Wardley Maps in Enterprise Architecture

Graham McLeod[1,*]

[1]Inspired.org, 4 Richmond Ave, Pinelands, 7405, South Africa & University Duisburg-Essen, Germany

Abstract

Enterprise Architecture is a widely applied discipline to assist enterprises in making strategic change and aligning business and IT strategy. Business Architecture and Technology Change are addressed in many EA Frameworks and Methods, but few properly consider the context of the enterprise. The Inspired EA Frameworks and Holistic Architecture Language are differentiated by a high focus on contextual awareness and being meta model driven to facilitate coherence across architecture domains. Wardley Mapping was introduced over the last decade to address the contextual factors, value chain of delivery to end customers and movement of elements in the landscape to higher levels of maturity (evolution). The paper discusses why Wardley Mapping is a good complement to EA models, how Wardley Mapping can be integrated with EA and the advantages that this can realise. It offers potential extensions to Wardley Maps and a meta model fragment to integrate maps with the EA world.

Keywords

Wardley Mapping, Enterprise Architecture, Meta Model, Enterprise Modelling, Context Analysis

1. Introduction

1.1. Enterprise Architecture

Enterprise Architecture is well established as a discipline which can assist organisations to more successfully plan and execute strategic change. It typically incorporates the domains of business, application systems, data/information, technology/infrastructure and security. There are many EA frameworks, methods and models available [1,24,25,3,7]. None of the major frameworks formally incorporate Wardley Mapping [19] at this time.

1.2. ArchiMate®

ArchiMate® [2] is a standard maintained by The Open Group which aims to provide a notation for expressing enterprise architecture models graphically. It has layers for business, application, information and technology. Each layer incorporates services and components. These layers are normally shown top down from business to process, to application, to data and technology. Each layer typically has components providing services to the layer above it.

1.3. Inspired Frameworks and Holistic Architecture Language (HAL)

Inspired.org has evolved Enterprise Architecture methods, frameworks and meta model for over two decades [21]. The approach is highly meta model driven with the goals of (inter alia): improving rigour, facilitating integration of domains, supporting reuse of architecture elements across various models, artefacts and analyses.

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*Corresponding author.

graham@inspired.org (G. McLeod)

In particular, the meta model underpinning the method has evolved over many years to be very comprehensive. It includes extensive coverage of business architecture and strategy concepts, including many which are contextual, rather than internal. The current model is dubbed the Holistic Architecture Language (HAL) [18]. It is a superset of models such as those which would support TOGAF® [1], Zachman [24], DODAF [25, 6], the BIZBOK[4], ArchiMate®[2], MEMO [3], Business Model Canvas [9] and Enterprise Engineering [7] approaches. Due to its comprehensiveness, we regarded this as the best candidate to contemplate support for Wardley Mapping. Reference [20] provides a good summary of the HAL Business Architecture fragment.

1.4. Wardley Mapping

Wardley Mapping [19] is a technique developed and promoted by Simon Wardley over the past two decades. It has gained popularity as a tool for analysing enterprise current state and situation, likely changes in the environment & technology and planning strategy and transformation. Wardley Mapping assists analysts to identify critical elements supporting delivery of value to customers and how these are realised. It highlights how these elements may evolve over time and how this impacts opportunities and informs strategy. It brings an essential element of dynamic behaviour and movement to enterprise modelling. It provides techniques for categorising stage of evolution of components and predicting their future states. It has been widely used in both industry and government, particularly in the UK [27, 28].

1.5. Motivation

Wardley introduced his concept of mapping to overcome limitations of strategy and EA techniques available in the literature and practiced in industry. He felt that these did not provide sufficient context of an organisation's position relative to the landscape, where the latter could include many factors, such as location, industry, resources, strengths, weaknesses, legal environment, technology change and more. In this respect his motivations were largely similar to those of Inspired in extending business architecture techniques to include many contextual items.

Wardley also provides important techniques for classifying the state of evolution of various components and how they are likely to mature. This adds an important element of movement to models, which allows better consideration of strategic options.

Our motivation to use Wardley Maps stems from the above factors. Our motivation to integrate the mapping into our EA techniques and meta models is based on the following advantages that can be realised through a successful integration:

- Reduced Effort - When using multiple techniques and models, we can re-use work that has already been done in other analyses and data that has previously been gathered, analysed, refined and agreed
- Improved Fidelity - By using components that are well defined (as in a meta model) and well related in the meta model, we can include elements which are better defined and better understood. (Re)using items which are available in the repository and across model types allows insights from various analyses to inform other activities
- Richer Model - By more carefully identifying the types of components in the models we can ensure that we are finding appropriate elements at various levels (aiding model completeness and integrity). Visual differentiation of item types in the models can enhance understanding for those reading the models and convey additional information at very little expense

We can summarise our objective as: Enhancing EA by adding the important dimension of tracking the evolution of components through stages of maturity, while enhancing Wardley Mapping rigour and value by providing well defined components widely accepted in EA methods.

2. Wardley Mapping Essentials

2.1. Purpose

Wardley maps are used to understand the customer/end user for whom an enterprise must deliver value; the means by which that value is created; the state of evolution of the elements supporting delivery; the likely developments in the relevant elements and the opportunities available for strategic change. It also has guidance for identifying dependencies, potential resistance and risk. It facilitates planning future delivery and strategy to get there.

2.2. Customer Focus

The starting point for a Wardley Map is the Customer or End User who should benefit from the Enterprise delivering value (the subject of the map). The Customer and their requirements should be well understood. Customers can be internal or external, can be seeking a product or a service.

2.3. Contributory Components

Supporting delivery of value to Customers, the maps include a variety of elements, including: Processes, Capabilities, Application Systems, Data or Information, Technology and Infrastructure. The list is not exclusive: any relevant element can be included.

2.4. Value Chain

Wardley Maps structure the supporting elements into a value chain. This is different to a Porter value chain [22]. The latter has a series of steps (in the primary value chain) that acquire inputs, translate them to something more valuable, structure interaction with the market, conduct sales activity and service or support the product/service in the field. Porter value chains also include support activities, such as finance, accounting, Human Resources etc. Wardley value chains are more a realisation chain working from the most visible (customer facing) elements to the least visible (back office) elements (e.g. a data centre). In this respect, they more closely resemble the layers in an ArchiMate® model or an Inspired 4 Layers Model. More on these later.

2.5. Axes

The vertical (Y) axis on a Wardley Map represents visibility (from the Customer perspective). At the top is the Customer or End User themselves. Below that are the Services or Product that they want or need. Below that are supporting elements that contribute to value delivery. Usually arranged in terms of dependency. E.g. a Process may depend upon an Application which in turn depends upon Data and a Platform; the Platform may depend upon Premises and Power, which would be at the lowest level.

2.6. Evolution

The horizontal (X) axis on a Wardley Map designates the level of evolution or maturity of components in the map. It ranges from low level of evolution to high, in four categories:

- Genesis - elements which are still new and for which no products or standards are available. Research and failure are typical
- Custom Built - organisations will need to build their own examples of these elements. This could include software, hardware, materials etc. The method of building is understood, but products are not readily available
- Product (+Rental) - The capability can be purchased, leased or rented from suppliers. The capability requirements are well understood. There are multiple offerings available in the market
- Commodity (+Utility) - There is a mature market with many vendors and offerings.

Competition is primarily on price, performance, convenience and service delivery

Wardley provides guidelines for determining where an element should be placed on this axis.

By building the map top down, respecting realisation (going down) and dependency (of higher level elements on lower level ones) a value chain is constructed. By placing the elements horizontally in the appropriate category box, the state of evolution can be appreciated.

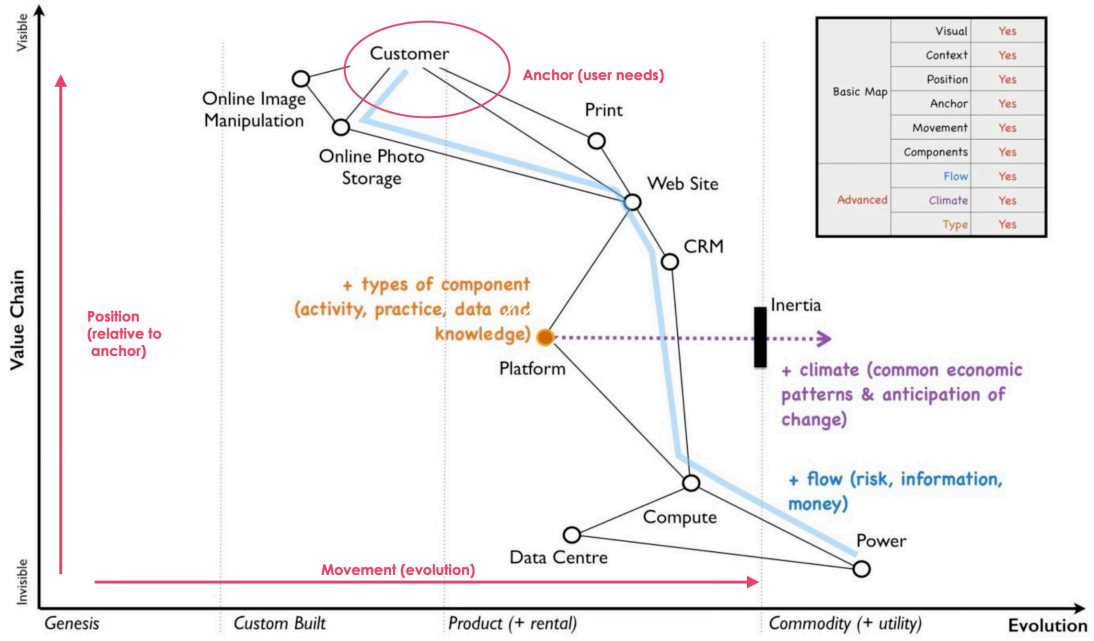

Figure 1 - Wardley Map (composite notes, source: [19])

3. EA Artefacts

3.1. Value Chains and Capabilities

Various EA methods include the concepts of Value Chains, Value Networks, Value Streams and Capabilities [1, 4, 21]. Value chains were originally introduced by Michael Porter [20]. A value chain specifies what an enterprise does to add value to inputs from the environment in producing an output that is attractive to its customers. I.e. what the steps are to *add value* over the input. The primary value chain consists of steps including:

- Inbound Logistics - how the inputs or raw materials are acquired
- Operations - how the inputs are transformed, enhanced or combined to create the output product or service
- Outbound Logistics - how the resulting product or service is delivered to end customers
- Marketing and Sales - how we choose what to make, who to sell to, how to price the product or service and how to engage with potential clients and achieve sales
- Service - how the product or service is sustained or supported in the market after deliver

There is also consideration of support activities, which run in parallel to the primary value chain, but are not broken into steps. These will typically include activities such as: Accounting, Human Resources, Product Development and Information Systems.

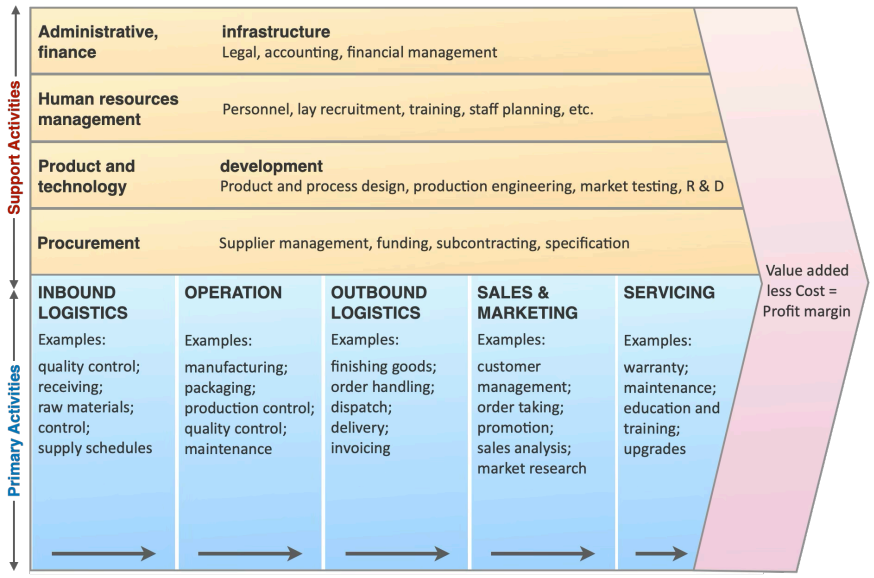

Figure 2 - Porter Value Chain Example, source: [22]

Value Streams are similar in concept, but are typically at a lower level of abstraction, higher level of detail and more limited scope. For example, we could do a Value Stream for the engagement of a new staff member, or contracting with a new distributor. Value streams document the key steps required to meet a high level goal. They will generally have an "end to end" perspective, i.e. what initiates the activity, what ensues and what is the end step that concludes that stream? An extension includes capabilities that are required to achieve the result. These are normally listed below the steps. A single capability may span several steps. A step can require multiple supporting capabilities.

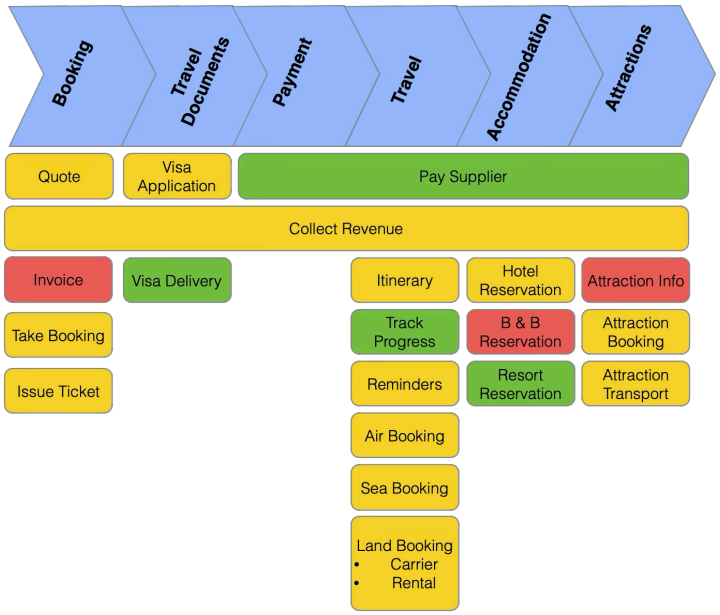

Figure 3 - Value Stream Example, source: Inspired

The definition of Capabilities varies across methods and authors. Most agree it is "the ability of the enterprise to do something". There is less agreement on what that involves. Many leave it at that as a sort of high level function that can be allocated to an organisational unit or role. The Inspired approach is much more definitive [21], including all necessary elements to actually deliver a product, service or artefact, including:

- The Function/Algorithm required - what must be done?
- The Process or Service to produce the result - what are the steps and necessary interfaces?
- Presence - what physical or location presence is required?
- Performance - is there a prescribed performance level, time of availability, volume handling requirement?
- Resources - what resources are necessary to actually fulfill delivery? This may include infrastructure, data etc.
- Language or culture - is there a required language, culture or behaviour?

3.2. ArchiMate® Layered Model

ArchiMate® encourages the development of layered models with stakeholder interaction at the top layer, process below that, application support, data and technology layers below those. The idea is that Business Services are realised via Processes, in turn supported by Applications which require Data and Infrastructure support. These models can be powerful in connecting the end result seen by stakeholders to the components which deliver the results. ArchiMate® models can become fairly large quite quickly, since there is separation of service and component at each layer. The overall concept is not unlike that of the Wardley Map value chain, however.

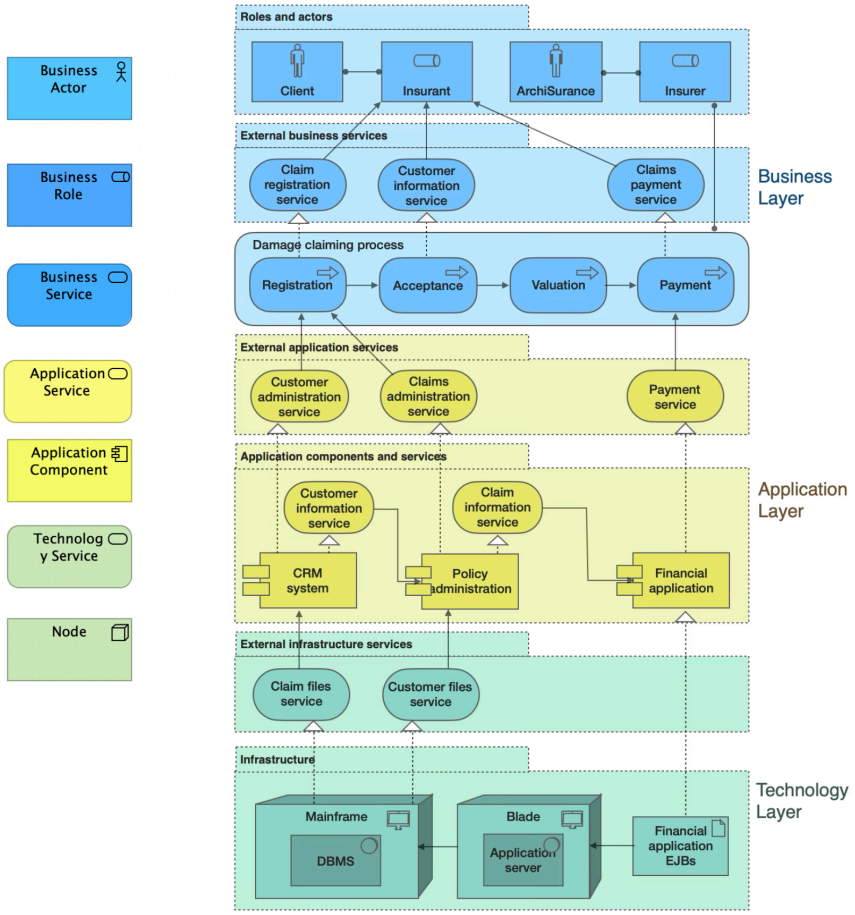

Figure 4 - ArchiMate® Layered Model Example, source: [2]

3.3. Inspired Four Layers Model

The Inspired approach includes a four layers model which shows: The Stakeholder(s) or Actor(s)

engaging with a system or process; the process steps; the supporting applications or application services; the data or information required and the infrastructure elements which these require. Rather than symbols, as used in ArchiMate®, the elements are usually shown via icons designating the type of item. The method and supporting tooling also advocates the idea of hiding intervening layers to identify dependency relationships between business layer elements and detail elements. The overall concept is not dissimilar to the ArchiMate® layered model or, indeed, the Wardley Map value chain.

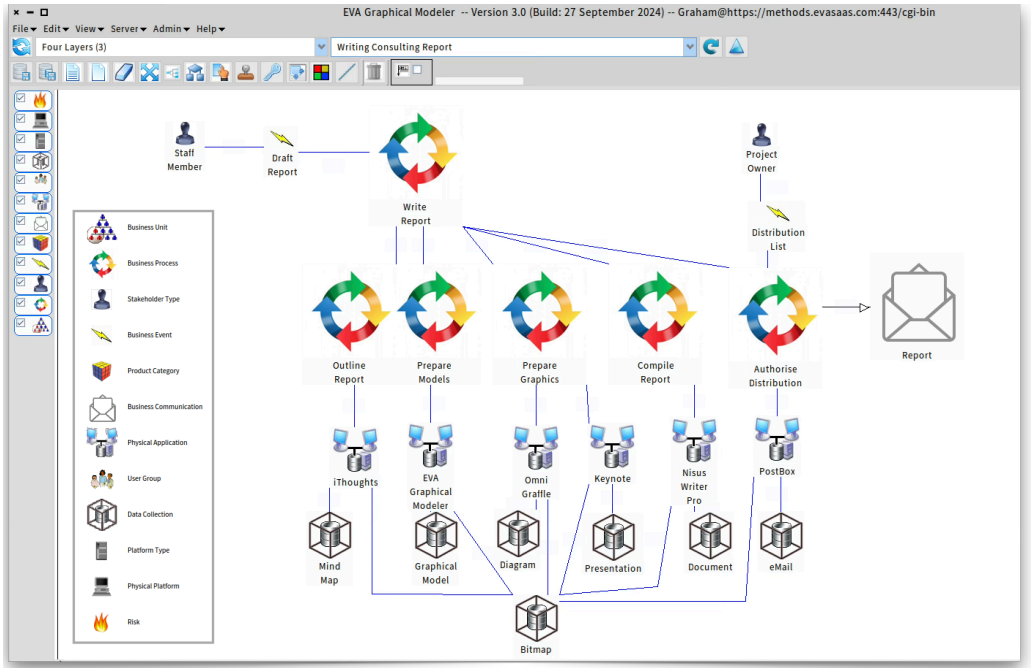

Figure 5 - Four Layers Model Example

3.4. SWOT and STEEPLED

Strengths, weaknesses, opportunities and threats (SWOT) analysis [29] is widely used in strategy work as one way of assessing the context, capabilities and challenges of an organisation. The two external elements of this (viz. Opportunities and Threats) are relevant to understanding context. They are present in the HAL models as subtypes of Motivation.

STEEPLED [30] is an approach derived from the earlier PESTEL as a way to consider contextual factors in strategic analysis of an enterprise. The acronym stands for: Social, Technology, Economic, Environmental, Political, Legal, Ethical and Demographic and refers to factors or change in these dimensions. It is a valuable technique for contemplating the context of an organisation and assessing changes that require a response in the organisation and its planning. The HAL model also caters for these, mapping them to subtypes of Driver, itself a subtype of Motivation.

3.5. Maturity Assessment Models

Maturity models were first developed by Carnegie Mellon Software Engineering Institute [26] and are widely used in architecture and information systems work to gauge the level of maturity of a discipline (as practiced in an enterprise), a process or a system. Inspired provides support for definition of various maturity models [15], ranking of maturity and guidance on improvement in the HAL meta model and tooling on the EVA platform [12]. This work has included the development of meta model components to support the generic concept of maturity, evolution and guidance. These ideas overlap with the concept of evolution in Wardley Maps, particularly the evolution axis.

4. Concepts and Meta Model

We now proceed to identify common concepts from the foregoing artefacts and models, with a view to integration of the Wardley Map technique into EA meta models and practice.

4.1. Stakeholders/Customer

Most of the models include the concept of a Customer, or more generically, a Stakeholder. This is usually the person or entity which receives the value generated. These map to HAL Customer_Type, a subtype of Stakeholder, in turn a role of Party.

4.2. Product/Service/Value

The Customer or Stakeholder should normally receive an expected value. This can be shown as a Value, or an Offering (super type of Product or Service). These map to HAL Business_Offering (super type of Product and Business_Service) which is a subtype of Value.

4.3. Functions/Process/Service/Capabilities

These include the actions which result in the transformation of the inputs to the value created. Functions describe what must be done, processes how it is achieved via various steps (which can be equated to functions). Services are functions performed by a provider on behalf of a receiver. The receiver can be a Customer/Stakeholder at the higher levels, but also other "clients" such as a Process, Capability or Business Unit at lower levels. Capabilities can be seen as functions, but can also incorporate notions of service, location, resources, culture and language. These concepts map to the corresponding HAL types Business_Function, Business_Process, Business_Service, Business_Capability.

4.4. Systems/Applications/Information

The above categories are often supported by technical components, including application systems and information. We have mapped these to the concepts of Application_Service (for application) and Business_Concept (for information). The latter is equivalent to the ArchiMate® Business_Object. If required, Physical_Application can also be included, but we would normally exclude it to simplify the model, unless the goal of the model is to contemplate new ways of delivering the application service.

4.5. Technology/Infrastructure

Technologies and infrastructure elements (e.g. a person-machine interface device, a server platform, a network element) are often supportive of systems and data delivery. These are mapped to the HAL Technology_Service and Technology types.

4.6. Resources

Resources may be required to underpin or support various elements. E.g. Power may be required to support the runtime technology infrastructure; Water may be required for a chemical process; Funds may be required for an advertising campaign. These are mapped to the HAL Business_Resource type.

4.7. Stage of Evolution

This can be mapped to the Maturity_Level concept in HAL.

4.8. Other Concepts

As noted above, nearly all the concepts that we need are already present in the HAL meta model [8, 13, 20]. We will need to add some relationships. We find some elements which are new to the Wardley maps, viz.

- The concept of a Barrier or Resistance which can inhibit change. This could potentially

translate to a Motivation in the HAL model, since it will require us to take some action. One could also motivate to consider it a Risk if it can potentially prevent achievement of the goals or delivery of value.

- The Wardley Map concept of Flow is easily accommodated by existing relationships in the HAL model of *precedes* and *follows* semantic relationship.
- The Wardley Map relationships from higher levels (e.g. Customer) to lower level (e.g. Product or Service) can usually be interpreted as the HAL *expects/expected by* semantic relationship.
- The Wardley Map relationships from higher levels (e.g. Product/Service) to Application Systems and Information; and from Applications Systems and Information to Technology elements can be modelled as *supported by/supports* semantic relationships.
- Another extension is the use of boundaries or zones to contain various map elements, usually when contemplating strategy, e.g. for grouping areas to focus on for projects. These can be thought of as analogous to swim lanes popular in methods such as BPMN. Inspired models have a more generic concept of bounding boxes or zones. These are generally just a container for a number of elements. When stored semantically, the normal relationship semantic from the container to elements is *contains/contained in*. Container instances can be created for each type of component included in the Wardley Map. These will be named for the corresponding type in the meta model (a power type pattern, as described by Odell [23].
- The Wardley concept of trends that should be included (e.g. from physical product, to virtual product, to commodity) can be mapped as a Driver, a subset of Motivation.

Adding these elements to the meta model results in the following fragment:

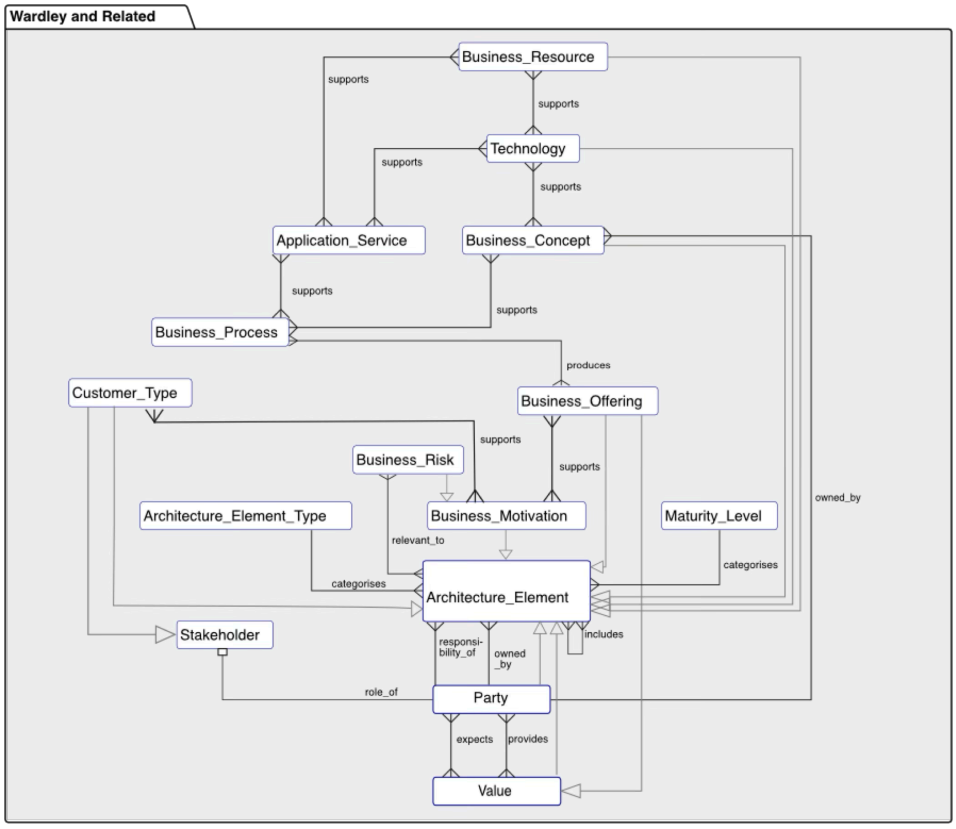

Figure 6 - Meta Model (subtypes of Motivation excluded)
Relationships: right of line read down, above line read to right

5. Graphical Modelling

In Wardley Maps, the main components are normally just shown as dots. They may be coloured or adorned. Colour is sometimes used to show responsibility (team or business unit), while adornments include a surrounding disc that may also be coloured. These typically show relevant roles, or appropriate methods.

We saw earlier that ArchiMate® uses compound symbols or icons to distinguish types of objects in models. Inspired models use either vector symbols or icons. Either of these approaches can also be used with Wardley Maps. Generally, icons are more compact and are preferable due to space constraints. An alternative is to use the normal dots but, in tooling, provide hover text that provides the symbol/type and details. A further option is to support clicking on the elements and displaying full details from a repository in either a lightbox or an adjacent panel.

If we want to avoid the visual noise of icons or symbols in the diagram, but still have some indication of type, we can do this by having horizontal zones or layers in the same fashion as the evolution axis provides. We can have a layer per type of object and place items in the appropriate layer.

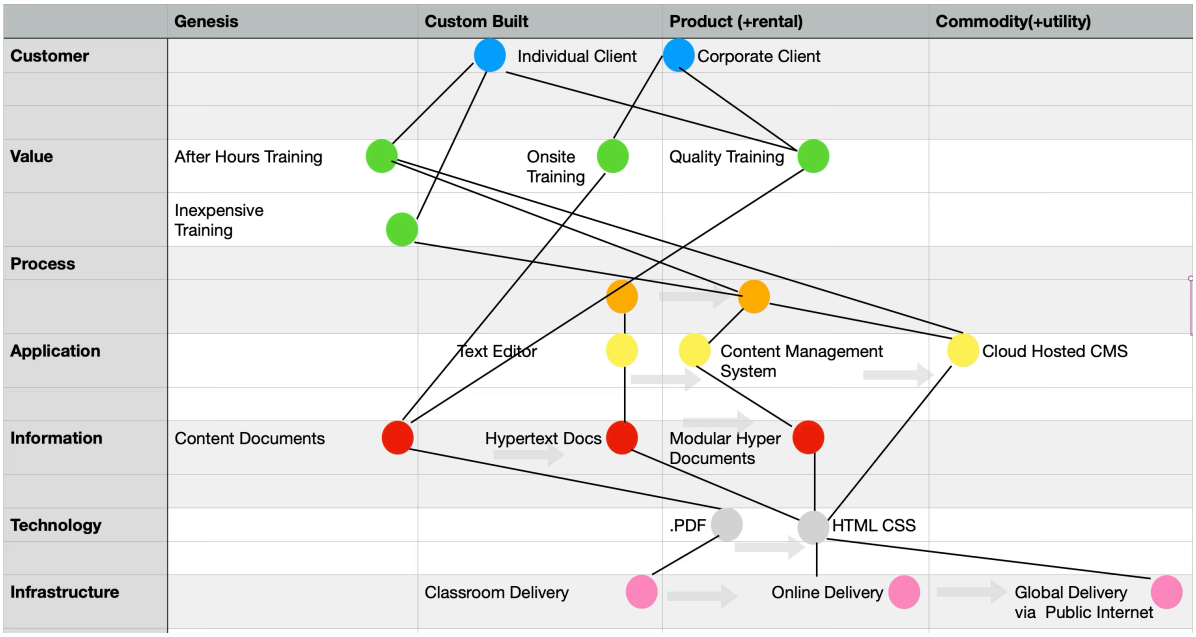

Figure 7 - Stratified Wardley Map (layers correspond to meta model types)

In this way, we can still easily determine the type (even without tool support) while keeping the map visually simple. Figure 7 shows an example of this arrangement. We can see the value chain (top down), the types of objects included in the analysis (layers) and the evolution of components with respect to maturity (within a layer, e.g. Applications, Information Format, Technology and Infrastructure).

We have implemented prototype support for Wardley Maps in the EVA Graphical Modeller [12] from Inspired. This was easily accomplished by extending the HAL meta model as described earlier in the paper and defining a suitable model type to map the concepts and the visual symbols required. We anticipate making this more powerful and polished in a production version.

6. Conclusion

It has proven relatively simple to add the Wardley Map approach to Enterprise Architecture

practices.

6.1. Advantages

Maps bring advantages of understanding context, territory, movement and strategic options as well as anticipating obstacles. They are an a-political and accessible means of discussing scenarios. The Wardley approach also provides guidance in the skills, culture and methods appropriate for various change activities (e.g. whether to use Agile, Lean or Six Sigma based methods).

The integration with EA allows reuse of elements previously captured for regular EA models, or the expansion of Wardley elements into other models. We feel that this significantly enhances both disciplines.

6.2. Issues

It is necessary to guard against making maps more complex than they need to be, especially visually. We have found that it is best to annotate maps (having several versions of a base map) to focus on the analysis at hand and include only the necessary elements for that discussion visually. Rigour can be achieved by identifying the components as architecture elements when created in a repository. Details can be retrieved interactively on demand via tooling, or printed with maps in generated documents.

6.3. Usage Experience

Since the first draft of this paper we have had the opportunity to use the integrated graphs in facilitated workshops with clients and in teaching of a Business Architecture Mastery Programme. This has supported our contention of enhancing EA perspectives as well as providing more rigour to Wardley Maps.

6.4. Futures

We plan to leverage Wardley Maps, integrated with EA in upcoming teaching and projects, as well as enhancing tool support. We are keen to engage with other groups working in similar areas. In particular, the approach suggested should be validated and refined through empirical feedback on the use of the techniques in the business architecture/strategy domain and in the application/ technology evolution domain.

Declaration on Generative AI

The author did not employ any Generative AI tools in production of this paper.

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