The Need and Requirements to a Strategy Ontology

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Abstract. The importance of strategy and strategy construct is not a new phenomenon. However as strategy work becomes less tangible, concerns with understanding, describing, and managing strategies develops into an increasingly complex subject. Current strategy concepts are dispersed and lack integration. Moreover, the enablement of modelling practices around strategy concepts considering the entire *strategy lifecycle* are also missing. Consequently, this paper focuses on issues with strategy in theory and practice, why a strategy ontology is needed and how this can be developed.

Keywords: Strategy Ontology requirements, Strategy levels, Strategy taxonomy, Strategy semantics, Strategy Lifecycle, Strategy artefacts, Strategy decomposition and composition, Strategy Meta Model, Strategy Modelling.

1 Historic Perspective

Strategy is a term that originates out of the Greek language stratēgia, (στρατηγία), where the meaning is centred on the military concept "art of troop leader; office of general, command, generalship" [19]. The expression ‘strategy’ came into use, in the 6th century AD (Islamic Hijri calendar -50) in the east roman area. It first entered the western world in the 18th century. At that time and until the 20th century, the word "strategy" contrariwise was known as "a comprehensive way to try to pursue political ends, including the threat or actual use of force, in a dialectic of wills"[4]. This was however more related to battle struggle, in which both opponents interact [4]. Today, within the defense industry it refers to planning directional components and manoeuvring the resources before the enemy is engaged. Once the enemy is engaged, strategy execution comes into play shifting attention to tactics. However, to ensure the continuous improvement of strategy, it is the activities undertaken at the operational level that enable this to happen. Knowing the centuries-old military origins of strategy allows us to connect some of the commonly business terms today, for example:

- Strategy refers to basic directional decisions, i.e. purpose and mission.
- Strategy consists of the important actions, to realise these directions.
- Strategy is also or has planning components
- Strategy is positioning; that is, it reflects on decisions needed to be a specific position in particular markets.
- Strategy is perspective, that is, vision and direction.
- Strategy is a "how," a means of getting from here to there.
- Therefore, strategy should answer the question: How should we allocate our resources? What are the ends we seek and how should we achieve them?

Henry Mintzberg already in his 1994 book, The Fall and Rise of Strategic Planning, points out that people use "strategy" in several different ways. For example, strategic planning isn't strategic thinking. One is analysis, and the other is synthesis [11]. In a 1996 Harvard Business Review article [13] and in an earlier book [12], Porter argues that competitive strategy is "about being different." He adds, "It means deliberately choosing a different set of activities to deliver a unique mix of value." In short, Porter argues to embrace strategy as both plan and position. Others such as Benjamin Tregoe and John Zimmerman [16], define strategy as "the framework which guides those choices that determine the nature and direction of an organisation." While Freedman debates that a strategy should describe how the ends (goals) will be achieved by the means (resources) [4]. Simandan, argues that strategy generally involves setting goals, determining actions to achieve the goals, and mobilizing resources to execute the actions [41]. Of course, there are many more definitions and descriptions that add to the confusion on what strategy is and what it isn't. Whilst various authors provide contrasting perspectives on what strategy is, we believe it encompasses the above perspectives. Therefore, strategy consists of: viewpoint, standpoint, direction, position, plan, pattern/concepts by which the ends will be attained. In a business context, we therefore use the strategy definition used by the enterprise standard body LEADing Practice in their Strategy Reference Content [10]. They define strategy as follows; *"Strategy is the direction, the plan and ends to which the enterprise seeks to position itself, as well as the means and methods by which the ends will be attained"*.

2 Strategy and its failure rate

There is an overwhelming amount of evidence documenting the failure rate on strategy execution. In 2016, Bridges, a reputable organisation surveying strategy execution since 2002, recorded a 67% failure rate [24].
McKinsey [28] reported that 70% of change initiatives linked to strategy fail. Weaker sources report failure rates of up to 80% and that 2% of C-level leaders are confident in achieving 80-100% of their strategy objectives [25, 26] .
There have been several studies into the economic impact of strategy failure. A revealing study in 2012 by Gene Kim and Mike Orzen highlighted a waste of $3 trillion on IT failures [29]. This focussed on the value that should be derived from IT which ultimately connects back to organisational strategy [29]. The waste amounts to 4.7% of global GDP. To put this into perspective, the United Nations (UN) claim that $267 billion per year would solve world hunger [30]. This is 0.3 % of global GDP, meaning that hypothetically a 10% decrease of strategy failure would satisfy the UN's figure of global GDP to solve world hunger [31].

Economic savings and gains for organisations that successfully execute strategy, would most likely not go towards ending world hunger. It could however be used to support growth. Organisational growth can result to more jobs and an improvement of economy, resulting in a positive growth cycle instead of a negative recession cycle [32]. **Positive growth and outperforming in your industry has everything to do with strategy.** The confusion around strategy academic discourse and the significant waste of resources, enforces us to rethink the way in which we

work with strategy. Future projections allude to concerns in the ability for organisations to adapt to change. No industry is immune to digital transformation and some argue digital being the reason why more than 50% of organisations since 2000 have fallen out of the Fortune 500 list [33, 34]. Evidence from IBM's global study on emerging trends and disruptive forces provide support this claim [35]. The inability to adapt to change will become critical for organisations [35]. Therefore, strategy continues the struggle in shaking off shackles that aim to prevent the ability to not only execute organisational goals; but also manage the turbulent change that disrupts industry.

3 The need for a Strategy Ontology

Ontology enables us to share and reuse meaning [7]. It facilitates the definition of concepts [7]. Put simply, "An ontology is a formal specification of a shared conceptualization" [37 p. 12]. This understanding allows us to frame ontology within a specific domain wherein the formal description creates a shared common vocabulary.

3.1 The necessity to share and reuse meaning around strategy

Powell [37] in his paper 'Strategy without Ontology' discusses the issues that surround the strategy field connecting this back to the absence of an strategy ontology. Language and terms are embedded in our human interaction and it is human endeavour that has progressed strategy to its current position today. However, with the absence of an ontology he argues various theories and models are 'just a game of language' [37]. The confusion around strategy and its definition and nature has been discussed throughout the last century. There is a noticeable increase in this discussion between 1956 to 1996 [17, 15, 16, 12, 14, 11, 13, 21, 22]. Despite this fact and the several ways in which strategy is applied there are very many useful theories i.e. frameworks, methods, approaches and artefacts [3, 2, 6, 23]. It doesn't take long to identify some of the most recognised strategic management methods in academia and industry. Godfrey and Johnson both discuss Balance Scorecard, Five Forces, Generic Strategies (Competitive Strategy), Value Chain and Blue Ocean Strategy in this light [5, 41]. We don't wish to critique them or discuss their usefulness, but rather discuss the need of alignment and harmonization in order for work to become more integrated. This provides the ability to engineer, architect and model strategies along their lifecycle. What we therefore do critique, is none of them build on a common ontology, as they all use different concepts, definitions, terms, objects and symbols. Therefore, in reality, for organisations applying these theories, it becomes clear that there is no underlying concept. The organisational strategy management landscape is rich with various models, frameworks and theories. It is a well-established academic field that complements the endeavour of strategy practitioners in industry. Nonetheless, the more these are applied, the more siloed the end result becomes. This endangers the entire strategy lifecycle process from strategy analysis, strategy design, strategy development, to strategy execution and the continuous improvement of the

strategy [1]. A valid argument as to why, organisations have a low success rate within and around the work of strategy [1].

Godfrey argues the concept of the CEO, as Strategy Architect but there is no suggestion of an architectural framework that connects all aspects to strategy [5]. A fundamental pillar of software engineering is the ability to reuse existing software to facilitate the specification, production, classification, similarities in requirements and, the ability to retrieve in order to enhance development productivity [9]. Without reusability the process of producing software becomes less efficient and standardised. When examining the traditional approaches to strategy and some of the commonly used models and theory, there is a distinctive lack of common taxonomy and thereby reusability. When applying the models and theories, the associated outputs are not designed to interlink, relate nor be reused. The foundation of providing the opportunity for reuse has to have a shared standard vocabulary, in the case of strategy these are the business terms [18]. The challenge that the strategist faces is to devise an effective means of filtering the high-level plans into operative tasks that execute the strategy. When the principle of reuse is applied in software development it enables the development of a more robust software architecture that relates components throughout the different software modules. Strategy needs to benefit from the same principle so that high level strategies can be related to different levels and layers across the enterprise Therefore providing an enhanced ability to engineer, architect and model strategy.

4 What constitutes a strategy ontology?

Strategy has an extensive array of concepts and through a formal specification we have the ability to effectively share meaning. This must be built upon a shared interpretation of associated concepts, thus, emphasising the importance of Borst's 'shared meaning' [36] The practice of strategy in industry has been and continues to be, analysed from an academic and industry perspective. There is substantial empirical evidence that provide details on the types of strategies applied in organisations. The Profit Impact of Market Strategy (PIMS) has provided empirical evidence for four decades [38]. This initiated in a pilot with General Motors in the 1960's which developed into a widely accessed data source detailing factors (including strategies applied) that differentiate business performance. PIMS has been subject to a number of academic works around strategy and performance. From an industry perspective, the likes of Mckinsey, Deliotte, Garnter and Bain and Company are just some of the large consultancy firms that publish their empirical findings around strategy adoption and C level perspectives on practice around strategy. The development of a strategy ontology will need to evidence how it maps against the patterns of strategy adoption in industry. Doing so will facilitate a pragmatic sharing of meaning that strategy practitioners can utilise. Although there is no definitive consensus on the principles that make up an ontology, there are reoccurring themes that can be found in academic literature that provide a basis for developing an ontology. Firstly, defining a hierarchy of classes that encompass relations is central to ontology development [7] [40]. This supports the development of explicit knowledge relating to a specific domain. This principle is named **'Strategy Semantics'**.

Furthermore, categorising the classes and enabling an assemble by order structure of instances within the classes, borrows from the science of taxonomy which supports the delineation of hierarchies within an ontology [7,40, 39]. This principle is named **'Strategy Taxonomy'**.
Models based engineering and the ability to create "User defined relations that are mapped from conceptual models"[40]; is also a key theme found in ontology development. This logically follows the first principle discussed and enables the mapping of a 'class object to model relationship'[43]. This third principle is named **'Strategy Engineering'**.
"To share common understanding of the structure of information among people or software agents" [39]; makes up the fourth principle. This is the ability of the ontology to form a basis of sharing meaning amongst different stakeholders, be it systems, organisations or people. This principle is named 'Strategy Architecture'
Building upon these four principles enables the Strategy Ontology to function within an informatics domain where principles of information engineering can be applied. This supports the development of model based engineered artefacts that provide a more rigorous approach to the way we model strategy. Furthermore, it provides the ability to model strategy across the different layers of an enterprise [18].

5 Requirements to the Strategy Ontology

Approaches to developing and engineering ontologies begin with defining an ontology's requirements; this is in the form of questions that an ontology must be able to answer. We call this the *competency* of the ontology [18]. For any task in which the ontology is to be employed, imposes a set of requirements on the ontology. These requirements can best be specified as a set of queries that the ontology should be able to answer, if it contains the relevant information. The competency questions are the basis for a rigorous characterisation of the information that the ontology is able to provide for the task [20]. Competency questions are used to evaluate an ontology in the sense that the ontology must be necessary and sufficient to represent the tasks specified by the competency questions and their solution. These are also the tasks for which the ontology finds all and only the correct solutions. Tasks such as these can serve to drive the development of new ontologies and also justify and characterise the capabilities of existing ontologies [8].
In the expansion of this paper, we detail the specific requirements and competency questions that enable a rigours development of a Strategy Ontology.

6 Requirements to a Strategy Meta Model

The notion of meta modelling is well established and commonly used in the realm of model-driven engineering [44]. There are standards which describe the model driven architecture [45] and provide language and modelling specifications such as Object Management Group's (OMG) Unified Modelling Language (UML). However, more consideration and focus are needed towards the application of meta modelling within the context of ontologies and ontology engineering [44]. Firstly, from an ontology creation perspective, the modelling and design principles of model-driven

engineering, including meta modelling, benefit from abstraction of a concrete system. These principles are only weakly exploited in ontology creation and design [44]. Secondly, if we consider meta modelling more generally as modelling with metadata, this becomes an imperative [44]. A Strategy meta model would be relevant as it would be an abstraction of the strategy system, describing and defining the various Strategy Ontology objects class, stereotypes, types and subtypes, their relations and how they all integrate. The Strategy meta model should therefore not only portray the strategy relevant objects, but also portray the strategy levels i.e. enterprise, groups and operations; linking the semantically possible related objects to these levels [1].

Von Rosing and Laurier [18] discuss how enterprise ontologies within their context of discourse can be categorised, classified and related. This facilitates a relationship and structure between the foundational, domain, task and application ontologies.

As an application ontology meta model, the strategy meta model should relate to other relevant application ontology meta models. Moreover, it should also relate to relevant domain and task ontology meta models as well as, the core reference ontology meta meta model and the foundational ontology upper meta model illustrated in Fig1.

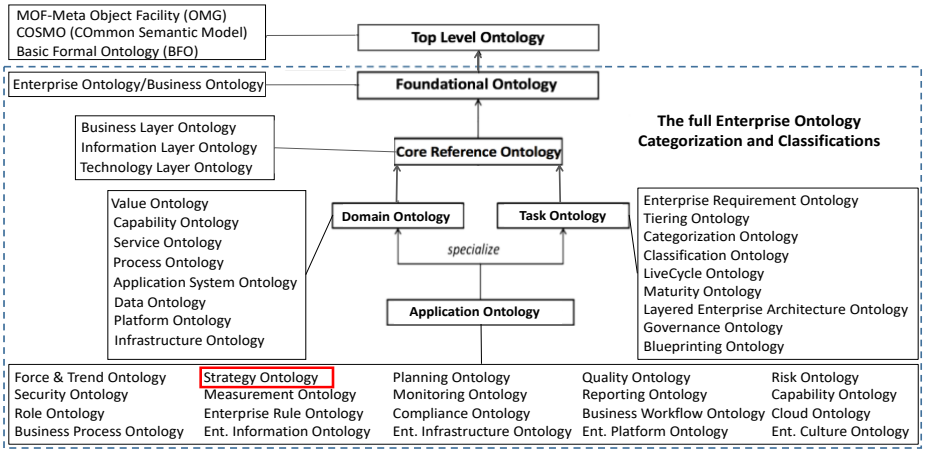

Fig 1: The relationship between the strategy ontology and the enterprise ontologies [1]

Therefore, the Strategy Ontology meta model should be a subset of related meta models and meta meta models. It should be visually represented, enabling first-order logic that facilitates the visualisation of objects and relations in the ontology that can be articulated as a (class) hierarchy. By linking (meta) objects to each other through their object relations, the direct and indirect interrelationships in and across the various business concepts and class hierarchies can be discovered [1].

7 Conclusion

This paper focused on the missing concepts to strategy exemplifying the need for a Strategy Ontology and an outline of the requirements needed for developing such an ontology. It did so by identifying why there is a need, what the scope and objective should be, followed by an overview of its requirements. The preceding paper will provide detailed descriptions of design components, the underpinning methodology

and further details on how the Strategy Ontology integrates and relates to the application, domain, core and foundational ontologies that provide a basis to share meaning across other organisational concepts.

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