

BUSINESS PROCESS MODELING USING EXTENDED EPC META-MODEL FOR SCM SYSTEMS

Danish Irfan, ****

COMSATS Institute of Information Technology, Abbottabad, Pakistan

ABSTRACT—This work extends the Event-driven process chain (EPC) with an additional perspective that integrates information about the key performance indicators (KPIs) given by SCM system. The considered extended metamodel makes the unseen knowledge about the relationships between the business processes and its performance metrics elements. In this scenario, a case study is also presented.

Index Terms—Business Process Modeling, Event driven process chain (EPC), supply chain management (SCM), performance metrics

I. INTRODUCTION

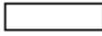
The proposal of EPC was first introduced by Keller et. al [1] in 1992 which is based on the concepts of stochastic networks and Petri nets (directed graph based workflow modeling). The EPC follows the Architecture of Integrated Information System (ARIS) framework which is being used --for modeling, analyzing and redesigning the business processes [2]. ARIS divides complex process models into separate views, in order to reduce the complexity. Aalst [3] instead of a high-level variant uses the classical Petri-net based techniques and formalism to analyze EPC’s potential approach and verify the correctness of EPC by using soundness property checked in polynomial time. It also discusses the problems associated to OR connectors and review the possible solutions. Birgit Korherr et. al. [4] elicits business process languages for UML 2 profile for EPCs by realizing them as a 1-1 mapping, since both of them provide similar concepts ensuring a business-goal oriented software development. Dominik et. al. proposed extended EPC (eEPC) which introduced further elements such as process participants or data and information systems [5] Kindler [6] considers the absence of formal semantics which also allows the exchange of models between tools of different vendors and prevents the use of powerful analytical techniques.

Section 1 gives a brief introduction and related work in EPC. Section 2 presents a case study for extended meta-model of the EPC [7]. Section 3 gives a case study of a considered enterprise. Lastly, section 4 concludes the study and presents the future directions.

II. EPC WITH PERFORMANCE METRICS (PM)

We have chosen the EPC as a basis for our model because of its wide-spread use in many companies for modeling business processes, and because of its flexible view concept, that allows separating the different aspects of a business process. We can easily add another perspective while keeping the original structure intact. The EPC meta-model (white) including the PM Perspective (dark) is shown in Fig 1. Each EPC consists of one or more Functions and two or more Events, as an EPC starts and ends with an event and requires at least one function for describing a process. The symbols and notations used for the performance metrics is given in Table 1.

TABLE I.
PERFORMANCE METRICS NOTATIONS

Symbol Name	Symbol
FACT NAME	
MEASURE NAME	
ENTITY NAME	
ATTRIBUTE NAME	

An Additional Process Object may be assigned to one or more functions, for example an Information Object or an Organizational Structure. All types of additional process objects may be assigned to any function. We extend the EPC meta-model with the PM perspective and introduce a PM Information Object as an additional process object. The detailed meta-model of the PM perspective is shown in Fig 1. Performance metrics (PM) information object represents the ways in which a business process might interact to access different decision making areas. PM information objects are additional process objects in terms of the EPC, which means that they can be assigned to a function that uses the KPIs supplied by them.

III. THE EXTENDED META-MODEL OF THE EPC - CASE STUDY

The forecasting methodology for the RFQ generated the timing limitation as the Request for quotations (RFQ), (ec₁) from the vendors starts. Simultaneously, the notes for the processing should be taken for dispatch of the purchase department along from the vendors. The supplier selection process lies in the control of purchase branch which selects potential suppliers on the basis of weighted features including cost, quality and ERP by consideration of cost comparison statement, RFQ forwarding vendors and the received quotations. Purchase department should have an interactive analysis of the order making the cost comparison (ec₄) of

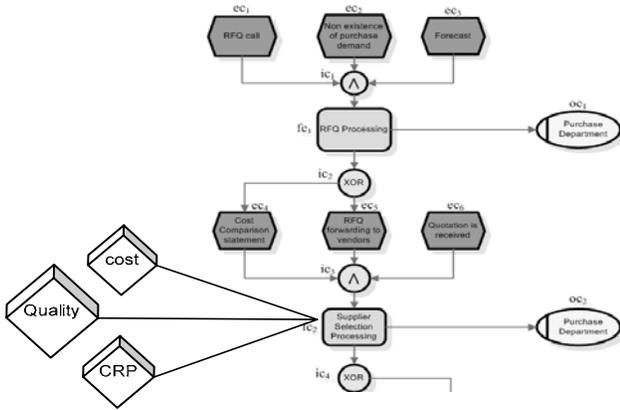


Fig.1. Extended Meta-Model of the EPC

the quotations received processing within the given time span. The modification and refinement (ec₉), (ec₁₀) of order also takes place in the mean time. Average processing cost should be measured by the Master production scheduler (MPS) (oc₄). The detailed material specification (fc₆) is outlined by the material resource planning (MRP) department (oc₆) which classifies the bill-of-materials (BOM) (ec₁₇) of the items, CRP description (ec₁₆) and the sourcing (ec₁₅). It should be maintained and stored in the data warehouse (DWH) associated with it. It will provide a base for the inventory management system. (ec₂₅), (ec₃₁) which issues the receipt along with the code allocation. Item receiving section (oc₆) should have interactive analysis of IGF and IGR. Manufacturing branch should keep the quality and time for processing in the function namely, discrete production items classification and processing. The QC passed items (ec₂₉) are forwarded to the finished goods inventory (oc₁₃) and hence proceed to the customer order process (dc₁). Fig 2 and fig 3 shows the current scenario.

IV. GOAL MEASURE TREE:

The EPC metamodel extends a new view, the Measure View; including Measure goal and Process Goal. The process goal itself is a part of the EPC, and describes the specific intension of a business process. A measure is an abstract metaclass and is connected with one or more Measure Flow Connectors (Quality, Cost or Cycle Time). The quality can be expressed e.g., by a low number of complaints or a high customer satisfaction. Cost represents the expenses a business process requires for instance for its execution. Cycle time presents a time based measure and defines the processing duration of a business process instance, or part of it. Quality and cost are in contrast to the cycle time often more focused on the type level of a process, as the required data is often not available on instance level.

The goal measure tree for the current case is presented in fig. It is the relationship between goals and measures. The main process goal is listed as EPC PM. The sub goals include order refinement, select potential suppliers, and quality control. The order refinement goal is fulfilled if the cycle time for X days meets. Weighted feature based competitive supplier fulfills the selection of potential supplier. Similarity desired quality is achieved upon meeting the quality metrics defined

considered by goal view.

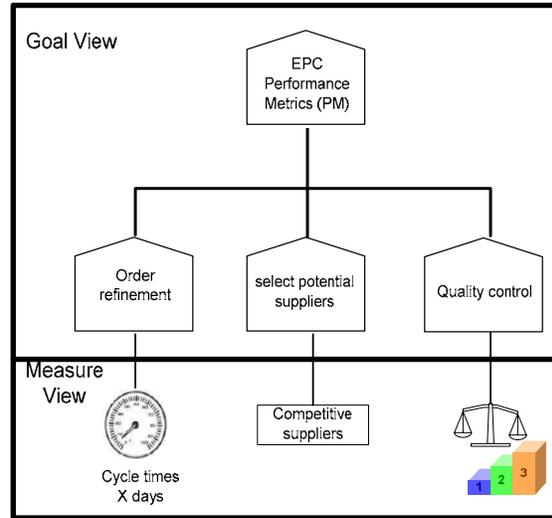


Fig. 4. Goal Measure Tree

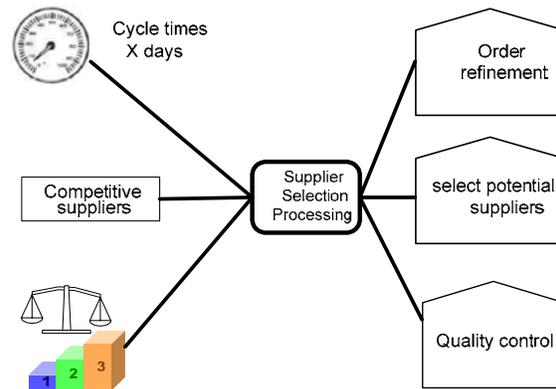


Fig. 5. First hierarchy level: Supplier categorization

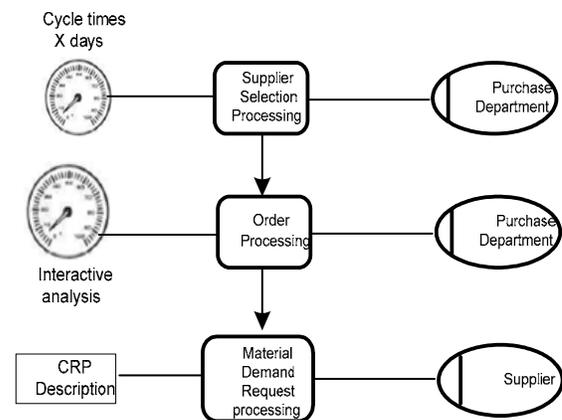


Fig.6. Second hierarchy level: Supplier categorization

First hierarchy level describes the practical applicability of the extension of the EPC with performance measures of the supplier categorization process. Second hierarchy level gives an inner view of the supplier categorization process until the supplier order processing and material demand processing is reached.

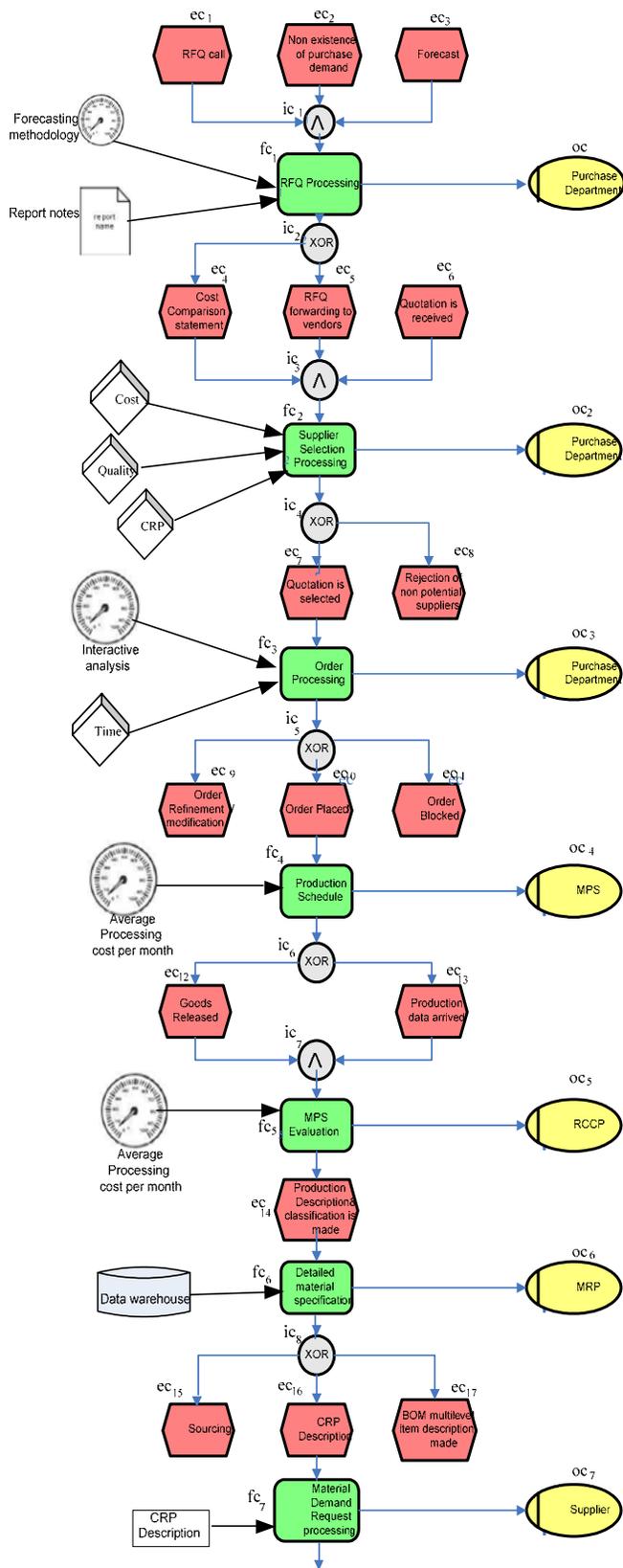


Fig. 2 The Extended Meta-Model of the EPC

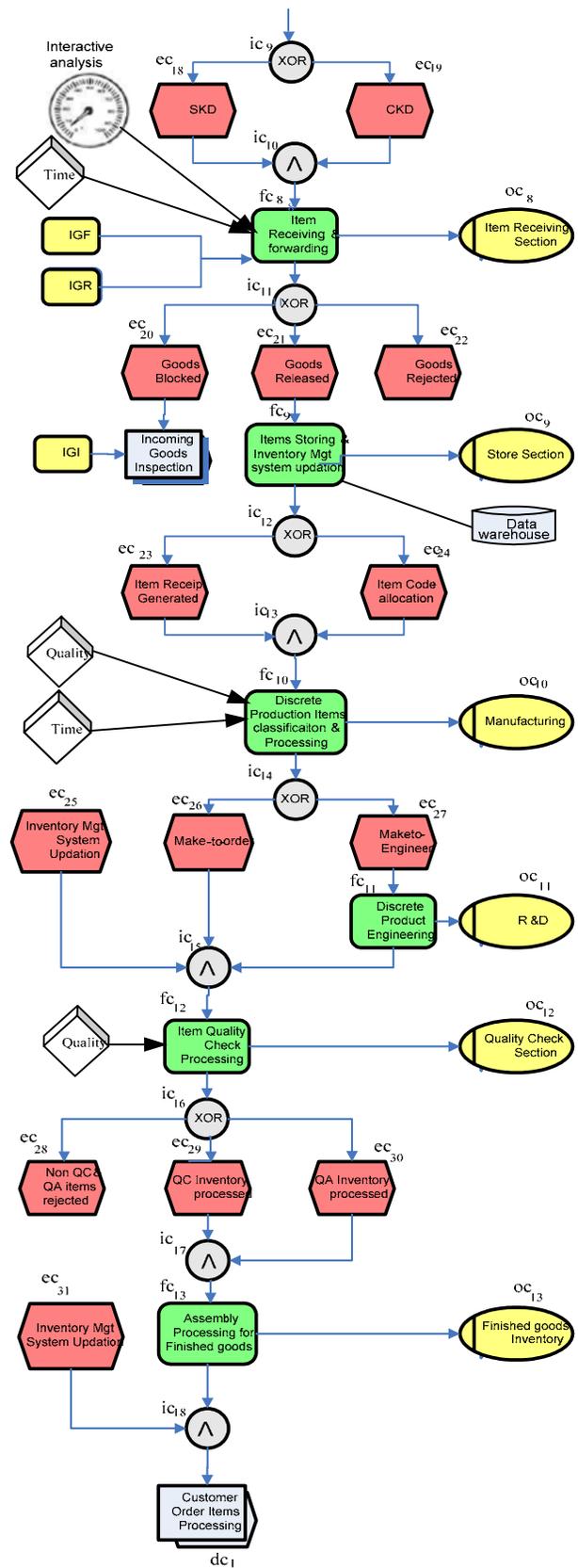


Fig. 3 (continued fig2) The Extended Meta-Model of the EPC

V. CONCLUSIONS

In this work we extend EPC metamodel with an additional perspective that makes the unseen knowledge about the relationships between the business processes, its performance metrics elements and the specific intensions of a business process.

We intend to implement the proposed model on a distributed software platform. Our future directions lie in application of the extended metamodel.

ACKNOWLEDGEMENTS

Authors acknowledge Dr. Birgit Korherr for precious help and suggestions for our work.

REFERENCES

- [1] Keller, M. Nu"ttgens, A.W. Scheer, Semantische Prozessmodellierung auf der Grundlage Ereignisgesteuerter Prozessketten (EPK), Ver"offentlichungen des Instituts fu"r Wirtschaftsinformatik, Heft 89 (in German), University of Saarland, Saarbru"cken, 1992.
- [2] Scheer, A.-W. ARIS - Business Process Frameworks (3rd Ed). Springer, 1999.
- [3] W.M.P. van der Aalst, "Formalization and verification of event-driven process chains" Information and Software Technology 41 (1999) 639–650
- [4] Birgit Korherr and Beate List: A UML 2 Profile for Event Driven Process Chains, Proceedings of the 1st IFIP International Conference on Research and Practical Issues of Enterprise Information Systems (CONFENIS 2006), April, Vienna, Austria, Springer Verlag, 2006
- [5] Dominik Vanderhaeghen, Sven Zang, Anja Hofer, Otmar Adam, "XML-based Transformation of Business Process Models –Enabler for Collaborative Business ProcessManagement"
- [6] Ekkart Kindler, "On the semantics of EPCs: Resolving the vicious circle", Data & Knowledge Engineering 56 (2006) 23–40
- [7] D. Irfan, X. Xu, S Deng, "Developing Approaches of Supply Chain Management Systems of Enterprises in Pakistan" , Intl. Arab J. of IT, Vol. 5, No. 3, July 2008, 296--303.