

UniqueBooksCO Enterprise Architecture

EA 2022/2023, DEI, Instituto Superior Técnico, Universidade de Lisboa

1. Project UoD

The UNIQUEBOOKSCO is a company selling books that focuses on the market of old and rare books. It currently has a store in Portugal, one in UK and one in France. The company has partnerships with a wide network of specialized suppliers that includes international antique dealers, booksellers, auctioneers, collectors, libraries, bookstores and small publishers rare books, editions of discontinued, and special editions. The company operates in a niche market where the entry of new competitors presents a low risk due to the complexity of establishing a network of specialized supply. This business provides margins that are on average over 30%. Furthermore, the turnover of the company sustains its operations and has been growing at a rate of 5% per year. However, the complexity of managing suppliers, difficulty in effectively manage orders placed and reach the target audience are limiting the growth of UNIQUEBOOKSCO and many of their smaller suppliers. Several market studies show that this business is due to sustained growth in emerging markets and the long-term intrinsic value of these objects.

The new strategy aims UNIQUEBOOKSCO to increase sales volume by 10% per year for at least a period of 5 years. This strategy involves betting on the direction of the business of selling electronics to market over the internet. At a secondary level, the company intends channeling at least 60% of its sales through this channel within 2 years. This project has the financial support of the foundation RAREBOOKSFOUNDATION bringing together public and private partners related to the dissemination, preservation and research of rare books.

The UNIQUEBOOKSCO strategy aims:

- Create an online store. This action is intended primarily to segment sales to the end customer (B2C model, Business-to-Consumer)
- Establish partnerships with shops selling books online for the UNIQUEBOOKSCO catalog be available in known means. This action is primarily focus on the B2C segment.
- Tween providing books through channels between companies through electronic media and traditional non-electronic, thus making the bridge to the universe of suppliers (model B2B, Business-to-Business).

Meeting these three goals have priority and are not subject to review as part of the contractual conditions established with RAREBOOKSFOUNDATION. The UNIQUEBOOKSCO thus aims to define an enterprise architecture to support the achievement of the above objectives. The architecture will specify:

- The business model, including strategy, goals, metrics and indicators.
- The products and services.
- The organizational structure, roles and responsibilities.
- The business processes.
- Support services to business and the information systems architecture.

UNIQUEBOOKSCO wants to minimize the risk of an enterprise architecture project. As such, it is requested that each team working to develop a pre-project which covers only a partial area of the overall business UNIQUEBOOKSCO. The results will then serve as criteria for the contracting the project overall. The project to develop is thus limited to the following areas:

- Sale of books in traditional stores.
- Selling books online (through shop and through other shops).
- Providing intermediation of books.
- Ordering books to suppliers.
- Management of the catalog and the inventory (stock) of books.

This means that areas that are not directly related to the above areas are not part of this project. The areas that should be excluded include all management processes and organization change, strategic governance, management and training of people, systems and technology management and finance and accounting. If in doubt about the limits of the areas to consider the working team should contact UNIQUEBOOKSCO.

1.1 Architecture Principles

UNIQUEBOOKSCO Management team, together with several experts and strategic consultants, identified the architectural principles that restrict the solution to be presented. The list below should thus be considered in specifying enterprise architecture. However, the decision to include or reject the principles should be considered and duly justified by the team working on the presentation of your project.

1.1.1 Business

- R-1. UNIQUEBOOKSCO is a business process oriented organization.
- R-2. The organizational structure of UNIQUEBOOKSCO tends to be flat, minimizing the levels of middle management and administrative redundancy.
- R-3. All organizational roles must be oriented to organizational jurisdiction, authority and responsibility.
- R-4. All organizational activities must be oriented to organizational jurisdiction, authority and responsibility.
- R-5. The online store's owned by UNIQUEBOOKSCO should be supported on AWS services from Amazon.com.
- R-6. UNIQUEBOOKSCO does not want to invest in logistics input or output (ie distribution).
 - R-6.1. All logistics input and output should be externally contracted.
 - R-6.2. It is necessary to define applicable service criteria quality of service requirements.
 - R-6.3. Collaboration with logistics service providers should be based exclusively on electronic B2B based on B2B standards.
- R-7. UNIQUEBOOKSCO does not want to invest in specialized warehouses
 - R-7.1. One option is hire this service externally.
 - R-7.2. Several strategic consultants advise hiring combined storage and distribution to the same service provider
- R-8. Partnerships with shops selling books online should be aimed initially at Amazon.com and / or Barnes & Noble.com.
- R-9. UNIQUEBOOKSCO operate on different channels. However, the standardization and reuse of processes, systems and technologies should be maximized.
- R-10. The connection to the providers should be optimized. This implies that:
 - R-10.1. It is necessary to define models of collaboration between UNIQUEBOOKSCO and suppliers, since there are many different models depending on the type and size of the supplier.
 - R-10.2. One model of collaboration should be based on fully electronic B2B solution
 - R-10.3. The technological solution should be based on service-oriented architecture (SOA), based on web services technology (see technological principles).
 - R-10.4. Several vendors use traditional and heterogenous channels for communicating with UNIQUEBOOKSCO. It is imperative that the UNIQUEBOOKSCO keep these channels to sustain its privileged network of suppliers. These channels include phone, mail, whatsapp, and electronic mail. However, the solution is to propose a seamless integration of these traditional mechanisms with new electronic solution proposed mechanisms. That is, the means-traditional need to be maintained, however, the integration of these means the level of new processes, systems and technology should ensure its full consistency and alignment
- R-11. All activities should be automated wherever justified.
- R-12. UniqueBooks wants that its employees are focus in carrying out not automated activities. These activities include, among others, interaction with diverse suppliers by traditional means, cataloging, evaluation and verification of several books, finding books in the supply chain.
- R-13. The break points and the critical points should be minimized.

1.1.2 Information

Due to the need to specify in detail the application and technological's architectures the following requirements for UNIQUEBOOKSCO business were identified. These requirements will have a direct impact on the information architecture.

- R-14. Books are purchased in batches to suppliers on specific dates.
- R-15. A batch is a set of one or more similar books. In fact, most of the UNIQUEBOOKSCO batches contain only a single book. However, sometimes you can purchase multiple copies of the same book to the same supplier.

- R-16. All books of the same batch have the same purchase price.
- R-17. The purchase price of the same book from different suppliers can be distinguished
- R-18. The purchase price of the same book to a vendor may vary over time.
- R-19. Books are always unitarily sold to customers, although a customer can buy any number of books.
- R-20. The selling price and margin are set by UNIQUEBOOKSCO by batch or by book.
- R-21. By default, all the books of the same batch are sold at the same price, but it is possible to set different prices for the book (eg depending on the demand and supply of the book market)
- R-22. The selling price of a book can be modified at any time, being always kept the history of the price's changes.
- R-23. Discounts may be applied to any batch or any individual book. Discounts may be different depending on the type of customer (eg end customer, partner, store).
- R-24. The revenue associated with a particular book is the difference between its purchase price and the sale price to the customer after applying existing discounts.

In order to demonstrate the BI capabilities of the information architecture, UNIQUEBOOKSCO CIO wants to see how it would put the following questions:

- R-25. "What is the revenue associated with the sale of the book titled 'ABC' in 2022?"
- R-26. "What is the customer who bought more books to UNIQUEBOOKSCO in 2022?"
- R-27. "What is the middleman who bought more books to UNIQUEBOOKSCO in 2022?"
- R-28. "What is the vendor that supplied more books to UNIQUEBOOKSCO in 2022?"
- R-29. What percentage of books sold through intermediaries in relation to all sales carried in 2022?
- R-30. "What percentage of books sold electronically in 2022?"
- R-31. "What is the average sales margin in 2022?"
- R-32. "What percentage of books purchased in 2021 were sold in 2022 considering the total number of books purchased in 2021?"

1.1.3 Application and technological Infrastructure

- R-33. The integration of systems and technologies should use EAI and SOA design patterns and SOA.
- R-34. The problem and the benefit of using each design pattern should be properly documented
- R-35. All business supporting technology should focus on standard solutions.
- R-36. The architecture elements custom developed should focus on added value areas (and should be justified).
- R-37. The applications should be identified based on the BSP method (CRUD matrix).
- R-38. A service-oriented architecture should be used (business services, application services and technology services).
- R-39. The minimization of application integration and the data migration operations is an important factor.
- R-40. At the application level you should try to use all of AWS services from Amazon.com
- R-41. The technological infrastructure should be managed by one or more external entities, being limited the own resources to resources that are considered critical (each of these elements must be accompanied by a justification). It is necessary to define quality criteria's for the service.
- R-42. Daily payment files are transferred to the interbank network (with payments from online customers) in the countries where UNIQUEBOOKSCO operates (the network in Portugal is SIBS).
- R-43. When a payment is made in a traditional store it opens a synchronous communication, encrypted, and with guaranteed delivery of the payment between the terminal and interbank network.
- R-44. Applications responsible for inventory management and suppliers share the same database.
- R-45. The inventory and supplier databases should be physically supported using three replicas. The instances should be located in geographically separate locations to maximize availability in case of failure.
- R-46. The integration between applications and external elements is done through an ESB (Enterprise Service Bus). In the ESB, UNIQUEBOOKSCO CIO defined that:
 - R-46.1. All the integrations are asynchronous.
 - R-46.2. The integrations must be based on the standard "publish-subscribe".
 - R-46.3. Each system can maintain its own local data model, being the ESB transformation between data models

- R-47.** In order to ensure a 360° customer management UNIQUEBOOKSCO implemented a client management system. All interactions with customers (online and face-to-face), including the management of sales, deliveries, invoices, shopping cart, etc., are integrated in that system (aka CRM).
- R-48.** All UNIQUEBOOKSCO systems are presented to users via the company intranet. All access to this system require authorization. The external access to the system are performed via VPN.
- R-49.** The CIO wants to have the ability to check the use of all systems of UNIQUEBOOKSCO. To do this you should defined an architecture that supports the management of historic (log) of the systems.
- R-50.** Whenever possible, the business processes should be automated by management systems for business processes and / or systems management business flows (workflow).

1.1.4 Current Information System Components

Currently Uniquebooks has the following applications.

Application	Main Goal	Type	Data layer	Appication and presentation Layers	IT Plaform obsolescence	Vendor Satisfaction Level	Last Update	Application Satisfaction Level	Maintenance cost
Warehouse Management application	Application responsible for managing product stock levels and product distribution among stores	custom development	Postgresql	Java 7	H	L	set/21	M	H
Order fulfillment application	Application responsible for recording and managing customer orders	custom development	Postgresql	Java 7	H	L	jan/22	M	M
Contact Center Management	Application responsible for telephone and email interaction	Product - SaaS	SQL Server	Talkdesk	L	H	fev/23	H	M
Customer management application	Application responsible for recording customer data and interations with the company	Product - SaaS	SQL Server	SalesForce	L	M	mar/21	H	H
Catalog management application	Application responsible for managing the product, and prices	custom development	Postgresql	quarkus reactive	L	H	jan/23	H	M
supplier management system	Application responsible for managing the suppliers and partners	custom development	Postgresql	Java 7	M	L	jan/20	L	L
Payment system	Application responsible for supporting the payment process and methods by customers, including bank reconciliation.		Postgresql	Java 8	M	H	set/22	H	M
Finance system	Application responsible for the Financial record (including accounts payable, accounts receivable software -	Product (custom)	SQL Server	SAP - FI	L	M	set/21	H	H

H **High** value in factor

M **Average** value in factor

L **Low** value in factor

2. Project Goals

Your mission is to assess current business , information, application architecture of UNIQUEBOOKS, by proposing answers to the following questions. The models should be performed using ArchiMate. The report should answer the questions that appear below. This will involve choosing the most appropriate viewpoint.

1. Context.

- What is the context of the UniqueBooks?
- Which business units are involved in managing the flows between UniqueBooks and its context?

2. Products and Services

Which products and services are provided by UniqueBooks? To which stakeholders?

3. Big Picture

UniqueBooks CEO requested a “Big Picture” of UniqueBooks. Identify the main business processes, business units, applications, and infrastructure that supports NHS products and services.

4. **Strategy** (Means and Ends):

- a) What is the vision and the Goals of UniqueBooks?
- b) Propose a business model canvas for UniqueBooks, including its Mission, strategies, tactics, business policies and rules, requirements, and constraints.
- c) Are there any goals, principles or requirements that are contradictory among themselves?
- d) Are there any goals, principles or requirements that are misaligned, or not considered in the remaining Enterprise Architecture?

5. **Organization structure**

What is the **organization structure** (and roles) of UniqueBooks?

6. Business Process

What are the core UniqueBooks Processes?

- a) Inputs/outputs: Information entities
- b) Roles/ actors

7. Information Entities

7.1. What **Information Entities** support the business processes?

- a) Major attributes
- b) (business) Identifier
- c) Inmon classification for the attributes

7.2. What are the structural relations among the information entities?

7.3. In which business processes are the information entities created, updated, read, or deleted?

8. Application Architecture

8.1 AS-IS

- a) What are the **current applications** that support UniqueBooks processes?
- b) What processes and information does each application support?
- c) Just considering the IT Platform obsolescence, Vendor Satisfaction Level, Last Update, Application Satisfaction Level and the maintenance cost, classify each application in: “keep”, “discontinue”, “don't know”. Explain in detail your approach.

8.2. TO-BE

- a) Ideally, what **applications** should be available at UniqueBooks considering its business processes and information management (just considering the AS-IS business processes and information)? Or stated differently, if UniqueBooks had no applications whatsoever, what applications would you recommend to support current business and information?
- b) Considering the ideal application landscape computed in 8.2.a), review your answer to 8.1.c), and propose a roadmap for each application. Typical roadmap guidelines are: maintain, discard, replace, consolidate (with another), improve functionalities or upgrade technology.

- c) Do you recommend the usage of any application patterns?
- d) What Application Architecture do you recommend? Model the proposed application architecture, including the application functions, services provided or consumed by the business and by other applications.
- e) Besides the Application Structure, please also present the Application Usage, the Application Cooperation, and the Application Behavior viewpoints.

9. IT architecture

- a) What are the different technological options for implementing the applications?
- c) Do you recommend a custom development for all the applications? Or a “off-the-shelf” software package? Explain your analysis?
Recomendar CRM que existem no mercado - analise de mercado
- d) What is the Processing infrastructure do you recommend? What about Storage? And communication? **É uma view toda junta**
- c) What is your recommendation for the IT architecture?
- d) What are the dependencies between the IT infrastructure and the applications? Where does each application will run?
- e) Explain how did you implement each guidelines or patterns in the EA of UniqueBooks? Do you recommend to consider some other guidelines?

10. Roadmap

- a) What project roadmap do you recommend? Which solutions/applications should be implemented first? Where would you start?
- b) Considering existing applications (AS-IS) propose a global roadmap for the change.

The project should be demonstrated through a report that will use models to answer questions relating to UniqueBooks Enterprise Architecture. The models should be performed using ArchiMate 3, BPMN 2.0 and UML 2.5 models and can be produced with tools such as: Archi, and Enterprise Architect.

The report should answer the questions above using views in Archimate, BPMN, UML, matrix, graphs and supporting text. This will involve choosing the most appropriate viewpoint to support your answers.

It is expected, for the purpose of the course, that you make reasonable assumptions about topics that are not clear or where important information for the project execution may be missing in the documentation provided. Please state clearly in your report any assumption that you make.

3. Planning

The project is divided into two distinct phases, described in the following table. The main objective of the first delivery is to provide comments on the content of the preliminary work. The following table identifies the expected focus for the first stage and the final delivery.

Table 1. Project planning.

Phase	Due Date	Focus
Phase 1	24 March	Questions 1 – 8.1
Phase 2	10 April	Questions 1 - 10
Discussion	11 April	Project presentation

4. Project Delivery

- Each delivery shall consist of a single file in ZIP format with:
 - A project report in a single PDF document with the following structure:
 - Introduction.
 - Answer to the questions. Each question should be answered by one or more models and being explicitly identified by its number and name.
 - For the final phase all source files used to prepare the project must be submitted (eg, Archi, Enterprise Architect, Excel, Word)
- The name of the file and all files included in it should be prefixed AE-N where N is the number of group
- Projects will be delivered electronically via the Fenix until the deadline described therein.

5. Project Evaluation

Students are encouraged to undertake the first phase of the project in order to obtain comments regarding the work done. The final project evaluation will be based on the results shown in the following areas:

- Technical quality of the overall enterprise architecture.
- Quality of individual artifacts produced.
- Structure and technical quality of the report.
- Project Presentation and discussion (in English).

The discussion will last for 15 minutes per group. In the first 10 minutes of discussion, the group should make a presentation summarizing the project done.

References

The additional support material needed for the project will be posted on the page EA Fenix (Project section). The reference list below contains links to references relevant to the project.

- APQC, "APQC Process Clarification Framework (PCF) - Cross Industry, version 7.3.0, 04/05/2022," 2022 (available online at <http://www.apqc.org/pcf>).
- Microsoft Corp., "Microsoft Dynamics RoleTailored Business Productivity ", 2007 (available online at https://download.microsoft.com/documents/uk/dynamics/crm/Microsoft_Dynamics_RoleTailored_Business_Productivity_whitepaper.pdf).