A Transformation Framework Proposal for Managers in Business Innovation and Business Transformation Projects-Intelligent atomic building block architecture

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Abstract

Today’s dynamic global economy forces business companies to struggle for survival; where such companies must be competitive and loosely interconnected in a wide networked business market. It is not a secret that a solid business environment that wants to insure its sustainable business future must adapt itself to frequent business transformation processes, to adapt to such a situation a building block based solution is proposed to support the business transformation project. Such a building block strategy for frequent business transformation changes is translated in a set of recommendations that support the company’s business resources in order to optimize the companies’ various business and information technology resources. Unfortunately, most of business transformation projects fail, because of the very difficult business transformation project’s “decoupled and technical” implementation or re-engineering phase. The author recommend a re-engineering phase that is based on atomic building blocks architecture; where the business transformation manager must have the right skills to model and prototype the most important Atomic Business Blocks, in order to insure the successes of business transformation projects. It is recommended to apply the adequate atomic business architecture and the needed modeling concepts. Such concepts are based on a one to one mapping pattern that is in turn based on enterprise architecture standards. Business transformation projects should apply an Atomic Business Blocks driven implementation phase that will help the implementation capability of the business transformation project; such an approach needs a specific a set of integration, modeling and prototyping skills

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Adaptable and loosely coupled atomic business block architecture patterns like the Atomic Business Blocks can be used to improve the quality and success rate of the implementation and integration of the defined business requirements. That is achieved by simplifying and unifying of the applied patterns for the: analysis, design, development and maintenance processes of the end business system. An optimal is based on the one to one mapping in which each business requirement and its transaction artifact is totally independent. Standardized and simplified enterprise business architecture, like, as shown in Fig. 1, enables the business transformation process to become iterative, where its design is based on a holistic approach using interconnection between all its implementation phases. The Atomic Business Blocks resources traverse through the Architecture Development Method, as shown in Fig. 1, where each phase refines the Atomic Business Block’s implementation’s capability; such an approach uses a unified view on the complete business information system that consists of: 1) the targeted and unified collection of Atomic Business Blocks used to implement the business environment, 2) the Atomic Business Blocks based data and applications loose components, and 3) the underlying Atomic Business Blocks based scalable technology infrastructure. The coordination of these main architecture parts is insured by the coordinated use of: 1) an enterprise business architecture pattern, 2) standardised methodology, and 3) portable tools, like the Open Group’s Architecture Framework’s Architecture Development Method for example. Business transformation managers (Business Transformation Manager), enterprise architects, business architects, business analysts and information technology managers can use this concept to gain knowledge on how can an enterprise business architecture project be managed; using atomic building blocks, and solution blocks, for a successful transformation. Such a Business Transformation Project has to make a choice of the optimal tooling and modeling environment based on a pseudo Model View Control pattern, as shown in Fig. 2. The complexity of the business transformation project’s implementation phase often causes the Business Transformation Project's failure and these failure rates are very high and the author estimate that the Business Transformation Manager should apply an Atomic Business Blocks pseudo bottom-up approach. Business Engineering (BE) is a cross-functional discipline that refers to the architecture, design, development and implementation of: 1) business requirements solutions, 2) enterprise business architecture, 3) the underlying business model, 4) the corresponding business processes, 5) the organizational structure of the business environment (that is known today as organizational engineering), 6) the (business) information systems, and 7) the underlying information technology. As already mentioned the research topic is about managing complexity in business transformation projects using standardized methodologies; where all these methodologies have many abbreviation and terms that makes the reading of such topics difficult, but unfortunately that is the nature of such fields.
2. "The research model and Environment"

2.1. The research question

The global topic's final research question (RQ) is: "Which business transformation manager characteristics and which type of support should be insured the implementation phase of a (e)business transformation project?". The targeted business domain is any business environment that uses frequent transformation iterations. For this phase of research that is inspecting hypothesis #2 the sub-question is: "What is the impact of the granularity and unification of atomic building blocks on enterprise architecture and business transformation projects?" The research and development (R&D) process of this clustered research project, until now proved the existence of an important knowledge gap, as well as the necessity for a real world framework that complements the existing enterprise architecture standards to support business transformation projects. Existing research projects have an approach of too much scoping of the research question and simplification of the research method to the level of “marketing like” basic descriptive statistics. This clustered research project is based on the action research model and heuristics, where it’s main phases are: a) the proposal phase; b) the research question phase definition; c) the literature review phase; d) the research model phase; and e) the research project’s prototypes (one prototype per hypothesis).

2.2. The Environment

The main characteristics of the research’s methodology and framework is the Selection, Architecture, Control, Decision making, and Training Framework (SmAmCmDmTmF, for simplification, in further text the author will use the term Environment) is the support for business transformation projects. The Environment’s aim is to convert the acquired relevant research and development outcomes into a set of managerial recommendations. The Environment is composed of the following modules:

- “Sm”: for the selection of the business transformation manager.
- “Am”: for the architecture and modeling strategy that can be applied by the business transformation manager.
- “Dm” for the decision making strategy that can be applied by the business transformation manager.
- “Cm” for the control and monitoring strategy that can be applied by the business transformation manager.
- “Tm” for the training of the business transformation manager.

In this research phase we are targeting the Atomic Business Blocks component’s impact on business transformation projects that is a part of the Environment’s architecture module.

2.3. The prototype

The Environment’s survey system has accumulated the results from domain specialists and has generated the synthesis and concluded the first iteration of this clustered research project. The results of this phase show that its hypothesis #1 (H1: for the implementation phase of the business transformation projects, the optimal business transformation manager must be an “Architect of Adaptive Business Environments (AofABE)” is credible. In this paper in which the author inspected the impact of atomic business blocks, the proposed research approach and methodology are based on the implementation of a prototype as a proof of concept, where the concept proposes a unified and enough granular pattern for business transformation projects.

2.4. Critical success factors

The Environment’s research and development model integrates research critical success factors in the form of independent variables that are also used in the real-world process of selection and support of the Business Transformation Managers’ and Business Transformation Projects’ activities. These Business Transformation Managers have a profile of technocrat and knowledge worker who supports and designs the transformation process.
of the business environment\textsuperscript{25}. The \textit{Environment} research recommends improving the success rates by delivering a set of reusable atomic patterns and the correspondent managerial recommendations.

The \textit{Environment} has a built-in decision making model where the Business Transformation Manager must implement an in-house grounded heuristics-based reasoning mechanism that is based on critical success factors (CSF). These CSFs are applied in: 1) the selection of the Business Transformation Manager; 2) the enterprise architecture and modeling strategy; control and monitoring, and 3) the training scoping. These CSFs are based on the hypothesis that a Business Transformation Manager who cannot design the business transformation process or who cannot manage the unbundling process in the implementation phase, does not have the capability to manage a Business Transformation Project management\textsuperscript{26}.

3. "The atomic architecture"

3.1. The atomic model first as a pseudo bottom-up approach

The pseudo bottom up approach of an atomic Building Block strategy used by the \textit{Environment} is influenced by the service-oriented architecture frameworks and business service integration possibilities that exist and are described in the Capgemini's Service Oriented Architecture framework, which defines a model strategy, methodology and productivity environment, and it outlines Service Oriented Architecture service directory.

The \textit{Environment} proposes to upstream business services that are altered to accommodate traditional web services environments; these services are stored into a specialized atomic Service Oriented Architecture environment using the model-view-control pattern (as shown in Fig. 2). For example, Capgemini's Service Oriented Architecture framework was specifically added to the integrated architecture as a reference architecture for Service Oriented Architecture. Capgemini supports architectural foundation that is necessary for successful business transformation projects; this article’s author shares this thinking and have chosen that the Atomic Business Blocks is the jumpstart architectural template for such business transformation projects. Capgemini is an important member of the Open Group, where it actively supports the adoption of international certification standards for enterprise and business architecture artifacts. The author recommends that business transformation managers should apply the Open Group’s Architecture Framework as a base for their business transformation strategy; where Service Oriented Architecture provides the conceptual and logical views of business services across various business domains, business information processes, business application and infrastructure technology layers\textsuperscript{28}.

3.2. Atomic building blocks

The \textit{Environment}’s atomic building blocks are based on the Open Group’s Architecture Framework’s generic characteristics of building blocks that have the following generic characteristics\textsuperscript{29}:

- A building block is a package of requirements, functionalities and artifacts designed to meet the business needs of the business transformation project.
- A building block has a standardized usage interfaces to access all its resources and functionalities.
- A building block is interoperable with other building blocks.
A building block defines the functionalities that will be implemented and captures the business, as well as the technical requirements.
A building block is technology aware and is standardized.
A building block is used as a template to build solution building blocks.

The Atomic Business Blocks have the following implementation characteristics:

- It unifies implementation and usage, and easily adapts to evolution of technology and standards.
- An Atomic Business Blocks can be an aggregation of other building blocks, hence a subassembly of other building blocks.
- An Atomic Business Blocks is a reusable template and easily replaceable.
- An Atomic Business Blocks can have many implementations.
- An Atomic Business Blocks has a unique identifier.
- An Atomic Business Blocks respects the “1:1” mapping concept.
- An Atomic Business Blocks enables business interoperability and integration.

![Business Requirements](image)

Fig. 3. Key phases and steps of Architecture Development Method at which Building Blocks are managed.

An Atomic Business Blocks is an artifact package (or a jar file) of functionalities and resources designed to meet a precise business transaction or an atomic business transaction. The way in which artifacts, functionalities and development resources are combined into an Atomic Business Blocks might vary between individual architecture solutions. The Business Transformation Manager has to coordinate, design and prototype the Business Transformation Project’s needed Atomic Business Blocks using the Architecture Development Method’s various phases, as shown in Fig. 3; where these Atomic Business Blocks will improve the legacy business systems transformation, integration and interoperability.

### 3.3. Solution building blocks

The Atomic Business Blocks based Atomic Solution Blocks:

- Define exactly which business services and components will implement the business functionality.
- Define the implementation of each Atomic Solution Blocks using the “1:1” concept.
- Fulfill atomic business transaction requirements.
- Are traceable and are interoperable; they can be used just-in-time.
- Compiled in execution to enable dynamic systems building.
3.4. Atomic reference models

The Atomic Business Blocks is based on the Open Group’s Architecture Framework’s foundation architecture, which is based on the foundation architecture of generic services this foundation architecture is part of the Technical Reference Model, which provides a model of generic platform of services. The Technical Reference Model is interoperable, as shown in Fig. 4, and can be used to build any system architecture artifact like the Atomic Business Blocks to emphasize two major common architectural objectives to create atomic reference models:

- Artifacts portability, by using the Application Platform Interface, which identifies the set of Atomic Business Blocks in the form of services that are to be made available for applications via the business platform.
- Interoperability, via the Communications Infrastructure Interface, for identifying the set of Communications Infrastructure services that are to be leveraged in a standard way by the business platform.

![Fig. 4. Detailed Technical Reference Model (Showing Service Categories)](image)

3.5. The “1:1” business modeling concept

To manage business innovation and transformation complexity in the implementation phase, an atomic architecture concept must integrate existing business standards; that is the main concern in keeping the architecture pattern feasible. That is achieved by the synchronization of various methodologies and innovation artifacts; that is enabled by the establishment of a real world “1:1” iterative model. The proposed architecture presents an atomic business resources pattern to keep every business artifact simple (or atomic) and enables that the atomic business resources can be managed by any type of team members profile, who should not necessarily be a computer science specialist. At the same time, these atomic business resources must be well classified and standardly interconnected to enable simplicity of manipulation. This simplicity is achieved by the application of the “1:1” mapping rule that interlinks atomic business resources. The Open Group’s Architecture Framework is a global concept that integrates major standards and the “1:1” atomic mapping concept can be used simplify these various standards; the question is how to keep the enterprise architecture project feasible and manageable with so many methodologies, artifacts.

3.6. Atomic “x” services

The atomic “x” service, where the “x” can stand for example for “b” for business or “i” for infrastructure… is an atomic class that floats across the interconnected business ecosystems using the web’s hypertext protocol. The mapping of atomic artifacts promotes the “1:1” design concept that is based on the idea that all the business artifacts can be inter-related with a simple concept; where an initial business feature or requirement has an over-all “1:1” relationship with all its related resources.
3.7. Atomic business transactions

The Atomic Business Transaction is a pseudo-sequential business process model, in which all the atomic business resources are dynamically linked. These atomic resources are generated by the related Atomic Business Blocks. The business transformation manager and the prototyping team model and develop the needed set of Atomic Business Blocks and their link to Atomic Business Blocks is to be used in the implementation phase. From the business perspective and defined requirement, a single atomic business transaction development is based on:

- The reflection of one or more business artifacts such as activity diagrams and/or business process models.
- From a technological perspective, the atomic business transaction is composed of application components which are the fundamental business entities of the system.
- Three independent attributes define the application component of the transaction: 1) interaction; 2) function; and 3) self-description.
- Business artifacts give a preliminary description of the application component.
- The technological requirement describes the attributes description.

3.8. Atomic architecture

Architectures derived from standardized enterprise architectures like the Open Group’s Architecture Framework differ greatly, because they depend on the business requirements quality and the Business Transformation Manager’s kills and the business company status. In reality many Business Transformation Project architectures will not include many of the reference services, but will include specialized services to support applications that are specific to the enterprise’s Business Transformation Project or to its micro-environment. In implementing an Atomic Business Blocks architecture, the Open Group’s Architecture Framework can be used to support and assess the requirements and to select the services, interfaces, and standards that satisfy the business needs.

Today, emerging business environments and avant-garde technology trends are driving enterprise business architecture practitioners to insure selection, training, guidance, leadership and vision during the frequent change process and especially the complex multi-disciplinary implementation phase. The Environment focus is on the development and modeling of atomic enterprise business architectures’ artifacts, which in turn is based on atomic business services. Gartner studies provide an insight into the critical success factors for such enterprise business architectures that estimates the risks of the implementation phase in order to achieve a robust agile business environment that enables the business to become more sustainable. This business driven approach is about ensuring that enterprise business architecture initiatives are under control by the applied business strategy; this approach implements a clear alignment between business requirements, organizational (re)structure, governing and business information technology; resulting in a pattern for the actual business transformation project.

4. "The atomic building block architecture"

Atomic business blocks help in the unbundling of the monolithic business environment by breaking the previous system components into a set of classified unique atomic transaction services. An Atomic Business Blocks is just another business brick in the wall... The business transformation manager (or the enterprise architect) builds a prototype to propose a set of Atomic Business Blocks templates to be used during the unbundling process of the actual monolithic business environment.

4.1. The Atomic Business Block’s “1:1” mapping

The outcome of the business transformation project is an automated bank of state-full atomic business artifacts. This is basically an alignment based on the “1:1” concept and the Atomic Business Blocks is decomposed into various artifacts as shown in Table 1.
Table 1. The “1:1” mapping table

<table>
<thead>
<tr>
<th>ID</th>
<th>Atomic Business Blocks’s artefact</th>
<th>Naming convention</th>
<th>Atomic Class</th>
<th>Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUID_xxx</td>
<td>atomic Vision’s Artefact</td>
<td>GUID_TrxName_aVSA</td>
<td>CLS_TrxName_aVSA</td>
<td>XMI</td>
</tr>
<tr>
<td></td>
<td>atomic Contract</td>
<td>GUID_TrxName_aCTR</td>
<td>CLS_TrxName_aCTR</td>
<td>XMI</td>
</tr>
<tr>
<td></td>
<td>atomic Use case(s)</td>
<td>GUID_TrxName_aUSC</td>
<td>CLS_TrxName_aUSC</td>
<td>XMI</td>
</tr>
<tr>
<td>.........</td>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
</tr>
</tbody>
</table>

The concept that is based on the Atomic Business Block’s “1:1” mapping is used as a proof of concept for the research hypothesis and the possible list of assessment steps comprise:

- promote the determination, willingness, and persistence to complete the difficult implementation phase using Atomic Business Blocks based strategy.
- prove the business need of business transformation projects and the ability of using Atomic Business Blocks for their successful termination.

5. "The prototype"

The proposed solution and structure are evaluated through the implementation of a real world business transaction where the concept of Atomic Business Blocks, where we see the class diagram in Fig. 5., proved to be applicable for business transformation projects, and also that the granularity approach can be used to refine the “1:1” mapping.

![Fig. 5. The prototype’s atomic business transaction](image)

A logical view of a series of transactions based on the Service Oriented Architecture-type approach was used as shown in Fig. 6., and the consumption of an atomic web service in a single transaction.

From the atomic business transaction activity diagram, the resilience of events exchanged during the transaction’s execution is important. All the events that are exchanged between various nodes require a strong encryption setting which is defined in the technology architecture phase. From a technological perspective, the atomic business transaction is composed of application components which are the fundamental business entities of the system, as presented in Table 2. A top-down combination of the Open Group’s Architecture Framework’s phases B and D resulted in the optimal construction of a transaction based on an atomic web services approach.
Table 2. Transaction components.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS-Business Builder</td>
<td>Provide business artifacts</td>
</tr>
<tr>
<td>Controller</td>
<td>Passes web service request</td>
</tr>
<tr>
<td>Search_WS</td>
<td>Web service looking for requested web services</td>
</tr>
<tr>
<td>Data Tier</td>
<td>Contains sensitive information</td>
</tr>
</tbody>
</table>

6. "Conclusion and recommendations"

Inflexible monolithic business information systems and teams are the major cause of failure for business transformation projects that are essential for businesses companies. This fact has motivated the author to research various techniques to promote and recommend solutions like the use of atomic business block architectures to avoid these types of failures. Atomic business block architecture uses a just-enough concept of the Open group’s architecture framework (OpenGroup, the Open Group’s Architecture Framework, 2014) and the proof of concept proved the justification for this approach. This research paper defines the concept of atomic business architecture in the selection, architecture strategy establishment, control, decision making and training framework to support business transformation managers in the business transformation project’s implementation phase. The author recommends the application of an atomic business block architecture strategy and pattern that will facilitate the implementation phase of the business transformation projects. In this “atomic” pattern the author recommends a bottom up approach that is based on the choreography of atomic business services. Atomic business services are in turn built on atomic business model and processes. These processes can be monitored through the use of atomic control services.

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