CHANGING E-PROCUREMENT IN THE AEC SECTOR WITH BIM

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ABSTRACT

The paper will analyze how the Building Information Modeling (BIM) approach; Service Oriented Architecture, and the emergence of Cloud Computing enable a full de-materialization of the whole building or life-cycle and the possibility of e-procurement become more efficient and increase market competitiveness. The paper describes how BIM, SOA and Cloud Computing can change traditional e-procurement functions, namely the elaboration of tendering documents, as the technical data can be automatically coupled with transactional information, as in RFP, Order, or Invoice, and published in electronic procurement platforms. The paper will present results of current industrial research of the application of this approach in the construction phase of building development projects. The paper concludes that despite its potential to change e-procurement practices in the AEC sector, there are some hurdles to overcome before the approach achieves a tipping point

Keywords: Building Information Modeling, Electronic Procurement, Service Oriented Architecture, Cloud Computing

1. INTRODUCTION

Procurement activities are quite intensive and occur in the different phases of any building / engineering project. Procurement can be of products or services highly structured, standard, and of routine nature. Procurement has become now addressed by electronic platforms, namely the e-procurement systems and particularly e-marketplaces. These systems have proved to provide positive impacts and the range of benefits is diverse, from simple operational cost benefits to more strategic benefits like improvement of flexibility and responsiveness. However, compared with other purchases, procurement in the AEC sector is characterized by high levels of unstructured goods and services, which makes the use of electronic systems for procurement activities more difficulty, particularly when much of the information that is necessary for the contractual arrangements are not well structured and in a "digital" processing format.

The last e-Business Watch Report [6] addressing the Construction sector demonstrated that the sector lagged behind other nine economical sectors (e.g. telecommunications, food and beverage, manufacturing, ship building and repair, etc.) as far as e-procurement was concerned. Although the AEC sector can incorporate the recent developments on public and private e-procurement, most of the initiatives are focused on providing solutions for structured-based e-procurement approaches. Current building / construction projects, either private-owned or public works, mostly address unstructured procurement. This implies that e-procurement solutions must be able to both accommodate the described technical developments on public and private business context, but also develop ways to successfully cope with the challenges of procuring unstructured goods and services. The big challenge is implementing an approach for the building / construction whole life-cycle that provide more "structured" elements for procurement, namely by designing and developing the project around product models – necessarily structured – and easily sustain structured procurement.

The Building Information Modeling (BIM) approach promise to introduce major change in visualization, coordination and planning processes of the building / engineering projects. However, the reviewing of the literature indicates that no efforts have been directed to the application of BIM for e-procurement. BIM and the information standard IFC can be interesting solutions for dealing with the "unstructureness" of building / construction projects and thus create the "information infrastructure" that easily supports e-procurement. Hence, this paper aims at providing a new conceptual approach for e-procurement, through the use of the BIM approach and the convergence of recent technological architectures. The paper starts by describing the state-of-art on e-procurement in the AEC sector

2. ELECTRONIC PROCUREMENT IN THE AEC SECTOR

In the AEC industry supply chain, procurement plays a significant role. However, the procurement term is usually referred to the contractual method and respective responsibility and risk sharing established between client/owner, designers and contractors. The main procurement methods can be [1]: Traditional Procurement; Design and Build; Public Private Partnerships (PPP); Management Contracting; and Construction Management.

Hence, the AEC procurement planning is a critical activity and is unique for each project. For an efficient procurement strategy, it is important for the contracting agent to have the knowledge of suppliers who can meet different requirements and deliver the right services and products under given constraints. In early phases of the project, the procurement activities relate mainly which the invitation for tender for the project team (architect/designers) and eventually for consultants (e.g. project manager). These processes are rarely conducted electronically. Procurement activities become more intense in later stages, particularly with the procurement of contractors and with the procurement of material and product supplies, and subcontracting services. Indeed, an important activity on the procurement activity is searching for desired products over a wide range of available products from a large number of product suppliers. In large projects a large quantity of various kinds of construction material is required. For example a typical large scale public building like a hospital, an office building, a school, etc. have many rooms. Each room needs light fittings, a door, floor and ceiling, floor and ceiling coverings, furniture, power sockets, some form of ventilation such as windows, walls, wall coverings, etc. Multiplying the requirements by the number of rooms, that can range from dozens to hundreds, gives the scale of purchases needed for to buildings. These purchases can be made from a wide range of product suppliers. Today, many companies/product suppliers do their business via Internet-based systems, enable sharing of product information with contractors and potential buyers. Acquiring information from websites has become vital for contractors as more and more e-procurement websites are available on the Internet [2] [3]. By using an e-procurement system for construction materials, different kinds of information pertaining to materials, suppliers, manufacturers, buyers, agents, buying patters, buyer's reviews on products and services, etc. can be shared with its end-users. From the perspective of suppliers, e-procurement systems act as a mechanism for disseminating product information to a large number of potential buyers and contractors

E-procurement, however, has certain limitations. Construction materials generally have a large number of specification parameters. Entering the specifications into web-based forms of several e-commerce sites to find the best product is a time consuming task for a contractor. A contractor has to: acquire and maintain a list of several web addresses; interpret and understand the semantics and navigation methods used in different sites; be aware of new sites coming into the market; and do a manual evaluation of all the information acquired from different websites [3]. The aggregation of information through e-marketplaces may overcome some of these difficulties but does not eliminate them. Different e-maketplaces have their own material searching and display patterns and use different attributes for storing construction material data [3]. Moreover, there is heterogeneity in the management of similar types of information by different suppliers. Two product suppliers selling the same or similar products but storing it differently using different attributes make it difficult for a contractor to identify the similarities between the two. Construction material information systems are isolated with no interaction with each other [3]. Although Request for Quotations/Proposals may reduce part of the problem if the information product is highly structured, in general it is difficult for a contractor to find all the information using one system and even more difficult to do a comparison of the products supplied by different suppliers based on criteria such as product specification, cost, availability and delivery time. This becomes particularly relevant if they procure unstructured products and services, as they tend to be.

The split between structured and unstructured procurement is particularly relevant in the procurement processes of AEC sector. On every building / engineering product there are always the need for the purchasing of highly standardized and routine materials, equipment and goods and services, like e.g. building materials, hoisting equipment, concrete supply, etc., particularly during the construction / erection phase. However, much of the purchase activities relate with the procurement of highly unstructured supplies like specialist design activities, construction, specialist subcontracting services, or even one-off non-standardized construction products and equipments. Whilst the former activities are not significantly different from what happens in other industrial sectors, the later unstructured procurement activities, and their relevance on the whole construction life-cycle, provide a high degree of complexity, with a potential for relevant improvements brought by Internet-based systems, as later it shall be discussed. Obviously, this is regardless of the obligations mandated by the legal contractual requirements.

In order to standardize e-procurement across national boundaries and across economical sectors (Construction, Oil & Gas, Transportation, Iron & Steel, Services and Public Administration), it was set the CEN/ISSS Workshop on Electronic Procurement, that converged public and private e-procurement [4]. It was agreed the reference e-procurement process that captures the essence and specific phases of electronic procurement activity, namemly: e-Tendering, e-Awarding, e-Ordering, e-invoincing and e-Payment.

The eTendering process covers the preparation of an offer by a tenderer in response to a call for competition, as well as its submission to and receipt by the contracting authority. The eAwarding starts with the opening of received tenders by the contracting authority, and after a clarification step, ends with the contract being awarded to supplier. The eOrdering covers all activities from sending an order document from public buyer to supplier, up to the transmission of de-livery instructions for ordered goods or services. The eInvoicing process deals with claim for payment for goods or services that have been either ordered or delivered, received or consumed under the conditions agreed by supplier and public buyer. The ePayment deals with aspects related to payment, i.e. checking of invoices against existing documents on orders, and providing payment information on parties and financial institutions, e.g. banks.

The AEC sector should attempt to use existing eCatalogue standards for the creation and use of eCatalogues in procurement, enabling suppliers to create "eCatalogue prospectuses" which can offer possibilities for re-utilisation. Such an approach should lead to a shared framework for eCatalogue prospectus creation, maintenance and transmission. The two most relevant initiatives/standards developed by international standardisation bodies in the area of eCatalogues are the UBL 2.0 and c-Catalogue, developed by OASIS and CEN/ISSS respectively [4]. Both standards primarily focus on post-awarding phases of procurement (eOrdering and eInvoicing), while their specifications can be also applied for pre-awarding, possibly following some extensions/customisations. These two prevailing initiatives/standards in the area of eCatalogue standardisation are compared in terms of their business documents, processes and messages, in order to identify similarities and gaps. There is currently an effort to working towards the convergence of these two standards. Apart from the need for standardizing processes and messages for conducting business electronically through the use of eCatalogues, the adoption of additional standards is necessary for standardizing the manner in which products and services are described in an eCatalogue. In order to overcome this problem, the path is either by the establishment of one, unique scheme that can accommodate the needs of all industries and all purposes, or by the establishment of a mapping/reference framework which can allow the interoperable co-existence of different schemes.

Besides the eCatalogues issues, e-procurement presents additional several technical challenges that create interoperability concerns regarding public procurement at European and global range, and that are being addressed by several R&D and industry initiatives. For example, European public tendering procedures require that companies submit certificates and attestations to proof that they comply with selection and exclusion criteria. Electronic business attestations that are interoperable are thus one of the major challenges to overcome, and that is being dealt at the PEPPOL project [5]. Electronic signatures interoperability is also a significant issue. Directive

1999/93/EC specifies the basic requirements for the use of electronic signatures, and in addition, there are technical standards available, such as X.509v3 for electronic certificates but in practice certification authorities do not recognize each other in all the cases, creating identification hurdles. Other less challenging issues are e-ordering and e-invoicing as these business documents are now standardized and XML-based.

3. THE SOA4BIM FRAMEWORK FOR AEC E-PROCUREMENT

3.1 THE EMERGENCE OF BUILDING INFORMATION MODELING

Building Information Modeling (BIM) allows the visualization, understanding, and construction to take place in the same 3D dimensions. BIM is promising to overcome current limitations of systems where communication takes place through 2D diagrams and text (drawings and specifications). BIM has also beneficiated with the advent of sophisticated CAD systems, where it was possible to enrich the 3D models of buildings and structures with, in addition to vectorial data, complementary data such as physical characteristics, unit costs, quantity take-offs, etc. Model intelligence refers to the fact that information may be contained in a virtual 3D model. Some of this information is physical, as it will contain information about the nature of an object, such as dimensions of the object, its location in relation to the location of the other objects in the model, the quantity of objects in the model, and other parametric information about the object. For instance, considering the object “wall”, parametric information refers to the information that distinguishes one particular component from another, similar one. Indeed, walls have qualities in common, but each individual wall may have different characteristics, such as its dimensions, material (e.g. wood or concrete, etc.), or supplier information. Each aspect of this type of information can be programmed into the specific wall object so that it accurately represents what the project requires.

A number of the larger modeling software companies are now developing suites of modeling and construction-related software tools that are quite interoperable amongst them. However, most of the BIM applications of modeling and their complementary software tools only address interoperability among themselves and not in relation to other vendors’ applications. The interoperability factor becomes even more acute if there is a goal of e-platforms to enhance the collaborative functions of BIM with traditional e-procurement, where building product objects (such as windows, doors, plumbing, etc.) besides parametric 3D model information must be coupled with transactional information, as in RFP, Order, Invoice, through e-marketplaces or through direct e-procurement. As previously discussed, universal e-procurement based on eCatalogues or in mechanisms that use product models must address the interoperability at the various levels. This imply the creation of data structures from the beginning of the building / engineering project that supports both the collaborative activities of the teams involved but also the e-procurement functions and activities in a seamless and automated way. As each building / engineering project tends to be unique, it is critical to the success of e-procurement that the BIM approach considers the use of universal interoperability standards for the various dimensions, i.e., not only on the e-tendering, e-ordering, e-invoicing or e-catalogues, but also on product and process models. This will require a demanding information architecture and management, based on state-of-art architectures like Model-Driven Architecture, Service Oriented Architecture or Cloud Computing.

3.2 ARCHITECTURES FOR E-PROCUREMENT

The World Wide Web Consortium (W3C) refers to the Service Oriented Architecture (SOA) as “a set of components which can be invoked, and whose interface descriptions can be published and discovered” [12]. Also, and according to Microsoft, the goal for SOA is a worldwide mesh of collaborating services that are published and available for invocation on a service bus [8]. SOA does not consider the services architecture from merely the technology perspective, but also proposes a normalized Service Oriented Environment (SOE) offering services’ description, registration, publication, and search functionalities. Placing emphasis on interoperability, SOA combines the capacity to invoke remote objects and functions, i.e., the services, with standardized mechanisms for dynamic and universal service discovery and execution. They can implement a business process by integrating services developed internally and externally to the company, providing a standard means of communication among different software applications running on a variety of heterogeneous platforms through the Internet. Web services are implemented in XML (eXtended Markup Language). The network services are described using the WSDL (Web Services Description Language), and the SOAP (Simple Object Access Protocol) is the communication protocol adopted. The registration of the services is in the UDDI registry (Universal Description, Discovery and Integration). Although providing a significant contribution, the SOA alone is not yet the answer to achieve seamless interoperability between applications. For example, despite the efforts made to ensure compatibility between all the SOAP implementations, currently there is no single standard. The Web Services Interoperability Organization, WS-I, is a good example of an organization supporting Web services interoperability across platforms, operating systems and programming languages, and that has been developing efforts for the convergence and support of generic protocols for the interoperable exchange of messages between Web services [9].

Cloud Computing can be seen as an evolution over the traditional hosting and application service providers, though more aligned with the service-oriented environments, and less with client-server architectures. “Cloud computing”, or simply “Clouds”, has been defined by [10]: "*Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Provider by means of customized SLAs*." The SOA in Clouds is used for addressing componentization, reusability extensibility, and flexibility. In order to construct scalable Cloud Computing platforms, there is a need to leverage SOA to build reusable components, standard-based interfaces, and extensible solution architectures. Within the Cloud Computing paradigm, there are some variations on what service is included. The most common reference is the Cloud Software as a Service (SaaS), which is the capability to use the provider’s applications running on a cloud infrastructure [10][11]. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email, Google Docs, etc.). There is no management of the underlying cloud infrastructure (network, servers, operating systems, storage, or even individual application capabilities), with the possible exception of limited user-specific application configuration settings [10][11]. Cloud Platform as a Service (PaaS) is the capability to deploy onto the cloud infrastructure of applications created or acquired by the user of the software services, though always using system tools supported by the provider [10][11]. There is no management or control over the underlying cloud infrastructure (network, servers, operating systems, or storage) but there is the possibility to control the deployed applications by the user, and possibly to host environment configurations [10][11]. Finally, Cloud Infrastructure as a Service (IaaS) is the capability to the user to provision processing, storage, networks, and other fundamental computing resources where there is the possibility to deploy and operate any software system, including operating systems and applications [10][11].

3.3 Electronic Procurement with the SOA4BIM Framework

Grounded on the latest architectures like Model Driven Architecture (MDA), Service-Oriented Architecture (SOA) and Cloud Computing, and the developments in the construction sector with the Building Information Model (BIM) approach, a generic framework for the AEC sector was developed [12][13][17].

The SOA4BIM Framework relies on the development of a Computational- Independent Model (CIM), that will model the design, construction, and maintenance building processes and products in a way that is not constrained by the requirements of the ICT platforms, i.e. only from a technical and business perspective. CIM can be grounded on some of the work previously developed, such as the Process Protocol Model [14], or on the work being developed more recently by the buildingSMART Initiative and its Information Delivery Manual (IDM), which is developing reference Process Maps for the whole construction process life-cycle [15]. Additionally, high-level e-procurement processes based on current developments of CEN/ISSS BI are also adapted and modelled at the CIM level.

Deriving from CIM, the SOA4BIM framework considers the design of the Platform-Independent Model, which will be a technology-neutral modelling of the various types of information in a construction project: 3D vectorial, material composition, project management (costs, time, etc.), contractual arrangements, sustainability, etc. In reality, the PIM layer is essentially a standard approach to BIM, where much of the work carried out by *de facto* and *de jure* standardization bodies may be considered, and standards like the IFCs, AP 225, AP 228, etc. should be used. For each project a PIM - BIM model is created with many of the data structures being reusable by the agents involved, since it uses neutral formats.

Although SOA4BIM Framework supports traditional client–server e-procurement model, it preferably adopts the Service Trading Model (STM) [4]. In this e-procurement approach the client (importer) only gets knowledge of available services at runtime by re-questing services and the fulfilling server (exporter) for an appropriate service from the trader at runtime.

This e-procurement system architecture relies on the SOA approach. The interactive generation of a tender document is that the client (importer) asks the user questions for the tender. After finishing this, the importer asks the trader to give him the name and address of an exporter which is able to generate a tender document in a specific format. The trader looks up the registered exporter services and gives back an appropriate exporter to the importer which opens a communication to the selected exporter. The exporter sends back the tender document to the importer and/or sends it to selected suppliers. SOA4BIM Framework enables moving beyond current traditional e-procurement systems and platforms that are portal-centric client/server model.

4. APPLICATION SCENARIO IN THE CONSTRUCTION PHASE

The SOA4BIM Framework is currently being implemented and validated in an industrial R&D project, designated by PLAGE [16], funded by the Portuguese Government, and by the companies Vortal, Primavera and Microfil. The project focus is on private and public e-procurement for the whole building and construction life-cycle, with both commercial and technical information being modelled in a cloud-based BIM server MDA and SOA architecture, using standards such as IFC and STEP APs, and with an e-procurement approach using SOA and Service Trading Architecture. A major concern of the project is to eliminate as much as possible unstructured information from e-procurement processes. The project also seeks to follow current CEN/ISSS standards of e-tendering, e-awarding and e-ordering, along with e-signatures, although in a less critically way.

The PLAGE Platform is a platform system that combines three different platforms (Figure 1) [16]. Microsoft SharePoint 2007 is used as the business collaboration platform system and as the front-end and to implement a set of workflow and rule-based procedures for the e-procurement. The EDM Model Server˙ from Jotne EPM Tech-nolgy is used for product and process BIM data management. Vortal eGOV is an e-procurement platform for the AEC sector for public and private eTendering, eAwarding and eOrdering. The disparate platforms work seamless in an integrated way through PSM instances, namely Web-services connections. These Web-services connections are also used to link to other AEC specialized software, like the Primavera Construction ERP Suite or Solibri Modeller. Apart from the later softwares, other specialized design and engineering applications export their IFC files to be used by the PLAGE Platform.

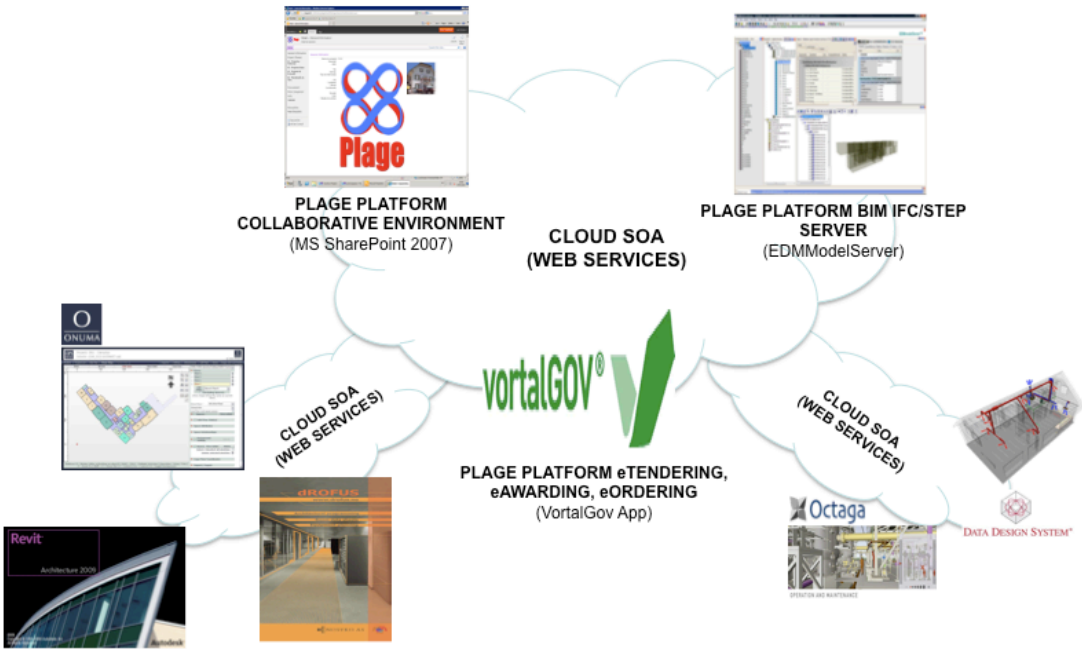

Figure 1 – PLAGE Platform Cloud Approach

Activities related with the concept design can be achieved without any e-procurement. In the detailed design phase, complex e-procurement interactions are likely to occur, with the involvement of disparate agents such as architects, structural engineers, electrical engineers, mechanical engineers, etc, for the specialities detailed design, and the high levels of unstructured procurement information that usually flows. The complexity increases also because competitive tendering is likely to occur, and there will be data flows – not only technical, but also commercial and managerial.

An application case has been developed for the design and construction phases of a building block for a public school. A PLAGE data model has been created to deploy the application scenario (Figure 2). In the construction phase the client /owner triggers the eTendering stage through the PLAGE Platform workflow (functionality over the SharePoint application). SOA-based PSM, i.e. Web-services, will make the exportation of the BIM-IFC/STEP technical and contractual data from the EDM Model Server to the Vortal eGOV to launch the eTendering process. Besides the architectural designs and specifications, the PLAGE Platform does also release the tender documents according to the requirement of the BIM-IFC/STEP standards, and the templates for the bid reply of the contractor competitors. In this process complementary information may be added like expected dates for execution, maximum price, selection criteria, etc. However, this information is incorporated on the tender documents through structured procedure which feeds also the original BIM IFC/STEP model. The tender maybe a whole building, with its disparate elements (structure, fittings, HVAC, etc.), or just parts of a building, as long as they are identified as construction objects (e.g. windows, electricity). The Vortal eGOV will configure the eTendering and eAwarding procedures and selection process, and will export tender documents/files to the various building block competing contractors using also specific PSM, since each company may have in its own different application to import and work on the files.

Contractors will use its own applications for analysing the tender documents with BIM IFC/STEP format, particularly in terms of list of materials, bill of quantities, planning of activities, etc. Although importing the BIM IFCT/STEP file saves considerable time for the preparation the proposal, and improve its accurateness, much of the internal bidding processes is still required, namely the planning of the activities, the calculation of the rates and unit prices of work, materials and other resources (e.g. equipment), along with eventual proposals for changes in the original designs.

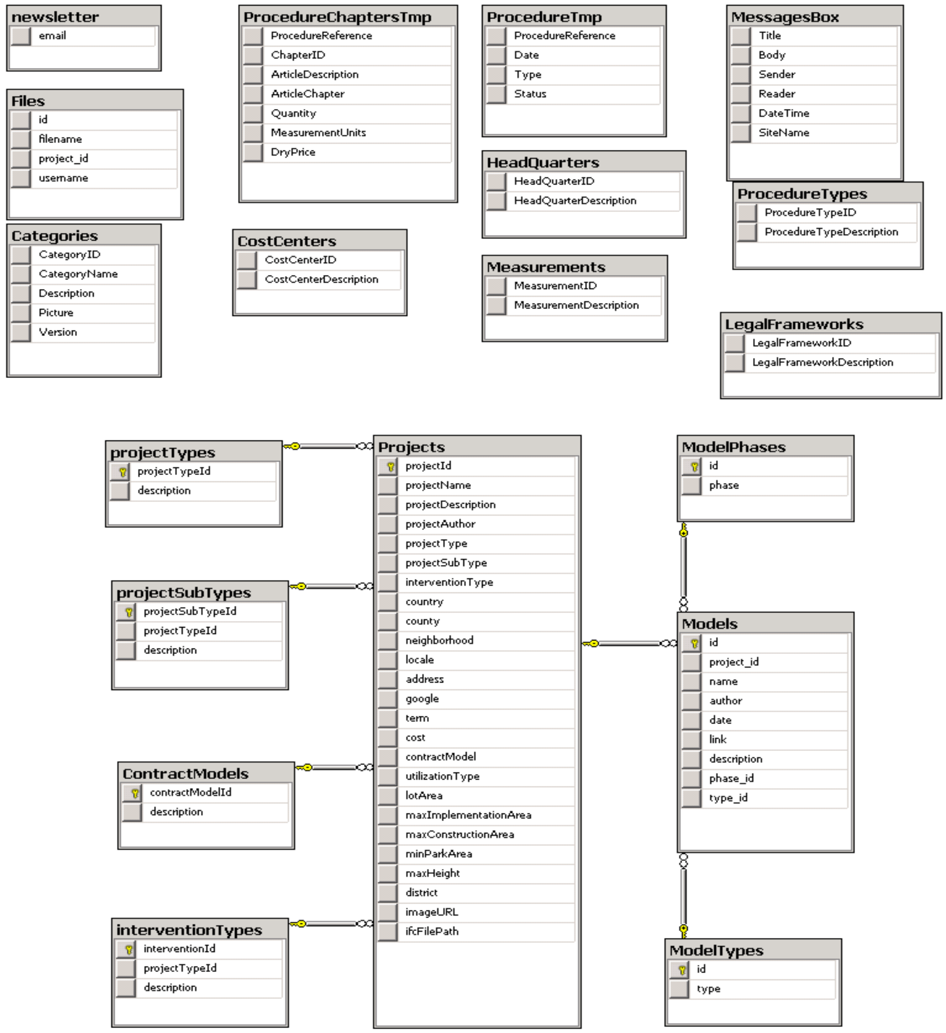

Figure 2 – PLAGE Application Scenario Data Model

Once concluded the preparation processes, the bid documents will then be exported by the contractors through a similar mechanism to the Vortal eGOV. After the selection process has been conducted (on the Vortal eGOV platform), the acceptance of the BIM-IFC/STEP bid, with technical and commercial data, is conditioned on the conformance testing performed in the PLAGE Platform. With the eAwarding of the selected designer, contractual arrangements are exchanged, maintaining the BIM-IFC/STEP web services approach.

The selected contractor will develop off-line technical work in order to develop the detailed designs, the detailed activities programming and resource allocation planning and resource. The contractor must then export these detailed elements to the PLAGE Platform, where, if conformant with the initial model, and accepted, will enrich the BIM model. Although there was a major effort to have mainly structured information in the e-procurement process, the platform supports also some complementary unstructured information in the bid document. Hence the documents exported to PLAGE Platform may contain additional information in the form of attached files (e.g. PDF format, JPEG, etc.) or eventually Web links. However each element of unstructured information has to be linked to an object within the BIM model. These complementary information and documentation may also be incorporated directly on the PLAGE Platform (rather than be imported along with the original file), through the manipulation of the BIM Model Viewer.

4. DISCUSSION OF RESULTS

The PLAGE Platform architecture has providing successful results for the design phase of building and engineering projects, and its being validated with pilots conducted on projects of public buildings procurement in different and construction contexts. The exportation of construction elements for the tender documents, in an aggregate way or individually, is a fairly straightforward process, as long a BIM approach is correctly used. However, the research has identified several unexpected issues that bring difficulties to practitioners.

Firstly, apart from known errors and lack of detail in some areas, IFC does generally support interoperability between disparate CAD-related applications, from the same vendor and from competing vendors (e.g. Autodesk and Archicad). However, interoperability success, in both situation, is much dependent on how the BIM model is initially created and how it will be read by the importing application. It does require that the agents creating and importing the BIM model follow, the same process specification/steps, for example, like describe in the Information Delivery Model (IDM).

Secondly, the platform does support the possibility to export aggregate or individual construction objects, and contractors may re-use the data in order to make budget calculations. However, current contractors' databases are not prepared for costing estimating and activity planning for "building elements". The PLAGE Platform grounds on building systems/assemblies classification Uniformat II in lieu with CSI Masterformat for framing specifications for tender process. However, current Portuguese contractors' cost estimating applications are based on conventional trade estimate, where all components of an exterior wall such as the brick, insulation and block back-up would be priced separately, distributed in their respective divisions, and their cost summarized with all other products. This makes the costing process based on BIM elements ultimately very difficult whilst their applications are not oriented to those formats.

Thirdly, although the PLAGE Platform does support "unstructured information" through pointers to links and files (internal or external), when exporting BIM IFC/STEP files it is often impossible to maintain the pointers, particularly the case for importing applications to support the additional files. This constraints much of access to information, e.g. catalogue data in PDF files, etc.

5. CONCLUSIONS

Despite being a reality in many economical sectors, e-procurement still falls from reaching the tipping point in the AEC sector. One of the main reasons lies in the inability to deal with the unstructured procurement, that is a substantial part of overall procurement activities. The emergence of the Building Information Modeling (BIM) approach, a reality in many construction projects, as been mainly focused on the technical aspects of project conception and execution, being an approach that has been addressing the increase of effectiveness in visualization, coordination and planning processes for building projects in several countries like US, Singapore, Norway or Finland. It is argued in this paper that BIM can be a crucial approach for e-procurement for public works, through its capability of "mapping" traditional unstructured information into structured objects and data. The paper advocates the convergence of Model-Driven Architecture (MDA), the Service-Oriented Architecture (SOA) and the emerging paradigm of Cloud Computing into the SOA4BIM Framework. The application of the SOA4BIM Framework in the context of public e-procurement is being foreseen as able to overcome many technological barriers by re-using much of the standardization and research work done in the electronic procurement, BIM and in the AEC sector, namely the IFC and STEP standards, and at the same time use current technology, like Web-services, for implementation.

The application of the SOA4BIM framework in the e-procurement context, in the construction/execution phase of a school building project has been validated in the PLAGE platform application scenario, described in this paper. The main difficulties found are related with the ability to convert individual building objects in aggregate product and service "blocks" that are released to tender. The research project has identified some important hurdles that hinder a systematic use of BIM for e-procurement, namely the need to use a standard process modeling in CAD BIM design, that is used all agents; the inability of contractors' databases to deal with objects/elemental construction building blocks that are derived from the BIM model; and the difficulty to maintain integrity of links with additional unstructured information on the BIM IFC/STEP model. Forthcoming research activities will focus on addressing these issues.

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