

Business Strategy Analytics for Public Procurement Architecture Development

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Abstract

The public procurement (PP) architecture development should be considered as highly customized set of projects, because of the necessity to respect local branch requirements and national regulations as well as to avoid corruption and to secure that system according to the national and local policies. Therefore, the enterprise architecture (EA) models should satisfy the regional and national requirements, and business strategies. Assuming that business structure and processes follow business strategy, the main goals of the paper are to present the business strategy model in the enterprise architecture language, i.e., ArchiMate and to emphasize the strategy formulation value for the business process modeling.

Keywords: Business strategy, business analytics, business architecture, process modeling, public procurement, ArchiMate.

1. Introduction

The historian, Alfred Chandler has formulated a thesis on how structure follows strategy [7]. He described the business strategy as determining long term goals and objectives, the adoption of courses of actions and associated allocation of resources required to achieve strategic goals. He defined structure as the design of an organization through which strategy is managed.

In this paper, author would like to present different interpretations of what business strategy is, and next, analyze how business strategy can be modeled and visualized in ArchiMate language. Therefore, the paper consists of three parts. At first, a general discussion on business strategy and its dimensions will be provided. Next, modeling of business strategy indicators in ArchiMate language will be presented. The third part will cover as an example - business architecture model for public procurement at municipality level.

2. Business Strategy Characteristics

Chandler argues that business strategy management is to be followed by enterprise engineering and utilization of that feedback from business engineers is further important for the strategy reformulation [7]. He defined the business strategy as a selected way of creating a fit between external environment, internal resources and capabilities. In that context, a strategy is a general plan or direction of activities in an enterprise to achieve strategic business goals. According to Mintzberg and Quinn, strategies have two main characteristics. They are made in advance of the actions to which they apply and they are developed consciously and purposefully [32]. So, in the strategy formulation process, strategists talk about the future, but from the point of view of the present. Due to this, the verification of a strategy plan is so difficult. Managers are able to evaluate only intended, deliberate or emergent strategy. Realized and unrealized strategies are evaluated a posteriori in a long period of time. Because of the inability of a priori evaluation of the enterprise strategy, some performance indicators to measure the progress toward the defined strategic objectives are specified.

The strategy management process covers strategy formulation, its realization and evaluation [44]. In that process, strategy is translated into:

- strategic goals, which are tangible and measurable to provide the base for monitoring the success or failure of the strategy's implementation as well as the process of strategy realization,
- activities and projects through which the strategy is achieved,
- key success factors and performance indicators to monitor the strategy's performance and its efficiency,
- organization's principles, which are rules, guidelines, policies and decisions for resolving problems and conflicts among stakeholders.

Business strategies should be evaluated in the aspect of their internal consistency, the ability to be suitable and adaptable to changing business environment, ability to ensure a competitive advantage or just its feasibility, and cost efficiency. According to de Wit and Meyer, there are three dimensions of a business strategy [11]:

- strategy process, which concerns with how and when the strategy is formulated, implemented, changed, and controlled, who is involved and when the necessary activities take place,
- strategy content, which concerns with what the strategy is and what are its outcomes,
- strategy context, which covers the set of circumstances under which both the strategy process and the strategy context are determined and embedded.

Beyond that, they have noticed that business organization's mission is important for the strategy realization. The mission is a task, duty, goal, motive or driver that is steering the organization in a certain direction. Corporate mission can be understood as the basic driver determining the enterprise way of activities. The corporate mission is assumed to cover the fundamental principles that mobilize the firm to its activities.

Wensley [47] defines an enterprise strategy as intention and anticipation. He reminds that Oxford English Dictionary presents intention as the purpose of an action goal, and anticipation is considered as the action of looking forward to something. For Pettigrew [36], an organization's strategy is the process result embedded in a context and strongly determined by that context. The question is how to describe that context. Usually many parameters are specified and they concern the business market, local policy, available technology and social culture. The definition of strategy as 5P (i.e., plan, pattern, perspective, ploy, position) was formulated by Mintzberg and Quinn [32]. They define strategy as the plan that integrates an organization's major goals, policies (i.e., principles), and action sequence into a cohesive whole. A strategy as a ploy is really a specific maneuver intended to remove an opponent or a competitor. Strategy as a pattern is a stream of actions, which are successfully and consequently implemented in many business organizations. Strategy as a perspective is just a point of view to look at the future. And finally, strategy as a position means the location of a business organization in an environment.

3. Business Modeling in ArchiMate

A well formulated business strategy helps organizations to allocate their resources in a unique and viable way based on its relative internal competencies and shortcomings, as well as on anticipated changes in the environment. The Figure 1 covers the Business Model in ArchiMate language. In general, the business strategy goals state what is to be achieved and when the results are to be accomplished. However, they do not state how the results are to be achieved. The business strategy policies concern the rules and guidelines that express the limits within which the operational actions should occur. The strategic decisions included in the business processes are to determine the overall direction of the business organization, and all the changes that may occur in its most important surrounding environments.

Taking into account the strategy definition presented above, it is possible to select the business strategy characteristics, which could be specified in ArchiMate language (Figure 1), although that language is consistently under construction [3, 5].

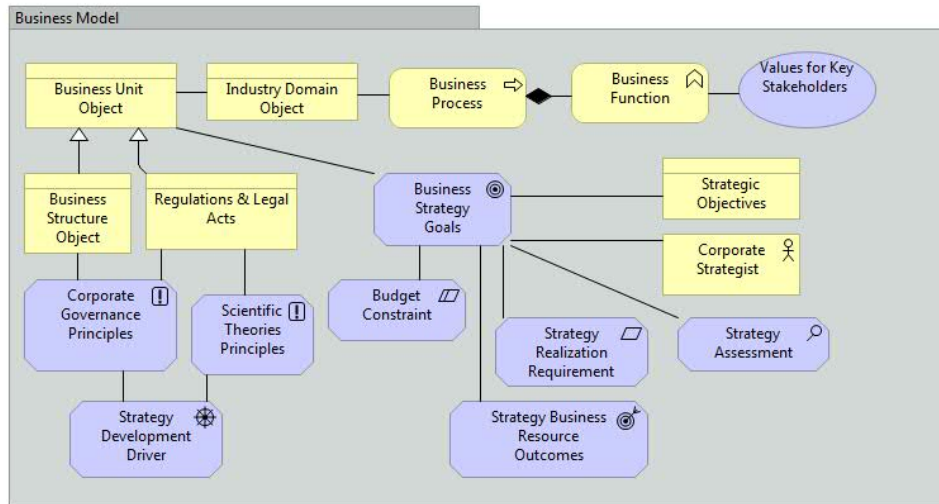


Fig. 1. Business Model in ArchiMate.

The key concepts in the field of enterprise architecture development include concerns, architecture principles, models, views and frameworks [24]. The principles are included in EA models to ensure EA effectiveness and cost efficiency [22]. The principles should be specific to modeling domain, measurable, achievable, relevant and time constrained [1, 35]. They are classified as scientific and normative principles. The scientific principles are laws or facts of nature. Normative principles are rules that guide human behavior. Architecture principles explain the links between the business strategy and operations included in the business processes [33]. The EA principles can be further transformed into requirements, i.e., functional, performance and interface requirements [12, 18, 28].

According to Greefhorst [21], the architecture principles are classified along the dimensions, i.e., type of information, scope, detail level, stakeholders, transformation, quality attributes, meta level and representation. They are distributed in two forms, as formal policy documents and as a more informed version that is spread informally within an organization as a set of good practices. In The Open Group Architecture Framework (TOGAF), architecture principles are general rules and guidelines, intended to inform and support the way in which an organization sets about fulfilling its mission [10]. Principles are identified with laws of nature, beliefs, rules of conduct, and good practices.

The EA principles are derived from elements, i.e., drivers, which ensure the appropriate justification for EA development. In the ArchiMate language, a driver is an external or internal condition that motivates an organization to define its goals and implement the changes necessary to achieve them. According to Erl [15], a principle is a generalized, accepted industry practice. Beyond the scientific and normative principles, Erl considers the design principles, which are highly recommended guidelines for IT solution development. Design principles are realized by applying them as part of a formal analysis and design processes and they are further incorporated as official design standards. Stair and Reynolds [42] divide principles into principles that primarily result in the implementation of a specific design and principles that primarily shape and regulate the application of other principles. Determining the guiding EA principles is important, since top-level architectures should only contain a limited number of architecture principles [9, 46]. More than 10 guiding architecture principles decrease the readability of ArchiMate models. The other architecture principles can be included in additional documentation. It is suggested to translate principles into solution requirements, and then into the design decisions which satisfy the EA goals. Beyond that, EA development requires a deeper understanding of customer's business models, operations and the ability to give customers the perception of how the ICT supports their business processes

[30]. The primary role of system requirements' specifications belongs to EA stakeholders (Figure 2). In ArchiMate language, the stakeholder is defined as the role of a business unit, i.e., an individual, a team, or an organization. That unit is interested in the achievement of certain business goals, getting the outcomes of the architecture, and a reduction of EA development risks [29, 40, 45].

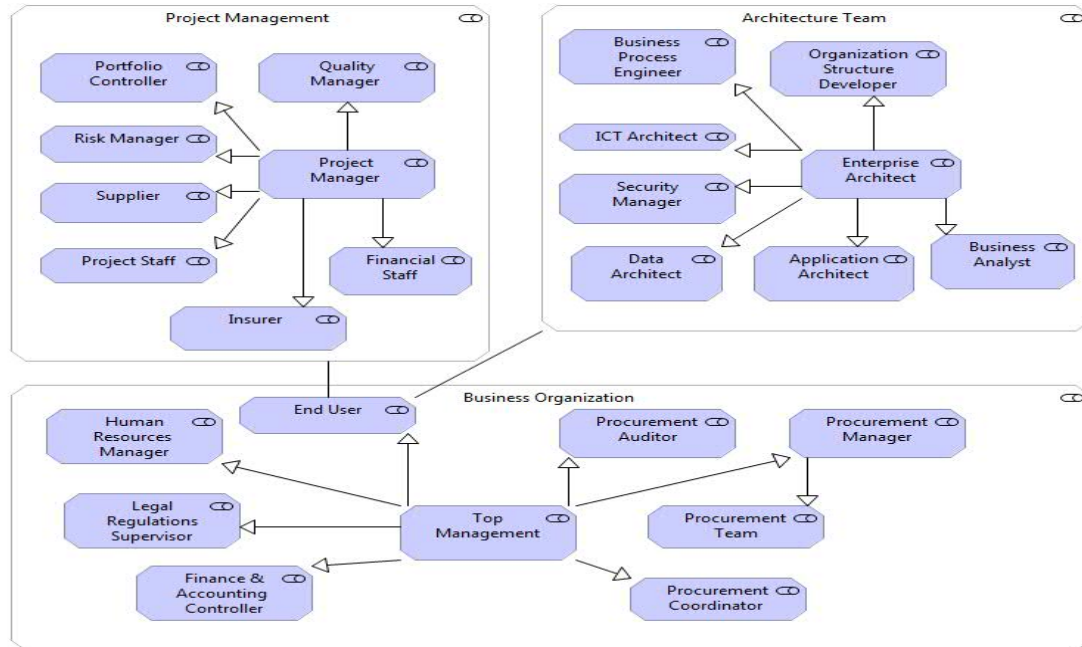


Fig. 2. Enterprise Architecture Stakeholders.

In the stakeholder theory [17], a stake as the most important concept is defined as an interest or share in a project activities for achieving business, technical and social goals. The stakeholders' interests concern maximizing budget profits, increase of personal satisfaction, environmental protection, benefits from external funds, protecting the intellectual and material properties, balancing resources and demand, and keeping the customers satisfied. It should be noticed that stakeholders focus on the minimization of venture risks, which include business, technology and environmental risks. For the EA modeling, it would also be necessary to design the stakeholders' hierarchy. In the Figure 2, the model of their interdependencies is proposed, taking into account their roles, power, and rationality.

Asking about stakeholders follows a question of for whom EA values are created, who is harmed or benefited by the EA development decisions, whose rights are enabled and whose values are realized by these decisions, whose rights are supported, and who is the loser [2, 26, 37]. Stakeholder analysis requires to consider all the parties who will be affected by and who affect the important decisions for the EA development. The EA principles explain the cooperativeness of stakeholders through voluntary agreements, stakeholders' responsibility, complexity of their motivations and values, continuous creativity, and emerging competition [4].

Wieringa [48] defines a stakeholder's goal as a desire for which the stakeholder has committed resources in a certain process of value creation. The strategic question on doing the right things in the value creation process concerns activities, which are consistent with the EA principles. Beyond that, a question on value creation requires respecting the accountability principles [14]. In ArchiMate language, value is identified with the relative worth, utility or importance of a core element or an outcome [3]. Value expresses the approval or disapproval defined by the stakeholder after buying or obtaining a product, service or even access to information. Value is usually described in terms of money, however, non-monetary values, e.g., value of information or knowledge are also included in business

architecture models. Value is to be reached as a result of the coordinated activities being available. Activities for generating value are included in the business processes.

In ArchiMate language, a business process is identified with the sequence of activities or a unit of internal behaviors to produce a product or a service through the consumption of resources [3]. The ArchiMate language is not a satisfactory tool for modeling business processes. The Business Process Model and Notation (BPMN) is much better understandable for business analysts and for system developers, as well as for managers involved in the process management and controlling [34, 41, 43]. The BPMN can be used to describe business operations on a detailed, as well as on a high level. It addresses in particular the process models, and only marginally, the organization resources and capability aspects [27]. Therefore, those two languages, i.e., ArchiMate and BPMN are complementary for the EA modeling. In the business process reengineering (BPR), a business process is assumed to provide outcomes that represent an end result to achieve. The outcomes should satisfy the recipients of the business process values [13].

Creation of value included in the products and services is the business organization strategy goal. A goal in ArchiMate language is defined as an end user state that a stakeholder would like to achieve [3]. For specifying the way of achieving the goals, the EA architects in cooperation with other beneficiaries determine the EA requirements (Figure 1). In general, the requirements can be classified as functional, non-functional and interface requirements (Figure 3). Functional requirements directly concern the extension of a stakeholder's purpose for the systems and the goals and objectives that satisfy them. Quite different are the non-functional requirements, which can be discussed as the constraints under which the entire system is to operate. The non-functional requirements are defined as relative, subjective, answering questions, e.g., what is the speed, availability, response time, recovery time of various system functions, security assurance, accessibility and system modularity.

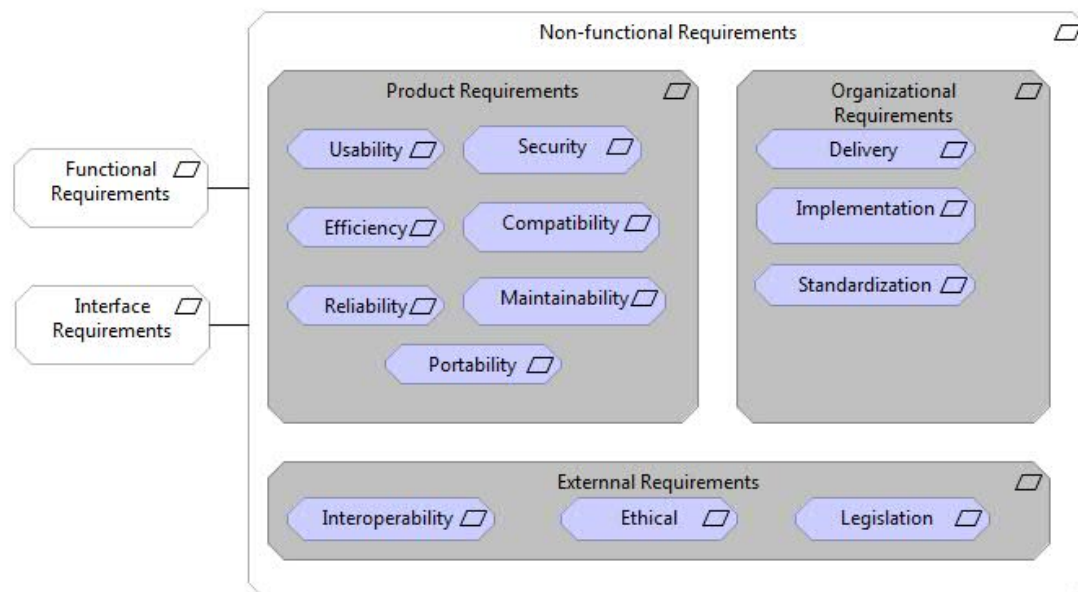


Fig. 3. Enterprise Architecture Requirements.

The architecture modeling in ArchMate language supports the traditional document-based systems engineering approach, which is characterized by generating textual specifications and design documents [3]. System requirements and design information are expressed in the documents and in figures. System engineering emphasizes the control of documentation and is to ensure that documents are valid, complete, and consistent, and that the developed system complies with the documentation.

Finally, for EA modeling in ArchiMate language, the constraints and assessments are considered. The assessment is defined as a way to reveal the strengths, weaknesses,

opportunities and threats (SWOT) for some areas of development [3]. The SWOT analysis is a very simple technique for the evaluation of the internal organization of a business, as well as its environment. The assessment results are needed to emphasize the gaps between the existing goals and new ones, which may trigger changes in the enterprise architecture. The assessment is to be compared to the activities of auditing as well as to the controlling works. Each project of the EA development is realized within the preliminary approved constrained resources. In ArchiMate, a constraint is defined as a limitation on the way of realizing the EA model. The restriction may concern usage of specific technology, limited time and budget for the realization, the necessity to respect a particular legal regulation, quality standards, or security norms.

4. Public Procurement Architecture Modeling on Business Level

The public procurement (PP) system can be included in an integrated information system for corporation, municipality, or for a local and regional government unit. In some other cases, the PP system can be combined with project management application, or just implemented as a stand-alone system. That application could be accessible in a cloud, provided online and offline, available commercially or for free. The PP system is assumed to be dedicated for a particular industry, projects or developed as commercial-of-the-shelf (COTS) application. In general, the PP system is based on a selected one of sourcing business models. These models are divided into three categories [25]:

- transactional model, which is the basic provider model, mainly applied for the acquisition of low-cost, standardized goods and services. It concerns the usage of frequent competitive bidding, the vision on what to supply at the lowest price. The main tendering tasks are to establish who and how will be the product or service provider, what are the fixed prices and right quantities. The suppliers can be prequalified in that tendering process;
- relational model, where the buyer is moving towards strategic relationships development. The pre-selection of suppliers is a natural step in that model. The pre-selection is realized according to the chosen criteria, i.e., previous experience, supplier performance, previous contracts, compliance performance, suppliers' external certificates, geographical position, inventory management, and training opportunities;
- investment-based model, in which an organization of shared services is developed to ensure centralization and standardization of operations to improve operational efficiencies. The model covers development of an equity partnership, which can take different legal forms, from buying a supplier (buy-outs, acquisitions), to creating a subsidiary, to equity-sharing joint ventures or entering into cooperation arrangements.

The European Commission's (EU) public procurement strategy covers a different classification of PP models [38]. The EU promotes the following models:

- Green Public Procurement (GPP), mostly focused on eco-innovations;
- Socially Responsible Public Procurement (SPPP), for providing of incentives to companies to develop socially responsible management;
- Public Procurement of Innovative solutions (PPI).

Regardless of which procurement business model is preferred, the risk assessment and management should be done. In general, a tender is the process of making an offer, bid or proposal, or expressing interest in response to an invitation or request for tender. In that process, a business organization will seek other businesses to respond to a particular need, such as the supply of goods and services, and will select an offer that meets their needs and provides the best value for money [6,19].

There are four main types of tender opportunities:

- open tendering, which is an invitation to tender by public advertisement;
- select tendering, which is open only to preselected suppliers [23];

- multi-stage tendering, which is used when there are a lot of respondents, so they are stage by stage excluded to those who are the most appropriate to the specific requirements;
- invited tendering, in which the bidder contacts a selected number of suppliers and requests them to perform the contract. It is used for specialist work acquisition, in emergency situations, or for low risk and off the shelf options [16].

The outline of a public procurement process is presented in Figure 4. The process covers the following sub processes:

- procurement strategy development
- procurement planning,
- proposal evaluation and supplier selection,
- negotiation and award of contracts,
- cooperation monitoring and integration.

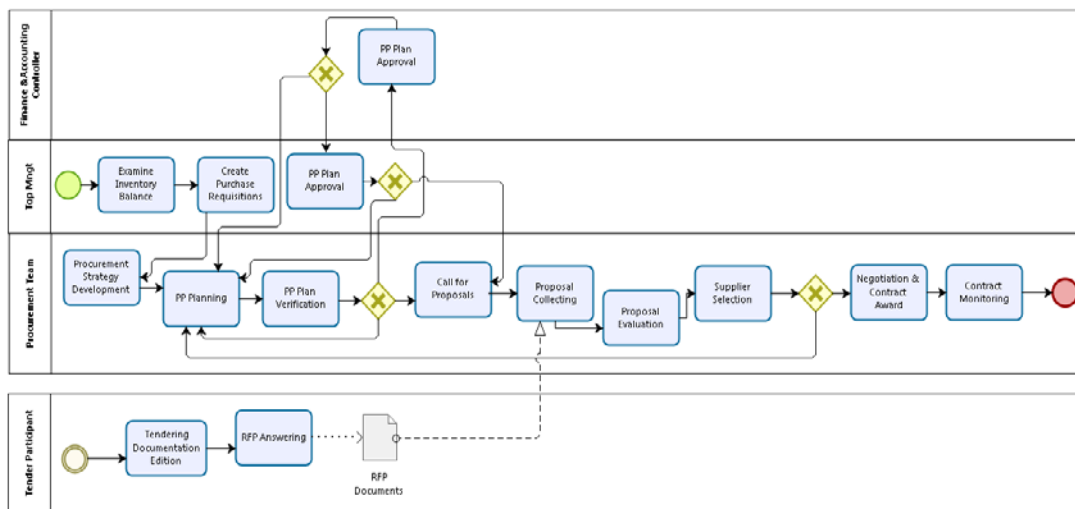


Fig. 4. Public Procurement Process.

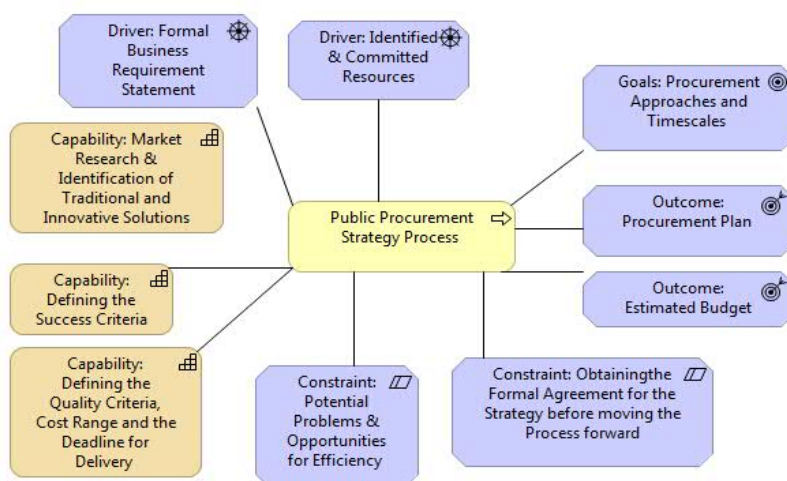


Fig. 5. Public Procurement Strategy Development.

The procurement strategy development consists of the following sub processes:

- defining the business needs,

- defining and selection of the tender opportunity,
- determining the appraised value for the tender,
- description of the tender subject,
- specification and analysis of the procurement support information system,
- description of the request for information (RFI), request for proposal (RFP), and request for quotation (RFQ). An RFQ is used when the bidders know exactly what they need and they are asking only for the price. The RFP is used when the tenderers ask suppliers to provide different solutions (i.e., proposals) and identify the associated costs [25],
- defining the contract award notice and conceptualization of the most important elements, i.e., deadlines, selection criteria, selection method, verification and validation ways, and publication locations,
- defining the procurement team, selecting people to the team, approval, providing tasks and regulations to them, specification of their roles, responsibilities and actions [20].

The mentioned above sub processes can be included in the extension of Figure 4. However, the ArchiMate language provides a unique opportunity to visualize the important concepts for business architecture modeling, i.e., business goals, drivers, outcomes, capabilities and constraints (Figure 5). Similarly, in Figure 6, the important concepts for public procurement process are visualized in a business architecture model. The ArchiMate language does not allow to express the business, technological or any other risks in business architecture model, therefore in Figure 6 risks are treated as constraints. In general, the typology of risks includes [8, 25, 39]:

- operational risk, related to work scope and workload allocation;
- financial risk, connected with financial instability or inaccurate baselines impacting pricing;
- compliance, vulnerabilities, and threats;
- extraordinary risks, called the worst case scenarios.

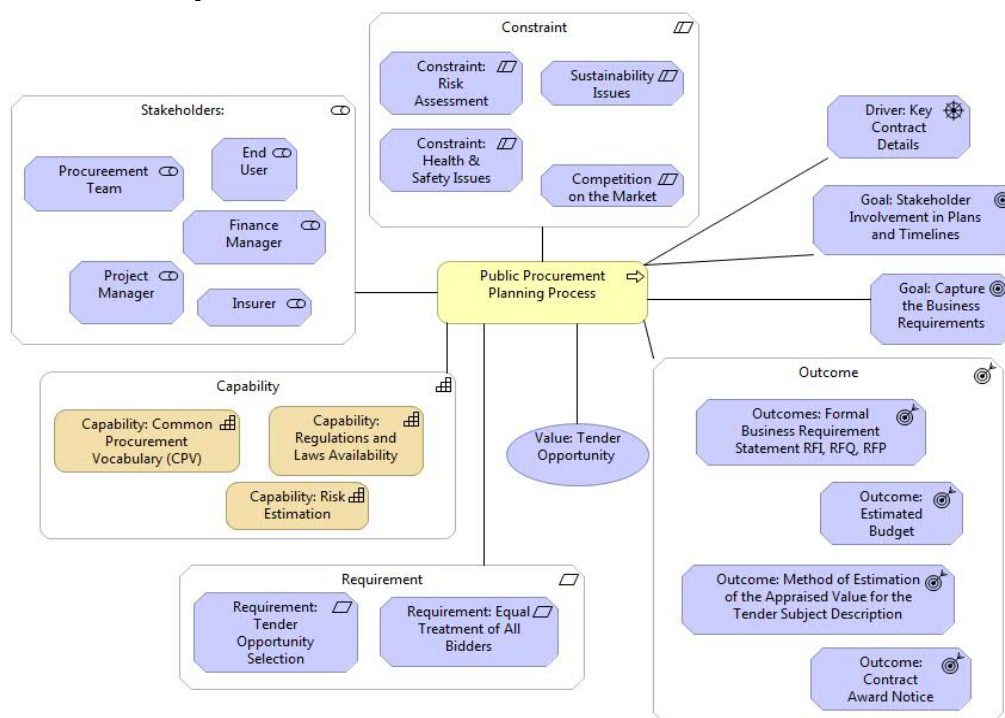


Fig. 6. Public Procurement Planning.

The third important sub process in public procurement process comprises proposal evaluation and supplier selection. The main activities included in that process are as follows:

- collecting and opening the proposals;
- ensurance of safety and security in the tender process;
- formulating the premises of rejection and selection criteria;
- excluding and rejection of proposals;
- requesting for supplements and for explanations;
- reverse procedure implementation and applying
- documenting the submitted proposals and tendering protocols.

In Figure 7, the business architecture concepts are specified for the proposal evaluation and selection. Some constraints are still the same as they are in the public procurement planning process. The evaluation and selection are critical for public procurement, therefore the specification of unique sub processes is necessary.

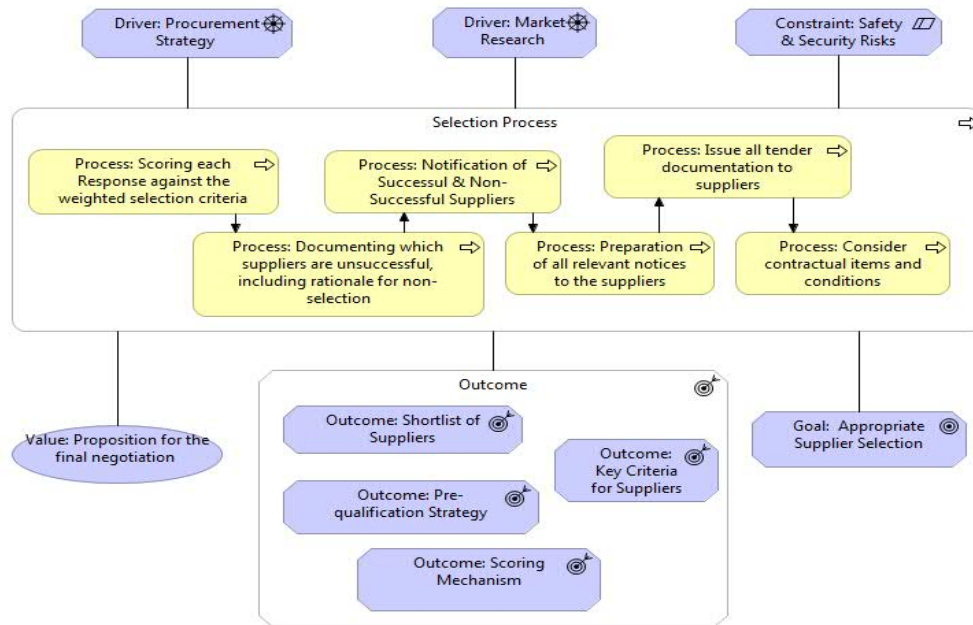


Fig. 7. Proposal Evaluation and Supplier Selection.

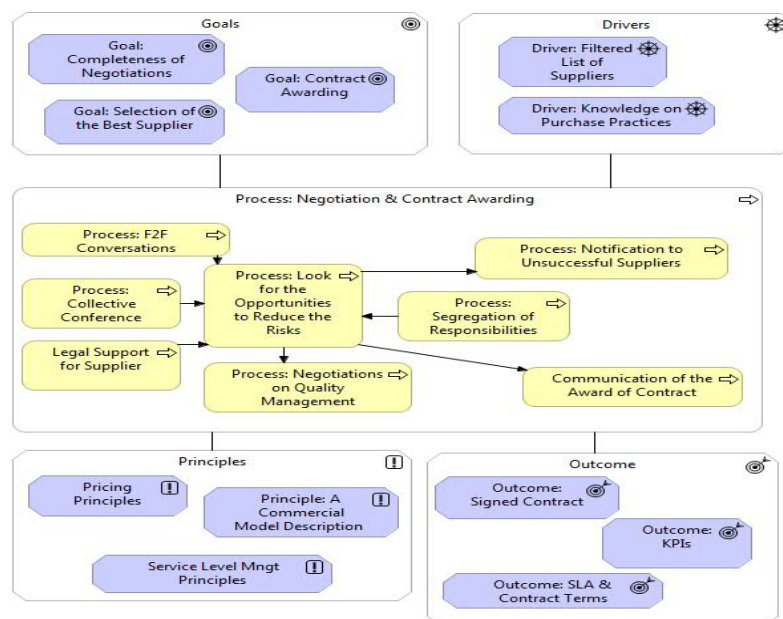


Fig. 8. Negotiation and Award of Contract.

The negotiation and contract awarding stage in the public procurement process is visualized in Figure 8, where the principles, outcomes, process goals and drivers are specified as important in the business architecture, because of their impact on the whole EA modeling. The negotiation and contract awarding is oriented towards agreement signing and ratification, establishing the process of order realization, establishing the payments and contract penalties for suppliers, for tenders, and finally - deposit governance. At this stage, stakeholders finally establish the terms, deadlines, quantities, signatures and document flows. They agree on deposit returns and ways of data verification. Finally, tendering process participants can move to the contract realization, monitoring, auditing and controlling. The specification of sub processes, goals, and outcomes for the last process is included in Figure 9.

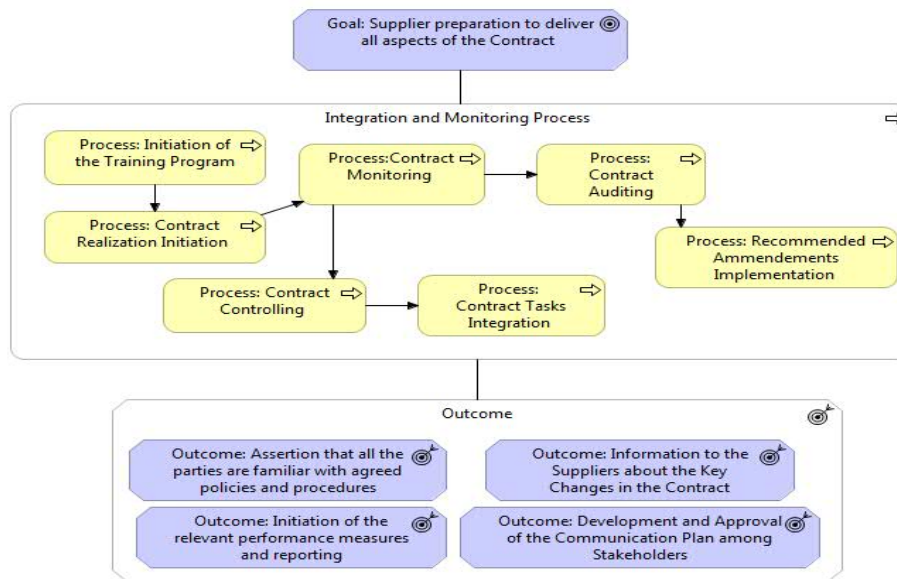


Fig. 9. Contract monitoring and integration.

5. Conclusion

Transparency is an important element in public procurement processes, policies, and the law. The procurement beneficiaries as the EA stakeholders are interested in buying products at low prices and high quality and their resources are usually constrained in comparison with their requirements. Therefore, the enterprise architecture for the public procurement organization should focus on the business architecture as creating the fundamentals of the whole procurement process. ArchiMate language is a suitable tool for modeling the strategy issues, which indirectly have a strong impact on the final model of enterprise architecture. The concepts, i.e., stakeholders, goals, outcomes, drivers, assessments, principles, requirements, constraints and value can be easily visualized as having impact on the business organization strategy development and fundamentally determining the ICT implementation. ArchiMate language connects architectural domains. It has a very broad scope, but less details than BPMN. BPMN, as mostly known for process modeling, is useful when declarative processes respected as transparent and not oriented for a particular case. However, for providing a flexibility to process execution, other languages [31] are more suitable.

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