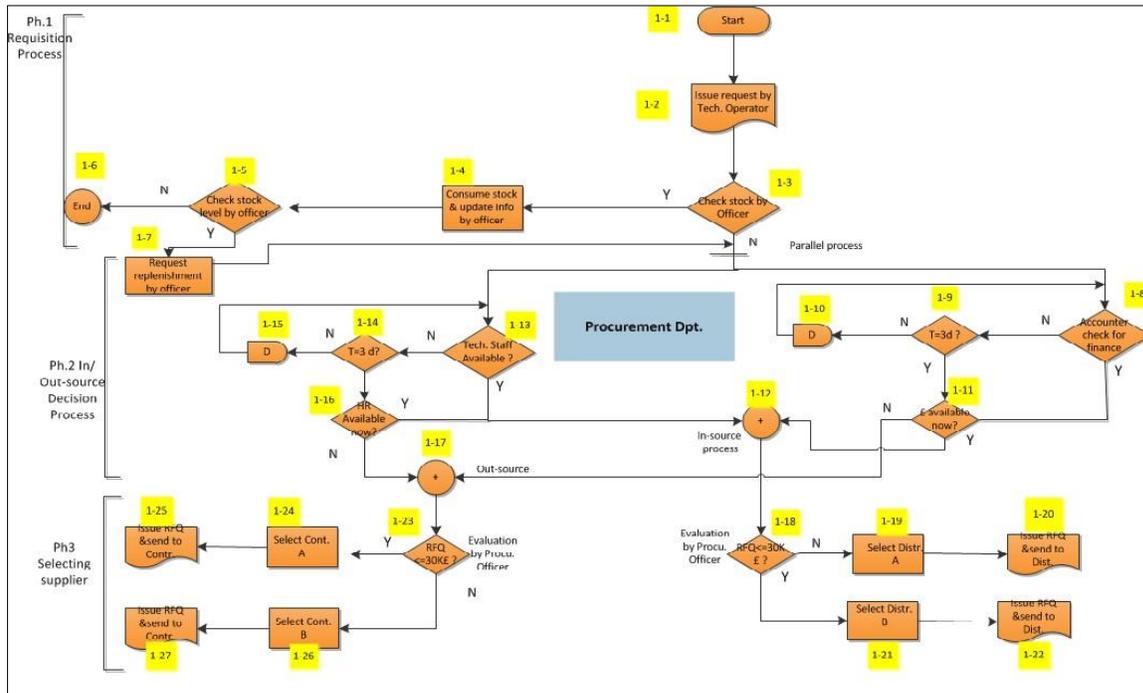


Figure 1: End user model

Funding checks: If the fund is not available to perform the procurement process, the system will permit maximum delay of 3 days to provide the budget (1-9) & (1-10). If the budget has been provided within the 3 days (1-11), the system will recommend In-source process (1-12), otherwise outsource process (1-17).

Technical staff checks: Likewise, process (1-13) checks the availability of technical staff, if they are not available, system will permit 3 days (1-14) & (1-15), if successfully provided, system will recommend insource process (1-12), otherwise outsource process (1-17).

Performing In/Outsourcing process: Based on the system decision (1-12) or (1-17), there are two probabilities as follow:

- If the system decision is to perform outsourcing process, a selection of contractors (3rd party) should receive the RFQ's (1-25) & (1-27) .

- If the system decision is to perform insourcing process, the RFQ's will be sent direct to distributors (1-20) & (1-22).

3.2 Contractor (3rd party) Model

The main function of the contractor is providing to the end user a comprehensive offer Performa Invoice (PI) which include prices, fees, tax and shipping. Then execute the purchasing order (PO) received by end user (figure 2).

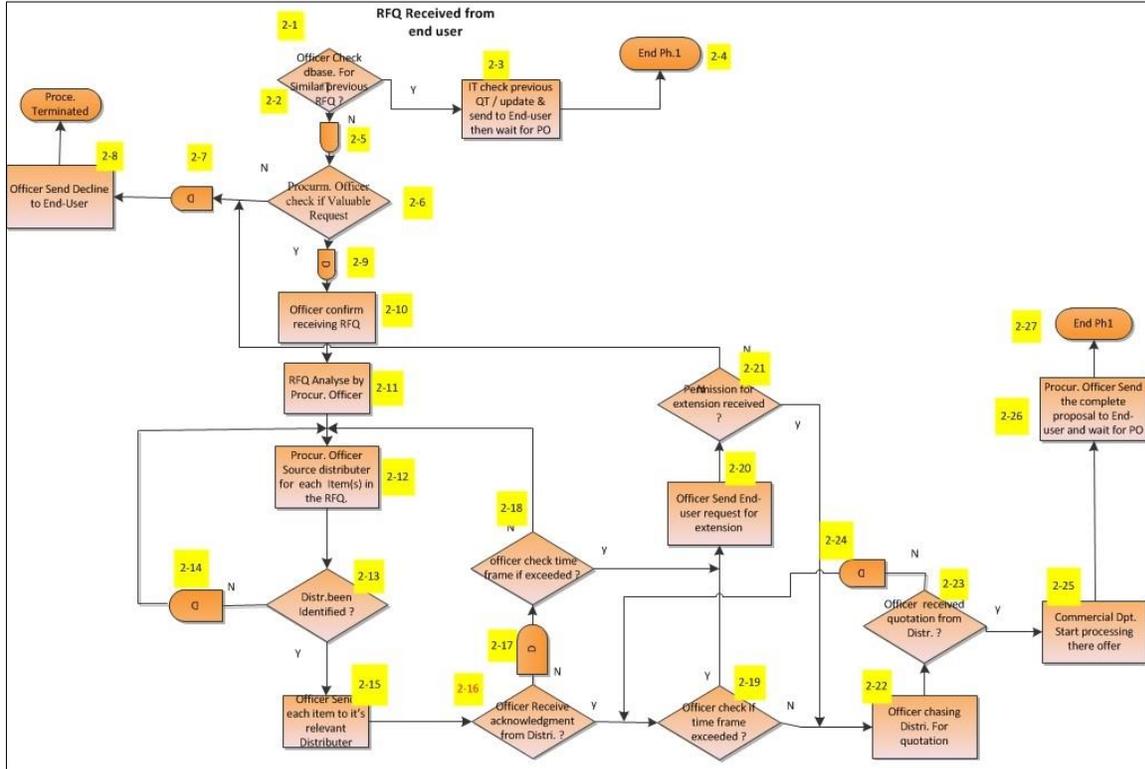


Figure 2: Contractor's model

Due to lack of technical support or budget scarcity, end user requires to perform the procurement process with contractor (Outsource) who can perform the job as complete package project.

When a contractor receive RFQ from end user (2-1) , contractor data base has to be checked in case a similar request has been executed in the past (2-2)&(2-3) , if this is the case , and a similar request been executed recently by the contractor , an updated offer (2-3) can be accomplished and sent to end user (2-4).

Contractor will make an assessment to the request (RFQ) (2-6), if the material value is low (not profitable); procurement officer will terminate the process by sending decline to the end user (2-8). If the value of the requisition is accepted, a confirmation message will be sent to the end user (2-10).

After analyzing the content of the requisition (2-11) such as items specifications, quantities, terms and conditions, procurement officer start sourcing for distributors (2-12). Sourcing process (2-13) will continue causing a delay (2-14) until find a proper distributor (s) to send them RFQ's. (2-15).

Decision process (2-16) checks whether an acknowledgment from distributor(s) has been received or not. If there is no acknowledgment received, procurement officer should continue sourcing for another distributor which causing a delay (2-17).

As time frame is critical issue, process (2-18) & (2-19) checks if time has been acceded or not, so contractor may request for time extension (2-20). These processes will continue in a loop until receiving confirmation from distributor followed by quotation (2-23). If quotation not been received, this causing a delay (2-24).

The final process contractor perform, is preparing a full offer including logistics, and tax (2-25) & (2-26) then send it to end user for assessment and purchasing order (PO).

3.3 Distributor Model

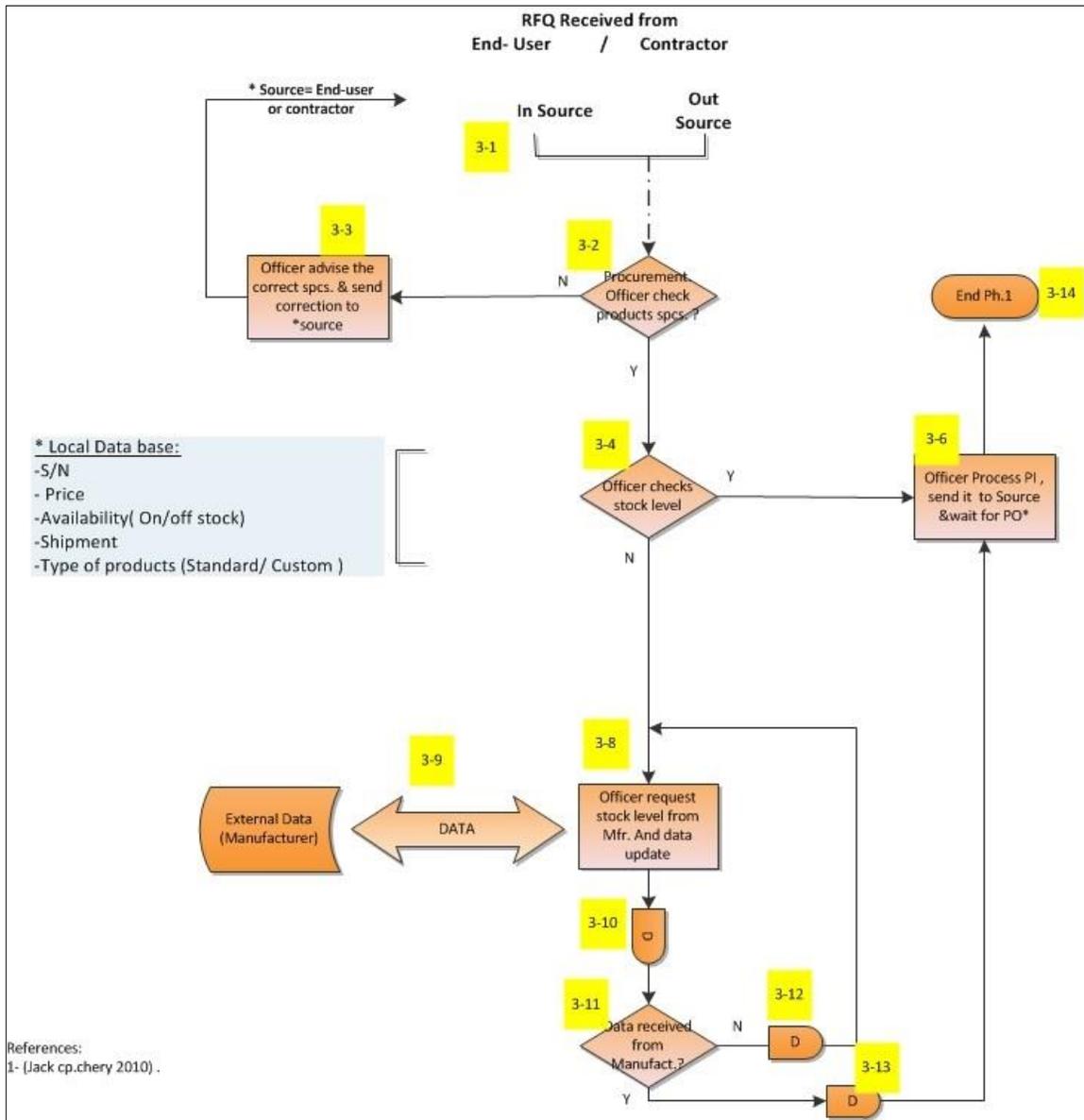


Figure 3: Distributor's model

As distributor may receive RFQ from end user (Insourcing), or from contractor (outsourcing) (3-1), distributor will check the specifications making sure it's correct (3-2). If specification is not correct (3-3), distributor will advise the source (end user / contractor) with correct specifications. Then check the local stock for availability (3-4) If item(s) are available on local stock , procurement officer will issue an invoice and send it to source (3-6) waiting for purchasing order (PO) , however if requested item(s) are not available on local distributor stock, officer will request an updated information from manufacturer regarding availability (3-8) & (3-9). This will cause a delay (3-10) until receiving the update (3-11), produce the invoice and send it to source (3-6). However, if distributor has not received the update, which causing a delay (3-12), the system will stay in the checking loop process until the status change.

3.4 Manufacturer Model

As the distributor cannot fulfill the requested goods from their local stock, they required to check with their manufacturer for the available stock level (3-9).

When the manufacturer receives this inquiry (4-2), first they will check whether the goods are available on stock (make to stock) (4-3) if it's available, officer will update the distributor with this information including date of delivery.

In case goods are not available on stock, a plan to make them should be set and update the distributor (4-6) with delivery duration in advance.

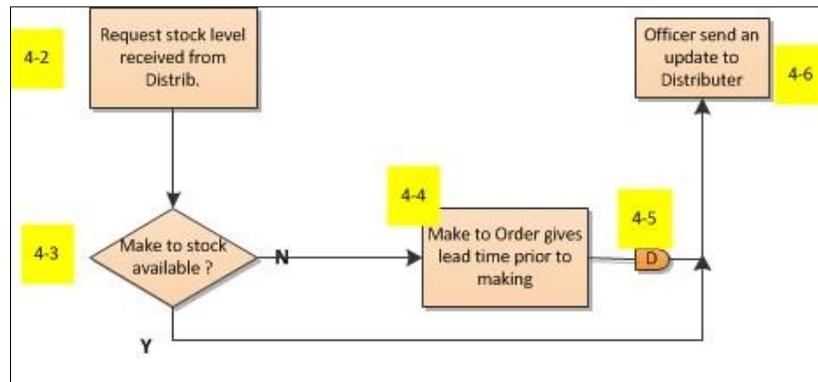


Figure 4: Manufacturer's model

These updates are important, since it will enable the distributor to keep end user with the latest development especially for led time.

4. Overall Model

Figure 5 illustrates the four parties connected with each other making a complete procurement network describing the information flows between stakeholders.

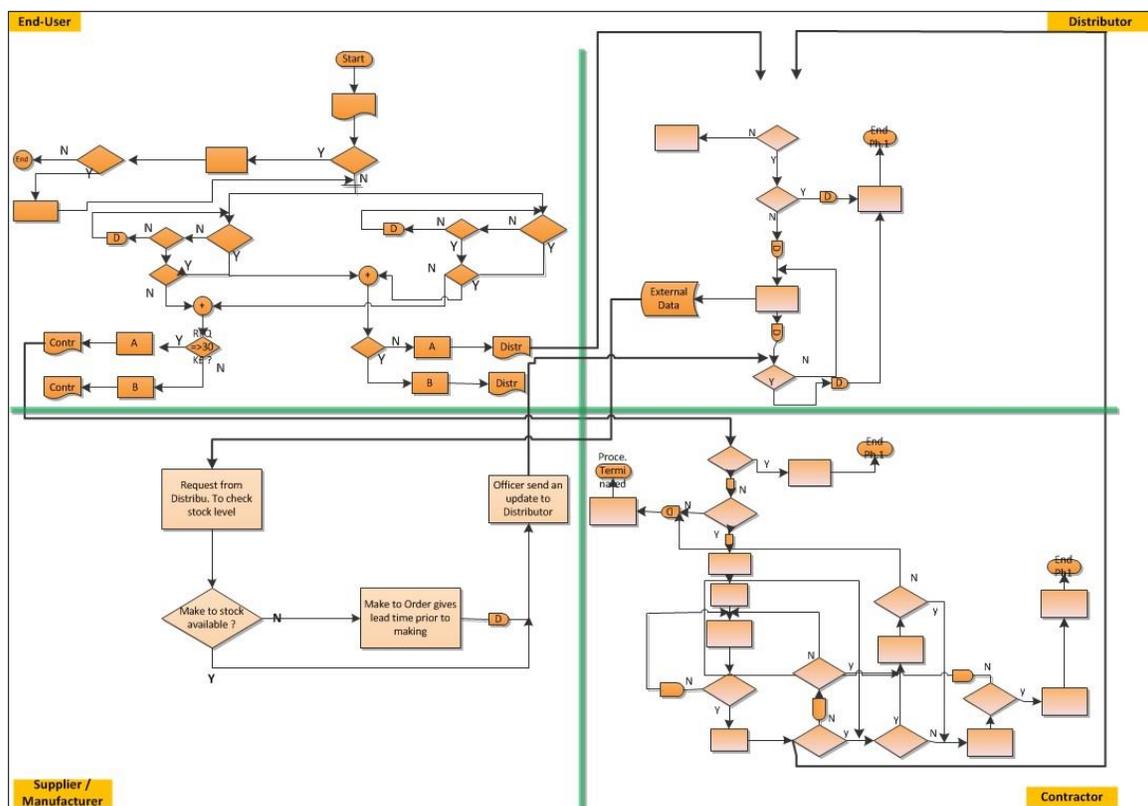


Figure 5: Complete Procurement Network

5. Conclusion

In this paper, a simulation model has been built for business procurement process based on insourcing and outsourcing strategy involving the end-user, the distributor, the contractor and the supplier. The main purpose of this paper is to integrate the dynamic aspects of procurement, insourcing and outsourcing decisions in a specific business area of purchasing equipment for oil production. We have chosen this modeling approach because it is the fact standard for modeling such complicated system and also it is widely accepted in industry, academia and provides suitable extension of mechanisms.

Initially, we have presented the outsourcing and the procurement issues according to the literature review. In fact, the existing models has some limitations, hence the need for flexible and reusable pattern of procurement. Therefore, we have listed a set of features which we have incorporated in the model. Then we have modeled the static and the dynamic aspects of each partner in the system. Meanwhile for future work, a simulation tool such as agent based simulation model (ABM) is recommended to evaluate the system.

Yet, even though this model investigates two main internal elements (Finance and technical expertise), however the procurement strategy and decision makers require external elements to build their decision and to secure the procurement project. Therefore, the further study can extend this model by adding external elements such as supplier selection and reliability.

References

- BOWERSOX, D.J. and CLOSS, D.J., (1996) *Logistical Management: the Integrated Supply Chain Process*, McGraw-Hill.
- Brando, L.E., & Dyer, J. (2005). Decision analysis and real options: A discrete time approach to real option valuation. *Annals of Operations Research* 135 (1), 21-39.
- Christopher, M. (1998). *Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service*. 2nd edition. London: Prentice Hall.
- Cohen, M.A., & Mallik, S. (1997). Global supply chains: Research and applications. *Production and Operations Management* 6(3), 193-210.
- Cucchiella, F., & Gastaldi, M., (2006). Risk management in supply chain: a real option approach. *Journal of Manufacturing Technology Management* 17 (6), 700-720.
- decisions. *IIE Transactions* 37, 945-956.
- Elmuti, D. (2004). "The Perceived Impact of Outsourcing on Organizational Performance", *Mid-American Journal of Business*, Vol. 18, No. 2, pp.33-42.
- Gong H, Murphy PW, Langille GM, Minielly SJ, Murphy A, McMaster CR, Byers DM (2008) Tryptophan fluorescence reveals induced folding of *Vibrio harveyi* acyl carrier protein upon interaction with partner enzymes. *Biochim Biophys Acta* 1784:1835-1843.
- Gong, H., Tate, M., & Alborz, S. (2007). Managing the outsourcing marriage to achieve success. *Proceedings of the Fortieth Annual Hawaii International Conference on System Sciences, 2007 (HICSS 2007)*, 239c-239c. doi: 10.1109/HICSS.2007.334.
- Goo, J., Kishore., R., Rao, H.R., & Nam, K. (2009). "The Role of Service Level Agreements in Relational Management of Information Technology Outsourcing: An Empirical Study." *MIS Quarterly*, 33(1): 119- 145.
- Kouvelis, P. and Milner, J.M. (2002) Supply chain capacity and outsourcing decisions: the dynamic interplay of demand and supply uncertainty *IIE Transactions*, 34, 717-728.
- Lacity, M. C., & Willcocks, L. P. (1995). Information systems outsourcing in theory and practice. *Journal of Information Technology*, 10(4), 203-207.
- Lee, Y.H., Jeong, C.S., and Moon, C. (2002) Advanced Planning and scheduling with outsourcing in manufacturing supply chain *Computer & Industrial Engineering* 43, 351-374.
- Liu, J., Wang, B., Wang, H., Kuang, X., and Ti, R.: Forced response of the East Asian summer rainfall over the past millennium: results from a coupled model simulation, *Clim. Dynam.*, 36, 323– 336, 2011.
- McGraw-Hill/Irwin, USA.
- Meixell, M.J. and Gargeya, V.B., 2005. Global supply chain design: a literature review and critique. *Transportation Research Part E*, 41 (6), 531–550.
- Nagurney A, Yu M, Qiang Q, 2011, "Supply chain network design for critical needs with outsourcing." *Papers in Regional Science* 90 123-142.
- Nembhard, H.B., Shi, L., & Aktan, M. (2005). A real-options-based analysis for supply chain
- Quinn, J. B. (1992). *Intelligent Enterprise*. New York: Free Press.
- Ross, S., Westerfield, R., & Jordan, B. (2009). *Fundamentals of Corporate Finance* (9th edition),

- Stevenson, W. J. (2005). Operations Management. Eighth edition, New York: McGraw-Hill.
- Weele, A. (2005). Purchasing and Supply Chain Management: Analysis, Strategy, Planning and Practice. 4th Edition. London: Thomson Learning.
- Wu. F., Li, Z., Chu, L.K., Sculli, D., & Gao. K. (2009). An approach to the valuation and decision of ERP investment projects based on real options. Annals of Operations Research 168 (1), 181-203.
- Yang, J., Qi, X., and Xia, Y. (2005) A production-inventory system with Markovian capacity and outsourcing option. Operations Research, 53, 2, p. 328.

Biography

Mohamed Laradi is PhD student in engineering and management (EM) at Coventry University. In 2012 received the Master's degree in EM. Interested areas are Supply Chain Risk Management, Procurement Process, Operation Management, Modeling and Simulation.

Dr. Anthony Olomolaiye is Senior Lecturer in Project Management at Coventry University . Received Ph.D., in Knowledge Management from Glasgow Caledonian University and B.Sc., in Construction, from Obafemi Awolowo University, Ile-Ife, Nigeria. His areas of rresearch interests are Knowledge Management, Managing Innovations, Project Management and Strategic Management in Organisations.

Abdessamad Douraid is PhD student in industrial engineering (IE) specialized in supply chain management and logistics. Basically, he graduated with bachelor of Electronic Engineering Systems from faculty of science Ben M'Sik-Casablanca in 2008. In 2010 he received the Master's degree in his same area of research (IE), alumni of university Hassan II "Ecole Nationale Supérieure d'Electricité et de Mecanique" (ENSEM) Casablanca-Morocco. His areas of interest are Procurement process, production system, modeling, simulation and optimization.