The Use of the IDEF-0 to Model the Process in a Software Factory

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ABSTRACT

This paper presents the use of IDEF-0 in the modeling of a production process of a Brazilian software factory. The information used in the modeling were captured through a case study.

1. INTRODUCTION

The development of the Brazilian software market is constantly searching for quality and productivity. This information can be verified analyzing the incentive programs promoted by Science and Technology Ministry (MCT) which the government established software is priority (Software, Semiconductors and Industry). One of these programs is SOFTEX (Society to promote excellence of Brazilian software). The objectives of SOFTEX are: to ranking Brazil between the 5 biggest software exporters and producers of the world and to reach international standard of quality and productivity in this sector.

Beyond of those programs, the Ministry develops, periodically, research to verify quality and productivity attributes of Brazilian software development sector. In Brazil exist near 11.000 companies with activities related to the development and commercialization of software, those companies hire 160.000 employees, which 25% of them own a quality program defined, and other 26% fell necessity to establish this type of program. This fact shows Brazil is conscious of the necessity of improving its products quality in the IT area, software sector, in this case. (www.mct.gov.br/sepin - November, 2006).

Parallel to these facts, COSTA (2003) presents a research involving 31 most significant companies, which act in Brazilian market using the Software Factory model. Only 41% of these companies apply a complete cycle software development; 45% apply its own methodology; 16% use projects control tools; 14% own CMMI certification; 13% use CASE tools and 10% apply quality metrics.

Based in the presented context, we can affirm: to reach SOFTEX objectives is necessary an effort of Brazilian UNIVERSITIES, COMPANIES and GOVERNMENT, with the intention of becoming aware the market about the existence of quality and productivity models to software factory. In this point of view, this paper has objectives: 1) To present the use of IDEF-0 in the software process modeling of a Brazilian software factory, showing it is perfectly possible to work with production scale in this sector. 2) To verify the adherence of this notation in the software process modeling in a factory context.

2. BIBLIOGRAPHIC REFERENTIAL USED FOR THE DEVELOPMENT OF THIS PAPER

This section presents software factory and IDEF-0 concepts, witch are the base of this paper.

2.1 Definitions about Software Factory

Cusumano (1991) tells: the term software factory was used on the first time in 1960 at Japan. Even so, several companies associate the term software factory with the software development. However the software company witch doesn't assist characteristics of the software production in mass and in wide scale and doesn't own tasks and control standardization, work division, mechanization and automation can't be considered a software factory. For Cusumano the software factory development implies in the good practices of the software engineering systematically applied.

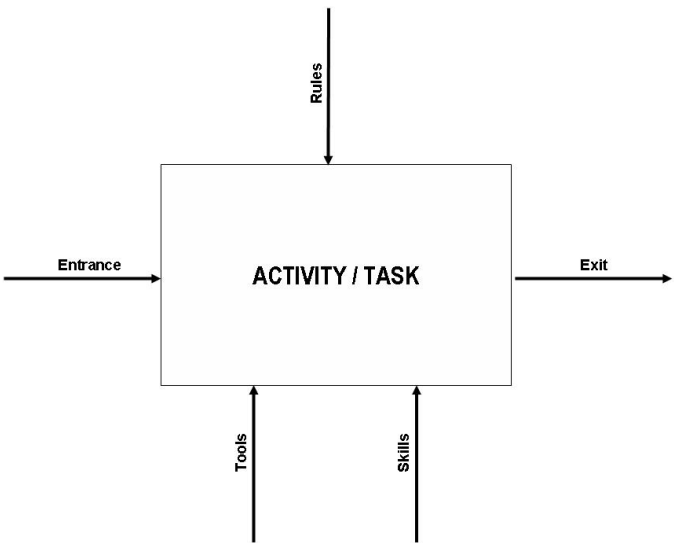
Fabri et. al. (2004) show that is possible to understand a software factory like a structured organization, gone back to software production totally building on the engineering and with strong features of work organization, to capacity modular components and to product in high scale. Software factory may have project management environment and tools, standard process, metrics to estimate cost, term and staff size and quality product guarantee policy.

2.2 Definitions about IDEF-0

The IDEF-0 was developed by American Air Force. In 1972 the SADT (Structered Analysis and Design Technique) was developed by Douglas T. Ross of SoftTech. The SADT was used in AFCAM (Air Forces Computer Aided Manufacturing) project, witch resulted on ICAM I (Integrated Computer-Aided Manufacturing I). The second version of ICAM was developed, documented and renamed as IDEF-0.

The IDEF-0 is a collection of activities, represent by ICOMs (Input Control Output Mechanism). An ICOM doesn't include only data and information but also everything that can be described about the process (scheme, estimate, regulations, products, etc). The ICOM in Figure 1 is a graphic representation of a task or a tasks group witch have "terminals". The terminals feed or are fed by an ICOM. An ICOM has raw material (entrances); rules and restrictions; people/skill; tools/mechanism

Figure 1. An ICOM representation



and products (exit). The entrance receives the data to be converted by an activity (or process), the rules and restrictions present how and when the entrance should be processed and executed, the mechanisms/tools represents who should execute this activity (can be an equipment, machine or others organizations) and the exit presents the result of as the entrance was processed (a product).

3. THE SOFTWARE PROCESS IDEF-0 MODELING A BRAZILIAN SOFTWARE FACTORY

The information presented in this section is configured through of a case study made at a Brazilian software organization with production characterized as factory. To organize this study, the authors used the bibliographical referential proposed by YIN (2005). (Note: the organization is certified with the quality model CMMI level 2). The authors of this work doesn't possess a formal authorization to publish the name of the company, this fact took them to denominate it as FÁBRICA BR.

FÁBRICA BR was founded in 1996 and provides IT solutions on data communications, internet and business process consulting areas. Nowadays, FÁBRICA BR has 600 collaborators on highlight areas.

Inside its production process, FÁBRICA BR does requirement mapping activities, business modeling, software project, comprehension (the comprehension objectives to verify if the project specifications are correct, consistent and intelligible, in order to reduce stop risks production or productivity breaks), codification, test (unitary and integrated), delivery and maintenance. Figure 2 presents the relationship among the software process activities of FÁBRICA BR. Note: process activities won't be detailed in this paper.

Analyzing Figure 2 is possible to verify the presence of process activities, rules and mechanisms that execute it, and two production units: the projects and the software factories. The first one is responsible to execute activities of requirements mapping, business modeling, project and software implantation. The comprehension, codification and tests activities are under the software factory responsibility. In the production process representation is possible to verify the process engine (characterized as a tool) is related with all activities.

Schaefer et. al. (1999), affirm the process engine can be classified as software with the objective of aiding in the communication and coordination of activities accomplished by process involved. One of the process engine objectives is to control the documents production (for example: requirement document), from requirements till delivery activities. FÁBRICA BR process engine possesses the follow functionalities:

- To maintain[1] production process activities;
- To maintain service orders, derived from software project;

Figure 2. FABRICA BR Process Modeling used IDEF-0

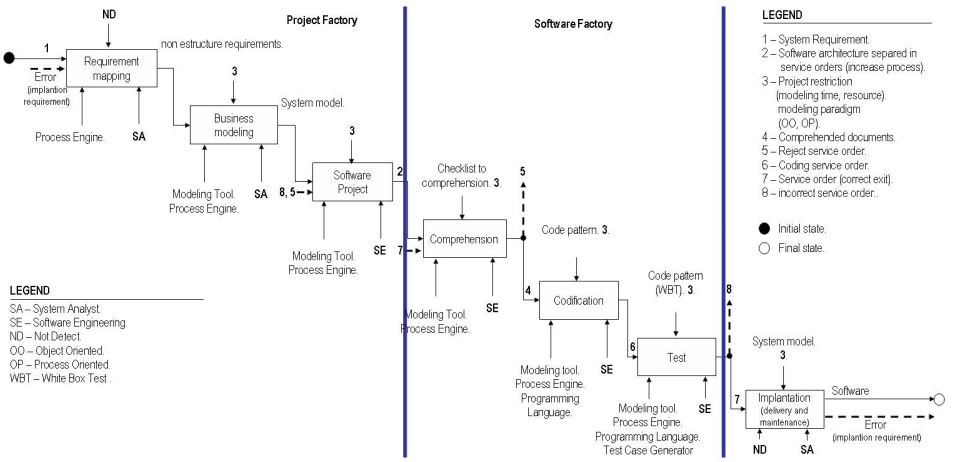


Table 1. Information produced with process engine

FÁBRICA BR Process Engine Production Control				
Client – Company XYZ				
Project – ABC				
Service Order: Date Code 00/00/00	Order: 1	Product – 1.1 St: OK	Actors: John (Leader) Mark	Activity: Codification: Started: 00/00/00 Finished: 00/00/00 t: 3/4 Testing: Started: 00/00/00 Finished: 00/00/00 t: 1/2
		Product – 1.2	Actors: Mary Peter	Errors: Err A Err B
	Order: 2			
	Order: 3			
Legend: St: Product State = In development or OK t: n/n1 = t – development time: n forecast, n1 accomplish.				

- To maintain involved with the software process;
- To maintain customers and theirs software projects;
- To maintain developed products, these related to services orders;
- To store involved, errors and development time for each product in each version;
- To relate developed products to the customers' projects;

With functionalities listed, the management information presented at Table 1, it can be inferred with process engine.

It is perceptible that project manager of factory receive a productivity estimate of each project and management reports. These reports are also supplied by process engine.

FABRICA BR software process possesses an incremental systematic because the inherent functionalities to software architecture document are separated in service orders (these orders aggregate one or more functionalities). The orders are understand, codified and tested by software factory and implanted by projects factory, one by one.

4. CONCLUSIONS

This paper presented the IDEF-0 software process model of a Brazilian software factory. The modeling notation used details the process in following aspects: process activities; activities information flow; rule and tool (the paper emphasize the process engine) applied to activities and to software process actors.

The process theory establishes the process modeling should assist some visions, among them: workflow; skill; tools; dataflow and rule.

The notation IDEF-0 used on process modeling (Figure 2) assists all the visions presented, this fact proves her efficiency.

Finally, as future work, the authors intend details about production process present in this paper, using IDEF-0 as a modeling technique.

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ENDNOTE

[1] In this paper the word maintain translates the idea of the storing, deleting e consulting of a determined data.