Integrating Benefits Dependency Network in ArchiMate

Fernando Antunes[1,2][0000−0002−0129−6136] and Sérgio Guerreiro[2,3][0000−0002−8627−3338]

[1] Universidade Aberta, R. da Escola Politécnica 147, 1269-001 Lisbon,Portugal
[2] INESC-ID, Rua Alves Redol 9, 1000-029 Lisbon, Portugal
[3] Instituto Superior Técnico, University of Lisbon, Av. Rovisco Pais 1, 1049-001 Lisbon, Portugal
1102656@estudante.uab.pt,sergio.guerreiro@tecnico.ulisboa.pt

Abstract. A significant number of IT projects fail to deliver the desired outcomes. Failure causes include *(i)* the dominance of black-box financial management approaches offering poor indicators, *e.g.*, return-on-investment or cost reduction, or *(ii)* not identifying the real business benefits provided by the value that can be generated by an IT investment. The Benefits Dependency Network (BDN) provides a solution to link the essential IT capabilities with the business changes necessary to deliver those benefits with the overall investment objectives and required benefits. Alignment between Information Technologies (IT) investments and business objectives is recurrently referred to in the literature as a paramount task owning a direct impact on the organization's profit. Enterprise Architecture (EA) plays an important role in describing the dependencies between an IT migration road map and the business counterparts, therefore, facilitating stakeholder's decisions. This paper proposes a new ArchiMate viewpoint to model the understanding, designing and managing of the business benefits of an IT investment. The solution is demonstrated in an industrial case that provides the ground to argue the integration of BDN in ArchiMate, in specific the relationships between the different architectural layers with an appropriate level of abstraction to support the decision-making process.

Keywords: ArchiMate · BDN · Business Benefits · Enterprise Architecture

1 Introduction

Evidence shows that a significant number of IT projects fail to deliver the expected outcome in what concern business benefits, *"recent surveys continue to show that this is the case in about 70-85% of IT investments"*[24]. The causes for such a high rate of failure is attributed to the dominance of the financial management and focus on indicators as ROI and cost reduction and not properly identifying the real business benefits of the value that can be generated by the investment.

The benefits management approach consists of a plan to realize benefits starting on the initial definitions and accurate definition of the expected benefit outcome for the project but linked across project implementation and post-implementation to guide decisions on how to adjust project scope, to keep in line with the projected benefits.
The Benefits Dependency Network (BDN) model [24] provides, and using the author's words, *"a framework for explicitly linking the overall investment objectives and required benefits, with the business changes necessary to deliver those benefits and the essential IT capabilities that enable the changes"*.
Establishing Benefits Management as a process has the objective of ensuring that realization of IT investments delivers the promised benefits to the organization. To be materialized, the benefits need to be actively managed during the project lifecycle [20].
The alignment of investments on technology platforms and business is crucial to achieving the outcome of business objectives. For this reason, Enterprise Architecture (EA) has taken an important role to support stakeholders as *"EA standards provide a road map to organizations for introducing technology, data, and process standardization and integration across the enterprise"*[6].
The adoption of EA practice by major organizations worldwide as *"The insights provided by an enterprise architecture are needed on the one hand in determining the needs and priorities for change from a business perspective, and on the other hand in assessing how the company may benefit from technological and business innovations"* [16].
The objective of this work is to provide a solution on how to model the alignment of the Benefits Dependency Network framework with ArchiMate to provide an integrated model to manage the benefits of IT investments. The result is an artifact that can support the project management process in terms of managing benefits in an integrated view between business objectives, business processes, and technology. This document is organized as follows. Firstly, in section 2 the background and the related work are presented. Then, to achieve the integration of the BDN framework in the Architectural domain via ArchiMate, a concept correspondence model was created to provide the correspondence between concepts and relationships, section 3. Afterward, a demonstration of the proposal consists of the application of the developed model to a real case study in a concert hall, section 4. Section 5 provides the results of the conceptual evaluation of the model and from interviews with experts that evaluated the model and it's application. Finally, in section 6, the conclusion regarding the achievement of the objectives and what further work can be taken to complement the solution to the research problem or to extend it into other areas.

2 Theoretical Background

Business Benefits Management and BDN: A considerable number of IT innovation projects suffer from the fact that the technical solutions they propose never materialize. Besides they result from high investment into specification and

development, they became just another information system or prototype proving a novel concept and failing the integration into real life situations. Such projects fail because they result in just a technology push and are launched missing a proper analysis of the business problem in its enterprise context. *"To avoid such situations, any architecture change should be first judged from the perspective of its business fitness. To make this possible, a technique is necessary for relating enterprise architectures to business models"* [14].

Surveys have demonstrated that only 30% of projects delivered the expected benefits, either because they were not existing or achievable or in 40% of the cases, they were not managed besides they were feasible. Benefits Management as a process has the objective of ensuring that realization of IT investments delivers the promised benefits to the organization. On implementing changes, these have to be managed to take into consideration that only through successfully managing the change, benefits can be realized [24]. *"Understanding the business context of the investment being considered is critically important. All too often, IT projects quickly become technology projects, rather than primarily business change projects with an IT component, and the context for the investment is soon forgotten"* [21]. IT investments do not deliver benefits or create value by itself. Benefits arise when IT enables people to do things differently by performing their roles in more efficient and effective ways. But, to be materialized, the benefits need to be actively managed during the project life cycle [20].

Benefits management is one of the processes through which effective project governance improves project success. Project governors should champion benefits realization in the project governance system, enabling the development and implementation of a comprehensive benefits management process [3, 2].

Benefits Management approach involves essential business-related domains. *"Development of the BDN not only enables the knowledge and experience of business managers to be applied more coherently to planning the investment, it creates a clearer understanding of how different groups need to work together to achieve the benefits"* and provides a process to manage the potential benefits from IT investments. As [24] stated, by involving key stakeholders on a benefits realization plan, *"many organizations that have adopted this approach have not only improved the success of their IT projects but they have also significantly improved the relationship between their business and IT staff."*

Benefits identification is a critical step in the benefits management process, which seeks to identify and document the benefits that will be the most relevant. Also, convincing contextually impacted stakeholders that need to be involved in the process as it's a key success factor for benefits realization [25]. The benefits management involves 5 stages [18]: Identifying and structuring benefits, planning benefits realization, executing benefits realization plan, evaluating and review results, and discover the potential for future benefits.

In the realization plan and through the investment life cycle, the potential disbenefits of the system should also be considered, i.e. what adverse impacts on the business organization it could have [17, 23]. BDN acts as a mechanism that maps the changes required for benefits realization. By enabling and subsequently

sustaining change, the benefits of using technology can be realized [18].
Framework implementation defines the following five iterative steps: 1, Identify and Structure Benefits; 2. Plan benefits realization; 3. Execute the benefits plan; 4. Review and evaluate results; 5. Establish the potential for further benefits. Benefit Dependency Network, represented in Fig. 1, is defined, as the realization

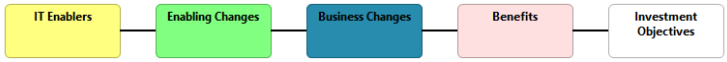


Fig. 1. BDN - Benefits Dependency Network [23]

of benefits, depending on changes to business processes and relationships on the ways in which individuals or groups work within the organization. BDN network construction is processed from right to left. Starts with the drivers, agree with the objectives for a particular investment. These must be identified and described together with the business benefits that will result if the objectives are achieved. Follows with the Business Changes that enable the Benefits. Enabling Changes consist of pre-requisites to the Business Changes implementation and finally, the Enabling IT structures are defined on the left of the scheme.

Table 1. BDN Concept Description [23]

Drivers	The forces internal or external causing the organization to make changes.
Investment Objectives	The agreed objectives for the investment.
Benefits	Identified benefits to be delivered by the project.
Business Changes	Required processes, activities, roles and responsibilities.
Enabling Changes	Actions required: training, education, information requirements, data migration, business rules, new application. Resource reallocation.
IT Enablers	IT systems to be considered or other technology than IT

EA and ArchiMate:

"An architecture is the fundamental organization of a system embodied in its components, their relationships to each other, and the environment, and the principles guiding its design and evolution" , as defined by the ISO/IEC/IEEE[1]. EA definition establishes a holistic vision of an organization considering the introduction and development of information systems to enable the organizations to achieve their business objectives.

ArchiMate is a de facto standard for EA practitioners and provides a vision of the architecture representing the distinct elements that assist decision making and stakeholder information through the representation of enterprise architectures over time, as it consists of a graphical modeling language [13].
The core language consists of three main types of elements: Active Structure elements, Behavior elements, and Passive structure elements. Based on these elements a layered structure results from the specializations of the core concepts. Architects and other stakeholders can define their views on enterprise architec-

ture. These views are specified by viewpoints that define abstractions on the set of models representing the enterprise architecture, addressing specific types of stakeholders, and sets of concerns [13].

Most EA modeling techniques focus on what the enterprise should do by representing 'as-is' and 'to-be' architectures in terms of informational, behavioral, and structural model elements at different architectural layers, e.g. a business, application, and technology layer. Little or no attention is paid to represent (explicitly) the motivations or rationale, i.e. the why behind the architecture in terms of goals and requirements [11]. The implementation of IT technology requires an integrated vision on the relation it has with the business, and in the way, it will support the vision of the organization,to maximize the investment and benefits generated for the business [12]. A key element of ArchiMate is the layered view and ability to create distinctive viewpoints, to address each stakeholder's requirements, together with the possibility of accommodating extensions to the needs that arise from new concepts [13].
Studies enhance the relevance of the process to link high-level strategy with the resources and processes in place to achieve the strategic business directions. By making use of the ArchiMate extensions, we can ensure a smooth transition from operational architecture descriptions to strategic business models using motivation and resource–capability models [14]. By modeling the high-level strategy concepts, the impact of organizational change resulting from new strategies can be easier and more accurately determined than by using a business model. *"By relating strategy to architecture, we open the door to new possibilities such as making impact analyses of strategy on architecture and changes in architecture on strategy"* [4]. ArchiMate provides a formal basis for modeling business models. This facilitates tracking of requirements from business demands down to the design specifications. It helps in discovering the effects of business model changes on architectural design [19]. A fundamental challenge resides in defining mapping functions between the schemas that fit the context and purpose of the integration. The application of semantic techniques to enterprise modeling brings value to the enterprise engineering community of practice as it facilitates the integration and analysis of diverse modeling domains [8].

3 Solution Development

The Benefits Management approach involves essential business related domains. *"Development of the BDN not only enables the knowledge and experience of business managers to be applied more coherently to planning the investment, it creates a clearer understanding of how different groups need to work together to achieve the benefits they and the organization wish to gain"* [20]. In order to achieve benefit realization, business changes are put implemented, enabled by IT/IS implementations. This describes an abstract structure to explain [23]: **- Why** investment is being made? **- What** types of benefit is the organization expecting to achieve? **- How** can combination of business changes and IT deliver those benefits?

The business goals, principles and requirements that motivate the design of the enterprise, are not covered by the ArchiMate core concepts. These motivational properties modeling is achieved by the Motivation Elements [10]. ArchiMate language includes as motivation elements: Stakeholder, Value, Meaning, Driver, Assessment, Goal, Outcome, Principle, and Requirement [13]. The Strategy Elements are typically used to model the strategic direction and choices of an enterprise, as far as the impact on its architecture is concerned. They can be used to express how the enterprise wants to create value for its stakeholders, the capabilities it needs for that, the resources needed to support these capabilities, and how it plans to configure and use these capabilities and resources to achieve its aims [13, 5]. Value Streams can be decomposed into value stages that create incremental values contributing to the value proposition for the stakeholder. Value stages are mapped to business capabilities to analyze an enterprise's current and desired ability to deliver the value proposition, and are a fundamental strategy element [22, 9].

Table 2 and 3 establish the mapping between BDN and ArchiMate concepts and relationships respectively. An ArchiMate BDN viewpoint is proposed as a final step. The following text justifies each conceptual correspondence.

BDN Business Driver Concept: Internal or external issues, specific to the context, that executive and senior managers agree that the organization needs to make changes and the timescales for those changes [23].
ArchiMate Driver: *"A driver represents an external or internal condition that motivates an organization to define its goals and implement the changes necessary to achieve them."* [13].
Justification: Clear semantic alignment between ArchiMate **Driver** concept with the **Business Drivers** on BDN. The Driver has no representation on BDN, however is a fundamental element on the benefit realization plan.

BDN Investment Objectives Concept: Statements that describe what the organization is seeking to achieve from the investment. A description of what the situation would be on successful completion of the investment[23].
ArchiMate Goal: *"A goal represents a high-level statement of intent, direction, or desired end state for an organization and its stakeholders. Goals are typically used to measure success of an organization"* [13].
Justification: ArchiMate **Goal** is semantically aligned with BDN **Investment Objectives**.

BDN Business Benefit Concept: An advantage of a stakeholder or group of stakeholders.Implies that the benefits are "owned" by the individuals or groups who want to obtain value from the investment [23].
ArchiMate Outcome: *An outcome represents an end result. Outcomes are high-level, business-oriented results produced by capabilities of an organization, and by inference by the core elements of its architecture that realize these capabilities. Outcomes are tangible, possibly quantitative, and time-related.An outcome may have a different value for different stakeholders* [13].
Justification: ArchiMate **Outcome** concept is semantically aligned with BDN **Business Benefits** concept.

BDN Business Changes Concept: New ways of working that are required to ensure that desired benefits are realized, this will be the ongoing ways of working in the organization [23].
ArchiMate Value Stream and Capabilities: *"The strategy elements are typically used to model the strategic direction and choices of an enterprise, as far as the impact on its architecture is concerned. They can be used to express how the enterprise wants to create value for its stakeholders, the capabilities it needs for that, the resources needed to support these capabilities, and how it plans to configure and use these capabilities and resources to achieve its aims.*" If multiple actions need to be put in place to achieve a benefit, a value stream can be used for modeling the business changes as "Value stream represents a sequence of activities that create an overall result for a customer, stakeholder, or end user"*."Value streams are combined by capabilities alignment, a capability represents an ability that an active structure element, such as an organization, person, or system, possesses." "Capabilities are expressed in general and high-level terms and are typically realized by a combination of organization, people, processes, information, and technology"* [13].
Justification: ArchiMate **Value Stream** and **Capability** concepts are used in conjunction to align with concept BDN **Business Changes**.

BDN Enabling Changes Concept: Prerequisites for achieving the business changes or that are essential to bring the system into effective operation within the organization. Enabling changes are "one-off" activities rather than ongoing ways of working. Agreeing new working practices, redesign processes, change to job roles and responsibilities, training, new business skills [23].
ArchiMate Course of Action:*"A course of action represents an approach or plan for configuring some capabilities and resources of the enterprise, undertaken to achieve a goal"* [13].
Justification: The BDN concept relates to an action that becomes an IT enabler and represents a Behavior element which is defined for the ArchiMate Course of Action concept which defines an action that involves resources, defined on a plan to configure other capabilities. ArchiMate **Course of Action** concept was adopted on this model to represent BDN **Enabling Changes** concept.

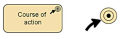
BDN Enabling IT Concept: Information systems and technology needed to support the realization of identified benefits and to enable changes. The IT enabler is defined as a structure element [23].
ArchiMate Resource: "A resource represents an asset owned or controlled by an individual or organization. Resources can be classified in different ways: tangible assets, intangible assets, and human assets" [13].
Justification: ArchiMate **Resource** concept from Strategy elements represents a capability provided by structural elements.Very broaden in the type of elements that can represent, provides the BDN **Enabling IT** concept with different possibilities to extend to other types of structural elements.

Relationships: BDN Network use arrows that are drawn from objectives to benefits - each investment give rise to one or more benefits. Each connec-

tion consists of realization of each step. The correspondence representation and justifications is present on Table 3.

BDN to ArchiMate Correspondence Tables: BDN Concept and Relationships alignment with ArchiMate Concepts and Relationships are summarized in Table 2 and 3.

Table 2. BDN to ArchiMate Concept Correspondence

BDN Concept	BDN Description	ArchiMate Concept	ArchiMate Description
Business Driver	Issues with executive and senior managers agree to mean the organization needs to make changes and the timescales for those changes. Can be internal or external but are specific to the context.	Driver 	A driver represents an external or internal condition that motivates an organization to define its goals and implement the changes necessary to achieve them. The factors which influence other motivation elements. They can originate from either inside or outside the enterprise.
Investment Objectives	Statements that describe what the organization is seeking to achieve from the investment. They should be a description of what the situation would be on successful completion of the investment.	Goal 	A goal represents a high-level statement of intent, direction, or desired end state for an organization and its stakeholders.
Business Benefit	An advantage of a stakeholder or group of stakeholders that implies that the benefits are owned by the individuals or groups who want to obtain value from the investment.	Outcome 	Outcome represents an end result. Outcomes are high-level, business-oriented results produced by capabilities of an organization, and by inference by the core elements of its architecture that realize these capabilities.
Business changes	New ways of working that are required to ensure that desired benefits are realized This will be the ongoing ways of working in the organization.	Value Stream 	A Value Stream represents a sequence of activities that create an overall result for a customer, stakeholder, or end user.
		Capabilities 	A capability represents an ability that an active structure element, such as an organization, person, or system, possesses.
Enabling Changes	Changes that are prerequisites for achieving the business changes or that are essential to bringing the system into effective operation within the organization. Enabling changes are one-off activities rather than ongoing ways of working. Agreeing new working practices, redesign processes, change to job roles and responsibilities, training, new business skills.	Course of Action 	Represents an approach or plan for configuring some capabilities and resources of the enterprise, undertaken to achieve a goal.
IT Enablers	Information systems and technology needed to support the realization of identified benefits and to enable changes	Resource 	Represents an asset owned or controlled by an individual or organization.

The Benefits Management Viewpoint : Table 4 presents the Benefits Management Viewpoint Description and Fig. 2, the implementation of the proposed concept alignment and connections in order to represent the BDN Network.

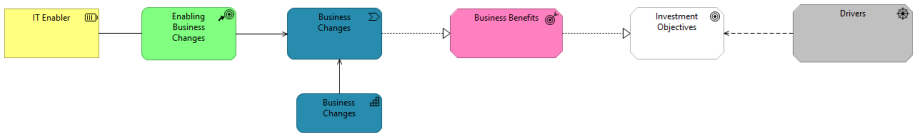


Fig. 2. BDN Viewpoint

Table 3. BDN to ArchiMate Relationship Correspondence

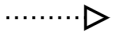
BDN Connections	Justification	ArchiMate Relationship	ArchiMate Description
Business Changes-Business Benefits.	Business Benefits is a result of realization of the precedent concept.	**Realization** 	The realization relationship represents that an entity plays a critical role in the creation, achievement, sustenance, or operation of a more abstract entity.
IT Enabler - Enabling Changes	In order too respect the ArchiMate Ontology when used in design tools as Archi this was the relationship used to connect IT Enabler and Enabling Changes	**Association**	The Association Relationship represents relationships that are unspecified or one that is not represented in ArchiMate.
Enabling Changes - Business Changes	Enabling Changes serves the Business Changes so Serving relationship is applied on the model.	**Serving**	The Serving Relationship represents that an element provides its functionality to another element
Driver - Investment Objectives	he Driver Concept has no representation on BDN , however is a fundamental element on he benefit realization plan and can, if required, be represented on ArchiMate.The BDN Driver influences the definition of Business Objectives,	**Influence**	The influence relationship represents that an element affects the implementation or achievement of some motivation element

Table 4. Viewpoint Description

Stakeholders	Stakeholders, business managers, enterprise and ICT architects, business analysts, CxOs, business managers.
Concerns	Business-oriented results, Architecture strategy and tactics.
Purpose	Designing, deciding, informing
Abstraction Level	Overview, Coherence, Details
Layer	Business, Application, and Technology layer.
Aspects	Motivation, Strategy

4 Application Demonstration

The demonstration of the proposed solution is based on a project to provide a Concert Hall, based in the city of Porto in Portugal with an IT system to manage: content production, archive and online content sales. The Benefits Management application to this case is based on the knowledge of the project and not as a process that has been taken formally for the purpose of the project. Following Benefit realization plan process, Drivers, Investment Objectives, Benefits, Business Changes, Enabling Changes and Enabling IT are identified and are summarized on Table 5, and explained as follows. **Project Drivers:** Preserve the activity of the Concert Hall as a cultural asset, Reduce the dependency of financing from external stakeholders and Provide visibility of the activities to stakeholders and the society, in order to demonstrate the value of the institution as a cultural asset. **Investment objectives:** Content preservation, content monetization and an automated workflow in order to not increase the headcount and as well as minimize workload impact on the existing staff. **Business Benefits:** Content archive availability to be used either for production as well as for historical preservation, the enabling of revenue from content production and an automation workflow to enable content production to use less resources in terms of headcount and processes. **Business Changes:** where mainly the definition of new workflows in order to produce content, manage the content archive and integration with the web portal platform, involving definition of roles for the different areas in order to provide each of the services. **The Enabling changes:** focused mainly on workflow and role definitions as well as training. **IT Enabler:** consists

on a content management system which integrates a workflow management tool that enables the digital processing of content from acquisition of content during events, thorough content post production using outsourced production, via an application on the cloud interfacing with the on premises system, and interfacing with Web Portal management and with an archive workflow. The business processes design focused on maximizing the operational efficiency through the use of the technology and enabled by workflow design and role definitions for each of the production roles. Technology enabler was provided by the Sony Navigator X platform, interfacing with Sony Ci Cloud and Optical Disc Archive system, and also by the design of scripts to interface with the institution web portal.

The application of the BDN framework to the case is expressed in the Table 5 and the graphical representation following the framework is represented on Fig. 3.

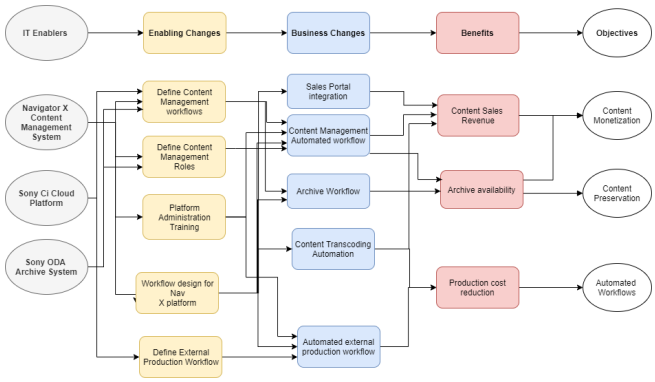


Fig. 3. BDN Framework applied to the Concert Hall use case.

The development of the architectural aspects of he solution, using ArchiMate provide stakeholder views in relation to all core project aspects of technology, application usage, business roles. Through the motivation extension is also possible to achieve a representation of the elements behind the project drivers and realization. However, the benefit realization management concept is not present in the ArchiMate motivation elements as well as the architectural views are not present in the BDN framework. Creating a viewpoint for the effect of benefit management, follows the guidelines expressed for using viewpoints [15]: **Scope:** as it selects the appropriate domain that needs to be represented or modelled, in this case the BDN domain; **Creation of views:** as it creates or selects the actual content of the viewpoint to create a selection or part of the larger pre-architecture model; **Validation:** this is still work in progress in order to obtain an agreement that the model is representative of the actual or intended situation. The purpose of this work is to provide stakeholders with the tools for the benefit realization inside the architectural domain; **Obtaining commitment**

about this model is the following step after validation that ensures that a commitment about the impact of what is described on the view; **Informing:** other stakeholders not directly involved about plans and impact.

As also defined [15], the creation of composite viewpoints is relevant to fit with the intended audience and need not to stick with the standard ArchiMate notation which allows the definition of new viewpoints. By providing the Benefits Management viewpoint on ArchiMate, is possible to establish the link with views covering different domains of the Architecture. This supports the understanding on how specific aspects on the business or technical viewpoints can affect benefit realization. Fig. 4 presents a representation of the integration of the BDN ArchiMate view with other architectural domains for the Concert Hall case. On the left side of the model is present Technology and Business domains representation, for this case, and by the integration of BDN in ArchiMate, these domains can be related with the appropriate BDN concepts for the purpose of benefit realization management.

In a similar process, specific capabilities considered for the benefit realization process can benefit from views that represent the resources and processes that are associated to their realization, addressing specific stakeholder concerns that require deeper insights of the core layers associated to the benefit realization management, represented on Fig. 5. BDN integration on ArchiMate can scale up or down the views intended for communication and evaluation at appropriate stakeholders level, accomplishing the informational objective of modeling and supporting the decision making process.

Table 5. Concert Hall BDN Concept Identification

Drivers	Provide Stakeholders (Patrons and State and Community) with visibility of the activity./ Preservation of history of the Institution./ Reduce the dependence on external financing by self-financing.
Investment Objectives	Content Monetization. / Content Preservation./ Automated Workflow.
Benefits	Content Sales Revenue./ Archive Availability. / Cost reduction of Content Production.
Business Changes	Sales Portal Integration./ Content Management Automated Workflow./ Archive Workflow./ Content Transcoding Automation. / Automated external post production workflow.
Enabling Changes	Define Content Management Workflows./ Define Content Management Roles./ Training for Content Management Aplications. /Platform administration training. /Workflow design for Nav X platform.
IT Enablers	Navigator X CMS. /Sony Ci cloud platform. / Archive Solution based on Sony ODA drive.

5 Evaluation

Wand and Webber The evaluation at this stage was performed on a first step by applying the Wand and Weber method, where two languages are compared in order to identify the existence of ontological deficiencies: Incompleteness, Redundancy, Overload and Excess [7]. By this analysis we can verify that no concepts

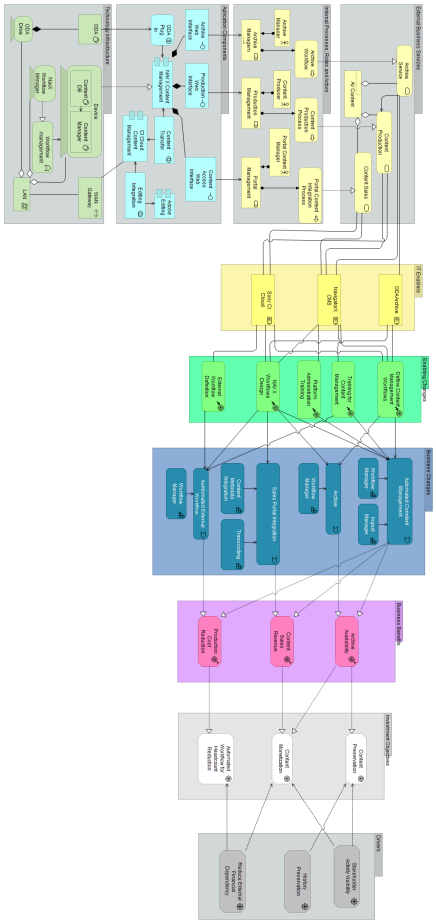


Fig. 4. Relating BDN Viewpoint integrated with core EA layers

are missing in terms of representation between both representations and also there is no lack of clarity as all concepts can be only mapped into concept as well as each concept is only mapped into one concept. This prevents ambiguity and provides clarity on the mapping definitions. Also the results offer the evidence that reversing the mapping from ArchiMate concepts to BDN provide the same results.

Interviews with Experts Interviews with eight industry experts in the area of the modeling and architecture consulting were conducted to evaluate the model proposed from different perspectives: *(i)* the value provided by the model to the EA discipline; *(ii)* Areas where it can provide additional interest; *(iii)* Quality of the conceptual integration; *(iv)* Usability and readability either from the modeling point of view or the stakeholder point of view; *(v)* Identification of areas for future work to enhance the value provided by the model.

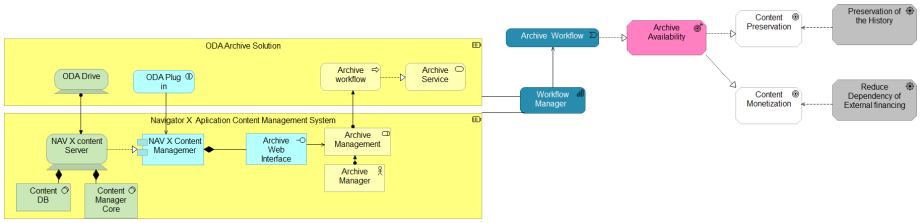


Fig. 5. Concert Hall Archive Workflow Capability View

A quantitative evaluation was applied to evaluate the coherence of the concept mapping and the readability when applied to a real-life use case. The expert's evaluation attributed a rate of Good (4 on a scale of 1-5 with std dev of 0,92) for the model and Good (4 on a scale of 1-5 with std dev of 1) for the application to a real-life scenario. Also, experts agreed that value added by the integration of the BDN framework inside an EA methodology provides a tool to communicate the architecture in a more holistic view to business stakeholder's and also to focus the context of the business perspective, through the benefits and not just on the technology implementation.
From the replies obtained, emerged that the model can provide a more focus on business perspective instead of technical focus, and also that can generate relevant views to address stakeholder's concerns, mainly on the communication of technical aspects with C-level stakeholder's. The interviews pointed out that modeling needs to be conscious of the number of elements as it can cause an increase of complexity against the need for simplicity.

6 Conclusions

The objective of this work was to produce an artifact capable of providing the representation of a modeling process to represent BDN on ArchiMate.The artifact proposed has been developed to identify the consistency between BDN concepts and ArchiMate concepts, taking into consideration the fundamental EA concepts. The artifact applied to a use case provided a representation of BDN in ArchiMate. The benefit of this representation opens the possibility that Stakeholders can develop specific views connecting to other architectural aspects and enabling benefit realization management integrated into the architecture of the organization and consistent with the modeling guidelines for viewpoint creation. It provides a framework, under an EA process, to support the benefits management and provide stakeholders and either technical or business project manager a tool to achieve the benefits objectives, identify new benefits, and identify disbenefits. Disbenefits is defined by Ward [23] to express the negative impacts of the technology implementation that are opposed to the benefits.
The demonstration produced on this work evidences that integration of BDN in ArchiMAte provides the tool to address Benefit Realization within the architectural domain and providing the possibility of enabling different views to address

the specificity of stakeholder's concerns.
By the demonstration produced on this work, was possible to evidence that integration of BDN in ArchiMAte provides the tool to address Benefit Realization within the architectural domain and providing the possibility of enabling different views to address the specificity of different stakeholders concerns. This research identified areas for future work. Benefits Management Plan requires the integration of performance indicators for investment objectives and benefits as the BDN framework determines that these concepts need to be quantified and measured. In ArchiMate, valued measurements related to performance indicators as cost, value, etc., can be incorporated in property fields of relevant concepts. The use of this possibility or consideration of different alternatives requires further development of the model. Also, the need to represent the owners of the realization of the Investment Objectives and Benefits in a modeling artifact to complement the BDN viewpoint, in the same way, it is defined in the Business Benefits Management Plan. Archimate includes the Roles and Actors concepts that can address this requirement. Future work needs to be developed to produce the integration model. The limitations identified in the research are the application to a specific industry context that can limit the generalization of the model and the demonstration produced using a project that was already implemented and not along with the project implementation that could bring an additional perspective of the real-life scenario use.

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