Communication Driven DSS for Construction Industry

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The paper focuses on the advantages of decision support systems (DSS) and also on the opportunity and the need of designing such a system for Romanian construction domain. The DSS which best fits the requirements is data driven, statistic model based and web system (communication driven DSS). First part presents specific problems to be solved in an informational system supporting construction processes nowadays and the importance of the construction price indexes in decision making process in construction. In the end a case study is drawn from the construction business to demonstrate the applicability of the approach.
***Keywords**: Decision making, process modeling, web-based DSS.*

Introduction

A decision support system (DSS) is an interactive computer-based system that helps decision makers to use data and models to solve complex and unstructured problems. Construction processes nowadays consists of several decision problems of paramount importance for the business. A critical and vital procurement task is to correctly evaluate offers and select the best contractor during the tendering or bidding process. This paper describes a web-based DSS that aids decision makers in choosing among competitive bids for building projects. The system is based on a framework of a generic process approach and it is intended to be used as a general decision-making aid. The DSS is currently under development as a research prototype in a process-support environment. A case study is drawn from the construction business to demonstrate the applicability of the approach.

The term construction covers a wide variety of activities, these include the construction of dwellings, non-residential buildings, and civil engineering works such as roads, bridges, dams, etc. Construction activity also encompasses repair, renovations, rehabilitation and maintenance of existing structures, etc. The demand for price indices for construction activity arises from the need to assess real changes in the output from these activities (i.e. To create a constant value series), which cannot be derived solely through reference to regular building and construction statistics.

Given the complexity of specific economic processes in conjunction with construction industry, like rental, leasing and insuring, it seems appropriate to develop a DSS (Decision Support System) to assist processes like evaluation, estimation, investment decision and so on. The DSS which best fits the requirements is data driven, statistic model based and web system (communication driven DSS). The system involve managing lots of data and there would be many organizations interested in using such a system - construction contractors, banks, insurance companies and, why not, the Government.

Web-based DSS / Collaborative DSS

World-wide-web technologies have rapidly transformed the entire design, development and implementation process for all types of decision support systems. In particular, web technologies have provided a new media for sharing information about decision support and a new means of delivering decision support capabilities.

Service-Oriented Architecture is an enterprise-scale IT architecture for linking resources on demand. These resources are represented as business-aligned services that can participate and be composed in a value-net, enterprise, or line of business to fulfill business needs. The primary structuring element for SOA applications is a service as opposed to subsystems, systems, or components.

A Service is a discoverable software resource

that has a service description. The service description is available for searching, binding and invocation by a service consumer. The service description implementation is realized through a service provider who delivers quality of service requirements for the service consumer.

Enabled by Web Services	Technology neutrality	Endpoint platform independence
	Transport and interface standardization	Standards based protocols
	Separation of provider/consumer	Enabling automated discovery and usage
Enabled by SOA	Functional standardization	Use (reuse) of Service, not reuse copying of code/implementation
	Abstraction	Service is abstracted away from the implementation, enabling technology and application independence
	Formalization of relationship	Formal contract between endpoints, places obligations on provider and consumer
	Relevance	Functionality presented at a granularity recognized by the user as a meaningful service

Fig.1. Web services and SOA

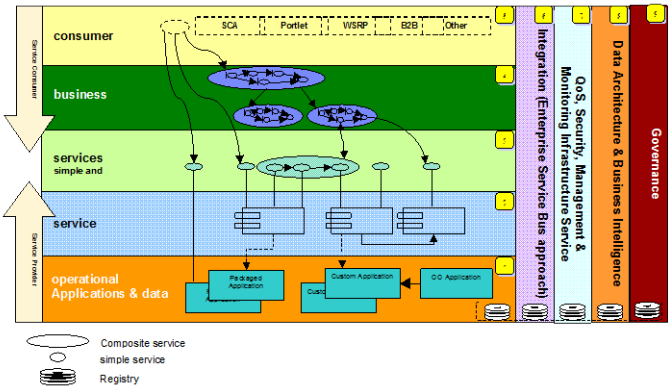

Fig.2. SOA Solution Stack

Model-driven DSS

There are two Institutes compiling construction price indexes for Romania, National Institute of Statistics and National Institute For Building Research. The National Institute of Statistics compiles Input Price Indexes, which are in fact indexes of materials and labor costs. These fail to to reflect changes in productivity and the large cyclical fluctuations in construction profit margins [INSSE02]. The National Institute For Building Research compiles Output Price Indexes, which is a considerable improvement because these reflect changes in productivity and also the cyclical fluctuations in construction profit margins.

Still improvements can be done, the statistic model I am suggesting is basically a Standard Factors Breakdown Method [OECD00]. As breakdown method, its starting point is a list of carefully specified factors or components, from which the total input or output costs of a building or construction project are built up.

For any given year a representative construction (or small number of projects) is selected and the quantities of each factor used to build it (e.g. materials, labor, transport, machinery, etc.) evaluated. Changes in the costs of construction are determined by monitoring the cost of each factor. The representative building or construction chosen initially is used only to establish the weights.

Methodology Summary

1. Standard Components are construction works, thermal / hydro isolation works, installations, and finishing operations;
2. standard factors for construction works are materials, labor, equipments, transportation, indirect inputs and overheads and profit.
3. Schedule of Prices is using:

- estimates for representative construction work from projects presented as offers;
- standard component value is the one corresponding to the construction works in the estimates;
- for the standard factors, analysis is done for each standard component;
- average prices for components and factors

are prices from materials producers and contractors.

Special care was taken for the Standard Components to reflect the new technologies that are widely used on the market. I have built a test case system for construction price indexes for urban residential buildings. Here are the obtained results.

Table 1. Price indexes for urban residential building

CPSA Code	CONSTRUCTION WORKS	Index IPIn	Weights	Weighted Index
451	**SITE PREPARATION**			
	Embankment works	2.85	14.5%	41.3%
452	**CONSTRUCTION WORKS**			
	Terrace works	2.29	2.6%	6.0%
	Other special construction works			
	Concrete works	3.18	35.5%	112.9%
	Foundation hydro isolation works	3.66	1.0%	3.7%
	Masonry works	3.09	12.4%	38.3%
453	**INSTALATIONS**			
	Electrical works			
	Electrical instalations	3.36	3.4%	11.4%
	Inside instalations for central heating			
	Steel / Black iron pipe setting	3.64	1.9%	6.9%
	Heating device setting	1.7	2.1%	3.6%
	Instalations for water supply			
	PVC pipe setting	2.5	1.2%	3.0%
	Steel pipe setting	3.67	1.1%	4.0%
	Cast iron pipe setting (trickling)	3.54		
	Basins setting (wash-hand basin, toilet and similars)	3.36	3.1%	10.4%
454	**FINISHING OPERATIONS**			
	Carpentry works	3.16	5.4%	17.1%
	Pavment works	2.95	10.8%	31.9%
	Painting, glass works			
	Glass setting	2.98		
	Painting	2.82	1.5%	4.2%
	Other works	3.00	3.5%	10.5%
	Increase tr II 2008/tr II 2003			**305.2%**
	PRICE INDEX FOR BUILDING			**3.05**

Conclusions

Construction processes in Romania nowadays consists of activities with dramatic growth (the construction of hotels, shops and private residential buildings). Other characteristics of the construction Romanian market: there are a large number of smaller and more specialized construction enterprises; there is considerable activity carried out by unauthorized persons; barter arrangements between construction enterprises are used; unexpected consumer behavior. All these make the decision making process difficult to carry out. The integrated, web-based DSS presented in this paper aims to facilitate specific decisions in conjunction with construction industry, like tendering or bidding process, rental, leasing and insuring.

References

- [INSSE02]http://www.insse.ro/cms/files/aplicatie/Metodologii%20CAM/Intreprinderi/Cost%20constructii/metodologie_cost_ctii.pdf
- [OECD00] ***, Sources and Methods – Construction Price Indexes, Statictics Directorate of the OECD and EUROSTAT, 2000
- [BRAND07] Brandas C, *Sisteme suport de decizie pentru managementul performant : Concepere, proiectare si implementare*, Editura BRUMAR, Timişoara 2007
- [FILIP07] Filip. F.G., *Sisteme suport pentru decizii, Ediţia a 2-a, revăzută şi adăugită*, Editura Tehnică, Bucureşti, 2007.