This document describes the CAPSICUM Framework for Business and IT Alignment, for the purposes of an Expert Evaluation by selected Reviewers.
There’s no right or wrong
No black or white
They’re just ideas
That want to be write

Design
How do we design?
They’re just ideas.
Ideas learnt, shoulders of giants
Ideas tried, inspired
Ideas thought,
They just fit

Evaluation (ih-val-yoo-ey-shuhn)
\textit{-noun} a measure of worth
Worthy ideas?
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**Glossary**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>A statement about a state or condition of the enterprise to be brought about or sustained through appropriate Courses of Action.</td>
</tr>
<tr>
<td>Objective</td>
<td>A statement of an attainable, time-based, and measurable aim that the enterprise seeks to meet in order to achieve its Goals.</td>
</tr>
<tr>
<td>Strategy</td>
<td>A plan or series of activities for obtaining a specific result</td>
</tr>
<tr>
<td>Tactic</td>
<td>The detail which describes how activities will be performed</td>
</tr>
<tr>
<td>Policy</td>
<td>Procedures that the organisation intends to enforce that guide decisions in support of rational outcomes</td>
</tr>
<tr>
<td>Rule</td>
<td>A regulation governing conduct</td>
</tr>
<tr>
<td>Role</td>
<td>A capacity assigned to a Resource which establishes its relationships with other Resources</td>
</tr>
<tr>
<td>Agreement</td>
<td>A binding arrangement that is accepted by all parties to a transaction</td>
</tr>
<tr>
<td>Capacity</td>
<td>The part that a Resource plays in an Undertaking (can be either Subject, Object or Stakeholder)</td>
</tr>
<tr>
<td>Outcome</td>
<td>One of a prescribed set of possible results associated with an Undertaking</td>
</tr>
<tr>
<td>Transition</td>
<td>A progression from one Undertaking to another orchestrated by an Outcome</td>
</tr>
<tr>
<td>Undertaking</td>
<td>A business activity that an organisation engages in to realise a Goal</td>
</tr>
<tr>
<td>Offer</td>
<td>An expression of intent relating to the deployment of a Resource</td>
</tr>
<tr>
<td>Resource</td>
<td>Things and their properties that define the vocabulary of the business Domain</td>
</tr>
<tr>
<td>Interface</td>
<td>A two way mechanism through which a Role provides input or receives output</td>
</tr>
<tr>
<td>Decision</td>
<td>A judgement relating to the selection of an Outcome</td>
</tr>
<tr>
<td>Operation</td>
<td>An instruction or procedure that invokes a Transaction</td>
</tr>
<tr>
<td>Attribute</td>
<td>A property that describes some characteristic of a resource</td>
</tr>
<tr>
<td>Interaction</td>
<td>An Interface with a Role which communicates Intent</td>
</tr>
<tr>
<td>Proposition</td>
<td>An offer of terms for a Transaction or Interaction</td>
</tr>
<tr>
<td>Evaluation</td>
<td>The logical consideration of a premise that determines an Outcome decision</td>
</tr>
<tr>
<td>Event</td>
<td>An occurrence that initiates an Evaluation, Transaction or Interaction</td>
</tr>
<tr>
<td>Instantiation</td>
<td>To populate an instance of an attribute with information regarding the state of a Resource</td>
</tr>
<tr>
<td>Context</td>
<td>The temporal State of a Resource</td>
</tr>
<tr>
<td>Intent</td>
<td>A state of an Attribute of a Resource, expressed via an Interaction with a Role</td>
</tr>
<tr>
<td>Premise</td>
<td>An assumption to be verified against applicable policies</td>
</tr>
<tr>
<td>Condition</td>
<td>A restricting situation of circumstances that is assessed against policy constraints</td>
</tr>
<tr>
<td>State</td>
<td>The temporal value of an attribute at a particular moment in time</td>
</tr>
<tr>
<td>Entitlement</td>
<td>A policy that governs the permissible behaviour of Roles</td>
</tr>
<tr>
<td>Term</td>
<td>Stipulations limiting an Entitlement</td>
</tr>
<tr>
<td>Condition</td>
<td>An interpretation of policies that govern a particular situation</td>
</tr>
<tr>
<td>Fact</td>
<td>A statement that establishes a definition in the business vocabulary</td>
</tr>
<tr>
<td>Assertion</td>
<td>A definition or statement of fact in the business vocabulary</td>
</tr>
<tr>
<td>Constraint</td>
<td>A limitation or restriction on an acceptable state of an attribute</td>
</tr>
<tr>
<td>Compliance</td>
<td>Constraints that determine permissible States of Attributes</td>
</tr>
</tbody>
</table>

*Glossary definitions are organised in the sequence of their position in the respective Stakeholder View.*
The CAPSICUM Framework Design

The CAPSICUM Framework facilitates strategic alignment of business and technology architectures. It is intended to decompose the dynamics of business endeavour into a standard model for business architectures that is semantically aligned with a model of a strategic business plan.

There are 4 conceptual models that make up the framework:

1. **The Strategic Purpose** - a model of a strategic business plan (derived from the OMG Business Motivation Model)

2. **The Business View** - a model of business operations (representative of a Computational Independent Model as defined in OMG Model Driven Architecture)

3. **The Technical View** - a model for a corresponding system design (representative of a Platform Independent Model as defined in OMG Model Driven Architecture)

4. **The Platform View** – a model for a corresponding technology platform (representative of a Platform Specific Model as defined in OMG Model Driven Architecture)

A high level view of the models in the CAPSICUM Framework and their relationships is presented in Figure 1:

![Figure 1 – The 4 models of the CAPSICUM Framework](image)

The focus of this thesis is on the design of the CAPSICUM Business View, the core component linking business strategy to technical system designs. The Business View is a meta-model of business endeavour which provides an abstract representation of business operations decomposed into semantically related constructs. The Business View is aligned through explicit relationships with the Strategic Purpose (a direct derivation of OMG’s BMM). The Business, Technical and Platform Views loosely align with the conceptual model layers of MDA, which facilitates model driven development.
The design of CAPSICUM has followed the methodology for Design Science Research proposed by March & Smith (March and Smith, 1995). The methodology involves an iterative cycle of design and evaluation for Constructs, Models, Methods and Instantiations as illustrated in Figure 2.

Note: This expert review of CAPSICUM addresses the activities in the March and Smith methodology represented by the cells labelled “Expert Review” below.

<table>
<thead>
<tr>
<th>Research Activities</th>
<th>Build</th>
<th>Evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructs</td>
<td>CAPSICUM Dimensions</td>
<td>Expert Review</td>
</tr>
<tr>
<td>Model</td>
<td>CAPSICUM Framework</td>
<td>Expert Review</td>
</tr>
<tr>
<td>Method</td>
<td>CAPSICUM Methodology</td>
<td>Expert Review</td>
</tr>
<tr>
<td>Instantiation</td>
<td>Real World Realisation</td>
<td>Practitioner Assessment</td>
</tr>
</tbody>
</table>

*Figure 2 – March and Smith Framework for Design Science Research*
**CAPSICUM Constructs**

There are three principal constructs supporting the design of the CAPSICUM Framework. Each construct represents a dimension in a 3-dimensional framework (see Figure 1 above). The constructs that make up the dimensions are:

**Construct 1 - Business Scope**

The Business Scope construct aligns with the principle components of a strategic business plan, derived from the strategic planning constructs of Ends and Means proposed in the OMG Business Motivation Model. BMM identifies the following components of a strategic business plan:

- **Ends**: Desired Results (what the plan is intended to achieve)
- **Means**: Courses of Action (how the organisation will execute the plan)
- **Means**: Directives (parameters that govern the execution of the plan)

These BMM constructs are adopted and extended by the CAPSICUM Strategic Purpose, articulating a structured model for a strategic business plan as the initial model of the CAPSICUM framework. The plan is made operational through the Business View, a model of the business architecture. The Strategic Purpose is aligned with the Business View through the construct Business Scope. The scope of a business operation is defined by its:

- **Domain** – the environment in which the business will operate;
- **Behaviour** – coordinated actions to be taken under given circumstances;
- **Governance** – the regulation of decisions that define expectations, grant authority, or verify performance.

---

1 The constructs adopted by CAPSICUM are the BMM definitions for Ends and Means. BMM does include other constructs (notably Influencers) which are not adopted by CAPSICUM Strategic Purpose.

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**Figure 3 – Construct 1 - CAPSICUM Strategic Purpose alignment with Business Scope**

**Domain**

The term Domain has been applied in a large number of semantically distinct contexts in information systems research. In this case the term is intended to broadly describe the environment in which the business operates, which may have geographical, societal, cultural, industry or other influences that define its specific sphere of operations and accompanying vocabulary.

The Business View - Domain is aligned with the Strategic Purpose - Desired Results. The Domain identifies Resources and their Roles, which will be mobilised in support of Desired Results. Undertakings represent the sphere of business operations which will be pursued and the Outcomes of an Undertaking reflect the achievement of Desired Result – Objectives.
**Behaviour**
The execution of a business plan is achieved through coordinated sequences of Behaviour, which deploy resources in support of Strategies and Tactics.

Strategic Purpose - Courses of Action are made operational through business processes, modelled in the Business View as Behaviour; coordinated Activities and their related Evaluations. Activities are negotiated between parties to an Undertaking by the expression of Intent. Evaluations of Activity Outcomes take into consideration the current Context of business resources expressed by their state.

**Governance**
Behaviour is regulated through the exertion of organisational Governance. Strategic Purpose – Directives lay down Policies and Rules that govern the actions and decisions relating to business conduct.

Strategic Purpose – Directives provide the basis for the Business View – Governance model. Policies are broken down into Entitlement and Compliance policies. Rules are interpreted as Assertions and Conditions.

The Business Scope is discussed in detail below

**Construct 2 – Technology Layers**
The structure of a typical information system is often represented by architectural layers that represent a conceptual separation of common technology constructs in business applications. This approach is well known through the widely acknowledged 3-tiered architecture attributed to John J Donovan (Donovan) which is traditionally defined as:

- User Interface
- Business Logic
- Data

This 3-tiered hierarchical representation is broadly representative of the structure of contemporary business applications. Most organisations are supported by a plethora of applications that follow this same basic structure. Since most business processes involve touch-points with multiple business applications, a well recognised architectural challenge of large complex organisations is to manage the integration of a multitude of application silos, each represented by a different implementation of this 3-tiered profile.

![Figure 4 – Typical 3 tiered application silos](image)

Various technology approaches for connecting the silos through process integration have evolved over time and consolidated into what is commonly referred to as the ‘integration layer’ (represented in various incarnations as EAI, Middleware and Enterprise Service Bus for example). This 4th process integration layer sits outside of the 3-tiered application silos and has been a catalyst for enterprise wide perspectives of a consolidated computing environment.
The complexity and constraints imposed on practitioners in managing the heterogeneous ‘islands of automation’ of a typical siloed computing environment have long been a concern (McFarlan et al., 1983). Various authors have suggested an organisational wide representation that slices across the layers, organising the siloed ‘solutions’ into layered ‘capabilities’, most notably Ross and Weill in their best-selling book “Enterprise Architecture as Strategy” (Ross et al., 2006). Distinct tendencies have been gaining momentum over time to consolidate User Interface (eg Portals, Mashups and other Web 2.0 technologies), Process (eg Middleware, Business Process Automation, Enterprise Bus) and Information (eg Data Warehouses, Master Data Management).

A major inhibitor to a true enterprise computing model has been in consolidating the fragments of business logic embedded in application silos. The recent momentum behind Service Oriented Architectures may well hold the key to unlocking this constraint. By exposing business logic through encapsulated web services, the service computing paradigm consolidates business logic into an enterprise wide Services Layer. The resulting perspective is broadly representative of an end state for a Service Oriented Architecture (Erl, 2005) and forms the 4 Technology Layers of CAPSICUM:

![Figure 5 – CONSTRUCT 2 - Technology Layers in an Enterprise Architecture](image)

**Note:** This construct has inspired the acronym CAPSICUM which stands for:
- Coordinating
- **Access,**
- **Processes,**
- Services and
- **Information in a**
- **Common**
- **Unified**
- **Model**

**Construct 3 - Stakeholder Views**

The concept of Stakeholder Views is a common construct in Enterprise Architecture Frameworks. In establishing the analogy with classical architecture, Zachman described how each of the various stakeholders with an interest in a computer system, need to be presented with architectural artefacts that are intelligible and meaningful to their unique perspective (Zachman, 1987). This approach has been adopted by many subsequent frameworks (AGIMO, 2007, CapGemini, 1993, DoDAF, 2007, FEA, IFAC/IFIP, 1996, Iyer and Gottlieb, 2004, Schekkerman, 2005, TOGAF, 2006) and consolidated in the IEEE standard 1471-2000 “recommended practice for architectural descriptions of software intensive systems” (IEEE, 2000).

The CAPSICUM Framework incorporates 3 Stakeholder Views inspired by the OMG viewpoints in the Model Driven Architecture (See CAPSICUM and MDA below):
- The Business View – representative of an MDA Computational Independent Model (CIM) targeted at business stakeholders and business analysts.
- The Technical View – representative of an MDA Platform Independent Model (PIM) targeted at a technical design audience of solution architects, enterprise architects and functional solution designers.
- The Platform View – representative of an MDA Platform Specific Model (PSM) targeted at a technical administration audience of technical developers, enterprise architects and system administrators

![Figure 6 – CONSTRUCT 3 - CAPSICUM Stakeholder Views](image)

The CAPSICUM Stakeholder Views are domain specific models of organisational endeavour. They establish and classify concepts and their relationships for a standard model of business operations. Stakeholder Views incorporate the two previously defined constructs (Strategic Purpose and Enterprise Computing Model) as X and Y dimensions of a matrix. The same matrix is used for each Stakeholder View, facilitating a longitudinal alignment between the views.

The X access of each Stakeholder View is a direct mapping to the 3 columns of Construct 1- Business Scope, namely Domain, Behaviour and Governance. The Y access of each Stakeholder View maps to Construct 2 - Technology Layers, namely Access, Process, Services and Information. The intersections of these dimensions create a 12 cell matrix into which the respective stakeholder constructs are organised. This pattern is repeated at each of the Business, Technical and Platform Views.

![Figure 7 – CAPSICUM Constructs](image)
CAPSICUM and MDA

Whilst CAPSICUM has a strong philosophical alignment with the MDA approach, it does not claim to conform to MDA or any other of the OMG normative specifications.

The CIM, PIM and PSM in MDA are viewpoints representing models of a software system that are relevant to the concerns of their respective stakeholders. MDA does not prescribe any guidance for MDA implementations or for the content of a CIM, PIM or PSM. The constructs and design of MDA models are particular to the domain being modelled and defined by relevant domain experts.

A model is a simplified abstraction of reality (Chorley and Haggett, 1967). A meta-model is a specification model that makes statements about what can be expressed in the valid models of a certain modelling language (Gasevic et al., 2006). The authors illustrate this concept with the following diagrammatic representation:

```
+-------------------+       +-------------------+
|                  |       |                  |
| System            |       | Model            |
|                  |       |                  |
| Metamodel         |<--------|                  |
|                   |         | assertions       |
|                   |         | terminology      |
```

*Figure 8 – Metamodel definition*

The MDA is a four-layered metamodelling architecture based on modelling spaces labelled M0 – M3 (OMG, 2003). The M0 layer represents the things in the real-world that are being modelled. The M1 layer is a model of those real-world things, defined using language and constructs specified by a metamodel in the M2 layer. MDA models are usually specified in UML, based on a domain specific UML profile which is represented at the M2 layer. The language and concepts used by the metamodels are defined in a meta-metamodel representing the fourth, M3 layer. In MDA, the M3 meta-metamodel is the Meta-Object Facility (MOF).

In the MDA paradigm CAPSICUM is aimed at the M2 layer, a metamodel providing standard constructs and semantics for the design of architectural models (M1) of a business operation (M0). CAPSICUM does not however strictly conform to MDA. It is not built in UML and has no relationship to MOF. A UML profile for CAPSICUM could conceivably be developed to fully insert CAPSICUM into the MDA framework, although this is not currently addressed in this research.

Whilst the philosophy behind MDA is generally considered promising and the approach has attracted a large community of supporters, it is not without controversy. Some of the issues raised by sceptics include:

- The OMG direction with MDA is tightly integrated to UML, MOF and QVT, other OMG modelling specifications integral to their vision for an MDA implementation. Clearly this constrains an implementation by requiring buy-in to all of those specifications. Some authors have expressed concerns with UML in expressing behaviour, even with the Precise Action Semantics in UML 2.0 (Haywood, 2004) and being too complex (Warmer, 2008);
- MDA has been criticised as “restrictive”, “dogmatic”, and even “DOA” in a highly controversial report from Forrester Research (Zetie, 2006). Despite the vehement response from the MDA community, a branch of quasi supporters continue to coin such terms as “pragmatic MDA” and “executable architectures” in discussions that support the philosophy but are not convinced by OMG’s execution or by vendor tools for MDA (Warmer, 2008);
OMG has focused on standard specification, rather than implementation in its promotion of MDA. However the question of whether models outside the OMG normalisation process conform to MDA remains ambiguous (Bezivin et al., 2003);

Some debate exists between what Haywood calls ‘translationists’ and ‘elaborationists’ (Haywood, 2004). The former support the idea that a PIM and PSM each contain a complete system specification, with 100% generation of both code and the PSM from a PIM (sometimes called Executable UML). Elaborationists advocate about 50-80% code generation with “refinements” made at the code level particularly to incorporate ‘behaviour’, identified above as a challenge for modelling approaches (Haywood, 2004).

Into this fragmented debate, laying claim to an alignment, dependence, conformance or even analogy with MDA would appear to be a risky proposition. In an attempt to avoid such risk, perhaps it should be said that CAPSICUM is reminiscent of MDA.

The majority of the debate in MDA is on the PIM and PSM and the transformations between the two, particularly in relation to automated generation of code via transformations. The CIM is rarely given similar focus, variously described as simply “business requirements” and even the notion that a CIM, “is a PIM where the problem has not been worked out as a solution” (Bezivin et al., 2003). For MDA to rise above the debate amongst technologists and engage business stakeholders with its promise, considerable effort needs to be applied in addressing the business viewpoint with more rigour.

The objective of establishing a standard meta-model for business architectures at the CIM level, facilitates the development of various possible technical designs at the PIM and PSM level dependent on the architectural styles and respective technologies that meet the needs of the exercise at hand. The Stakeholder Views construct provides a loose framework to illustrate this intent and to position the CAPSICUM Strategic Purpose and Business View within the broader context they support.

**Thesis scope**

At this stage of the CAPSICUM definition, the goal has been to develop a meta-model for a strategically aligned business architecture (CAPSICUM Strategic Purpose and Business View). In MDA terms, these models represent Computational Independent Models. By focusing exclusively on a CIM definition there is no intention to address the broader issues of model transformation, model notation and conformance with OMG specifications.

A complete definition for a PIM or PSM level metamodel is not contemplated in the current scope of work. However a high level illustration of early drafts of Technical and Platform View constructs is provided following the description of the Business View.
CAPSICUM Strategic Purpose

The CAPSICUM Strategic Purpose is derived from the Object Management Group’s Business Motivation Model (BMM). BMM is a metamodel that identifies standard descriptions for the elements of a strategic business plan where abstract concepts of a strategic plan are defined and the relationships between the concepts are established.

It is important to note that BMM does not propose an operational model of a business. BMM defines the motivations for the business existing, but it does not address how business initiatives are implemented in support of a strategic plan; for example how Courses of Action are actually executed in the course of doing business. There is no alignment of the strategic constructs with business activities, organisational roles or any of the attributes that define the resources in the business vocabulary and their inter-dependencies. OMG recognises that BMM needs to be inserted into a broader framework to provide a complete business model. BMM does include descriptions for assessments and influencers as well as “placeholders” for concepts such as assets, organisation units, business processes to allow for integration with emerging business standards for broader enterprise models (OMG, 2007). Further, BMM states in its preamble that “... tools based on the Business Motivation Model could provide a straightforward way of relating business processes, business rules and organization units to each other, and to the desired results, courses of action and business policies that affect them.”

Assessments, Influencers and the BMM placeholder concepts are considered in the CAPSICUM Business View. The Strategic Purpose adopts only the core strategic elements of Ends and Means from BMM namely, Desired Results (Goals and Objectives), Courses of Action (Strategies and Tactics) and Directives (Policies and Rules).

![BMM Ends and Means Diagram]

Although they do not form part of the CAPSICUM Framework, the BMM concepts of Vision (Ends) and Mission (Means) are introduced in order to provide context to the Strategic Purpose. The following definitions are extracted or paraphrased from the OMG Business Motivation Model (OMG, 2007).

**Ends:**
Ends define the target states that the business will strive to achieve (expressed as Desired Results). They establish “what” the business will do to achieve these states and are inspired by the organisational Vision.

**Vision:**
“At the highest level Ends are defined by the organisations Vision. A Vision describes the future state of the enterprise without regard to how it is to be achieved. A Vision is the ultimate, possibly unattainable, state the enterprise would like to achieve. A Vision is often...”
compound, rather than focused toward one particular aspect of the business problem.” (OMG, 2007)

**Means:**
Means define the behaviour (expressed as Courses of Action) and intent (expressed as Directives) of the operations the business will engage in. Means establish “how” the organisation plans to achieve its stated Ends and are elaborated in support of a Mission.

**Mission:**
“A Mission makes a Vision operative — that is, it indicates the ongoing activity that makes the Vision a reality. A Mission, like its counterpart Vision, indicates a correspondingly long-term approach — one that is focused on achieving the Vision. Like Vision, Mission is not very specific; it is something broadly stated, in terms of the overall functioning of the enterprise.” (OMG, 2007)

BMM defines the relationships between the concepts introduced above (as well as several other concepts which are not used in CAPSICUM). CAPSICUM does not attempt to redefine or modify any of the BMM concepts, rather to preserve and reinforce them by maintaining the integrity of their original definitions. For that reason, large parts of the Strategic Purpose description below are direct extracts from the BMM specification.

CAPSICUM extends BMM by proposing additional levels of detail for defining a Strategic Purpose, as well as providing a structure for aligning a Strategic Plan into a comprehensive framework for Business and IT Alignment. This will become apparent in the following sections.
The CAPSICUM Models

To facilitate reading and introduce the overall model designs, an overview of the Strategic Purpose and Business View meta-models and their relationships is illustrated in figures 10-12. The models, constructs and their relationships are explained in detail in the following sections.

**Note to reader:** It may be helpful to print out the following 2 pages to accompany reading of the model descriptions.

![CAPSICUM Strategic Purpose Metamodel](image)

**CAPSICUM Strategic Purpose and Business View Relationships**
Figure 11 – CAPSICUM Strategic Purpose to Business View Relationships

Figure 12 – CAPSICUM Business View Metamodel
A note on notation

The notation used for model diagrams in BMM and adopted in this document is informal. “Most of its concepts have only basic attributes - identifier, text description. Most of its associations are unconstrained: optional and many-to-many” (OMG, 2007).

Constructs and their relationships to one another are depicted by boxes connected by arrows. This is a similar approach to the expression of an RDF triple in semantic modeling. RDF triples are depicted as directed graphs, with concepts identified in boxes and arrows indicating relationships as an edge from a subject to an object. The originating box is the subject, the label on the arrow is the predicate and the destination box is the object in the relationship. The CAPSICUM models are all expressed as a collection of triples in this manner and depicted as directed graphs.

The following icon is inserted in the top right hand corner of each of the framework cell definitions to illustrate the position of the CAPSICUM cell under discussion in the framework:

Instantiation Scenario

In designing CAPSICUM, the framework has been through 4 real-world instantiations of various versions through its evolution.

To support the explanation of the framework, a business scenario loosely based on one of the CAPSICUM instantiations is used to develop examples of the framework constructs.

Scenario:

Australian Universities receive many thousands of applications for entry each semester. In this scenario, applications may be lodged through various channels including an on-line application service “Apply Online”. There is no restriction on who may submit an on-line application or from where.

Many applications are submitted with inadequate qualifications or are submitted by prospective students that simply require a Provisional Offer in order to submit an Australian visa application. Further processing only occurs if the prospect chooses to follow-up by submitting relevant documentation to complete the application process. For some demographic groups such follow up action is extremely low so the work done by Admissions staff is often unproductive.

The department of Recruitment &Admissions of one such University would like to reduce the significant administrative burden on Direct Admissions staff by automating a preliminary evaluation of on-line enquiries and the issuance of a Provisional Offer Letter to qualified prospects.
In CAPSICUM which follow, this scenario will be developed through each cell of the Strategic Purpose and Business View to illustrate how a business architecture supporting these requirements would be modelled in CAPSICUM.
Strategic Purpose – Desired Results

An organisational Vision provides inspiration for the Ends that the organisation is striving to achieve, but needs further elaboration to provide more specific definitions through the expression of Goals and Objectives (OMG, 2007).

Goals

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOAL</td>
<td>A statement about a state or condition of the enterprise to be brought about or sustained through appropriate Courses of Action.</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>Things and their properties that define the vocabulary of the business Domain</td>
</tr>
<tr>
<td>UNDERTAKING</td>
<td>A business activity that an organisation engages in to realise a Goal.</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOAL</td>
<td>enabledBy</td>
<td>RESOURCE</td>
</tr>
<tr>
<td>GOAL</td>
<td>formulatedBy</td>
<td>UNDERTAKING</td>
</tr>
</tbody>
</table>

Figure 13 – Mapping of Goals to the Business View
A Goal amplifies a Corporate Vision — that is, it indicates what must be satisfied on a continuing basis to effectively attain the Vision. A Goal should be attainable and should be specifically oriented to a single aspect of the business problem. A Goal should be narrow — focused enough that it can be quantified by Objectives. Compared to an Objective, a Goal tends to be longer term, qualitative (rather than quantitative), general (rather than specific), and ongoing (OMG, 2007).

BMM Goal statements are freeform textual statements without any defined structure for the formulation of a Goal. The value of BMM is in establishing relationships between a Goal statement and the constructs that support and govern the achievement of the Goal.

The CAPSICUM Strategic Purpose extends the BMM definition for Goals by requiring that a Goal statement address some aspect of the business the business domain. A domain in this context represents the scope of business endeavour; the environment in which the business will operate. The CAPSICUM Business View will relate components of the business architecture to the Strategic Purpose Goals by establishing relationships between the Goal statement and:

1. **Undertakings** which *formulates* the scope of activities in which the business will engage in pursuit of a Goal *(See Business View – Undertakings)*
2. **Resources** which include the people, places and things in the business vocabulary that will *enable* achievement of a Goal *(See Business View – Resources)*.

Every Goal should identify both the Undertaking and Resources involved in the Undertaking. Resources are deployed as ‘Subjects to’ and ‘Objects of” an Undertaking. Both need to be defined.

The following Goal statement describes a Desired Result for the University Recruitment and Admissions scenario:

*Scenario: GOA_0001: “The organisation will automate the evaluation of online enquiries for admission by prospective students”*

This Goal would be represented in the CAPSICUM Strategic Purpose as:

![Figure 14 – The structure of a Goal]
Objectives

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECTIVE</td>
<td>An Objective is a statement of an attainable, time-based, and measurable aim that the enterprise seeks to meet in order to achieve its Goals.</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>One of a prescribed set of possible results associated with an Undertaking</td>
</tr>
<tr>
<td>ROLE</td>
<td>A capacity assigned to a Resource which establishes its relationships with other Resources</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECTIVE</td>
<td>achievedBy</td>
<td>OUTCOME</td>
</tr>
<tr>
<td>OBJECTIVE</td>
<td>delegatedTo</td>
<td>ROLE</td>
</tr>
</tbody>
</table>

Figure 15 – Mapping of Objectives to the Business View

Objectives quantify Goals - that is, they provide the basis for metrics to determine whether the Goal is being achieved. Compared to a Goal, an Objective tends to be short term, quantitative (rather than qualitative), specific (rather than general), and not continuing beyond its time frame (which may be cyclical). It is self-evident that Objectives should be attainable. If they are not, the business plans are unrealistic and will likely fail (OMG, 2007).
BMM includes the following important qualifiers related to Objectives, which must be:

- **Time-based** - All Objectives should be time-based by either an absolute Time-frame (e.g., “by Jan 1, 2007”) or relative Time-frame (e.g., “within two years”).
- **Measurable** - Objectives include some explicit Metric for determining whether the Objective has been achieved (e.g., “30% of enquiries”).

CAPSICUM Strategic Purpose extends the BMM definition to include the following considerations in the specification of an Objective, which must be:

- **Accountable** – Objectives must be delegated to a specific **Role** which will be accountable for attainment of the Objective Metric (see Business View - Role below);
- **Identifiable** – Objectives should specifically identify the business **Outcome** which will be measured by the Objective (see Business View - Outcome below);
- **Contextual** – Objectives may identify **Conditions** relating to the state of Resource attributes, which qualify the context of the Objective. A Time-frame is an example of a Condition (see Business View - Conditions below).

**Scenario:**

The following Objective statement describes an Objective for the University Recruitment and Admissions scenario:

**OBJ_0001**: “Issue Provisional Offer Letters (POL) to 30% of online enquiries by international applicants for undergraduate programmes for Semester 1 intake of 2011”

This Objective would be specified in the CAPSICUM Strategic Purpose as follows:

**Figure 16 – The structure of an Objective**
Strategic Purpose – Courses of Action

Courses of Action define behaviour, and as such are concerned with planning “how” an organisation will achieve Desired Results. Whereas Desired Results defines a future state the organisation will strive to achieve, Courses of Action address the behaviour that will be followed to achieve that state.

Strategies

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRATEGY</td>
<td>A plan or series of activities for obtaining a specific result</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>A discrete, repeatable business function (a service)</td>
</tr>
<tr>
<td>INTENT</td>
<td>A state of an Attribute of a Resource, expressed via an Interaction with a Role</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRATEGY</td>
<td>executedBy</td>
<td>ACTIVITY</td>
</tr>
<tr>
<td>STRATEGY</td>
<td>negotiatedBy</td>
<td>INTENT</td>
</tr>
</tbody>
</table>

Figure 17 – Mapping of Strategies to the Business View

Strategies are mechanisms for planning business behaviour, Courses of Action by which Desired Results will be achieved. Compared to Tactics, Strategies tend to be longer term and broader in scope. A Strategy is implemented by Tactics (OMG, 2007).
Definitions of Strategy are typically represented by process models. Business processes realise Courses of Action (OMG, 2007). Process models elaborate the sequencing logic for the execution of activities and assign activities to roles. Several standards exist for modelling business processes and CAPSICUM does not intend to propose yet another. OMG, in their Business Process Definition Metamodel (BPDM) define a process as “...a kind of interactive behaviour that describes specific activity(ies) to be performed, interactions to be undertaken during its execution under the authority of a processor role” (OMG, 2008). OMG have specified a comprehensive notation for modelling business processes in their Business Process Modelling Notation (BPMN)(OMG, 2009).

The CAPSICUM Strategic Purpose extracts relevant elements from a process model in such a way that they can be mapped to the appropriate constructs in the CAPSICUM Business View. The intent is that existing process models already defined within an organisation should contain most (if not all) of the information needed for populating the CAPSICUM Business View. To illustrate this point, the following table demonstrate how BPMN Process constructs map to CAPSICUM Business View constructs².

<table>
<thead>
<tr>
<th>BPMN Concept</th>
<th>CAPSICUM Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Activity (Transaction or Interaction)</td>
</tr>
<tr>
<td>Transaction (a group of activities)</td>
<td>Undertaking</td>
</tr>
<tr>
<td>Data</td>
<td>Intent and Context</td>
</tr>
<tr>
<td>Event</td>
<td>Evaluation</td>
</tr>
<tr>
<td>Swimlane</td>
<td>Role</td>
</tr>
<tr>
<td>Gateway</td>
<td>Outcome</td>
</tr>
</tbody>
</table>

**Figure 18 – Mapping of BPMN to CAPSICUM Constructs**

In BMM Strategies and Tactics are once again represented by unstructured statements. In the CAPSICUM Business View, Strategies are communicated by Intent and executed by Activities.

**Scenario:**

A strategy for enabling the above Goal of automating on-line enquiries is described as:

**STR_0001: “Implement an on-line self assessment capability for prospects seeking to study at the University”**

The Undertakings and associated Activities to support this Strategy are illustrated in the following diagram:

² Note: CAPSICUM does not substitute a Process Model, but rather extracts the information needed to populate the framework. This table and subsequent examples in this document are not intended to represent exhaustive definitions for capturing the entire process logic but are simply illustrative of the general mapping of constructs. Further, some of the detailed sequencing and flows in a BPMN process model are not fully addressed by the Business View, but by incremental constructs in the Technical View.
This Strategy would be specified in the CAPSICUM Strategic Purpose as:

**Strategy:** Implement an on-line self assessment capability for prospects seeking to study at UNSW

**Goal:** The organisation will automate the evaluation of online enquiries for admission by prospective students

**Undertaking:** On-line Enquiries

**Undertaking:** Self Assessments

**Activity:** Prospect Log-in

**Activity:** Record Study Intention

**Activity:** Record Qualifications

**Activity:** Check Applicant Profile

**Activity:** Register Prospect for Apply On-line
Tactics

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>TACTIC</td>
<td>The detail which describes how activities will be performed</td>
</tr>
<tr>
<td>CONTEXT</td>
<td>The temporal State of a Resource</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>The logical consideration of a premise that determines an Outcome decision</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>TACTIC</td>
<td>influencedBy</td>
<td>CONTEXT</td>
</tr>
<tr>
<td>TACTIC</td>
<td>interpretedBy</td>
<td>EVALUATION</td>
</tr>
</tbody>
</table>

Figure 21 – Mapping of Tactics to the Business View

A Tactic is a method by which a Course of Action will be made operational. Tactics are not of themselves strategic, but support business Strategies. Compared to a Strategy, a Tactic tends to be shorter term and narrower in scope (OMG, 2007).

In BMM, Tactics are again defined as unstructured statements. CAPSICUM Strategic Purpose maps Tactics to the Business View via Evaluations, which interpret Tactics through the consideration of contextual conditions. Context represents temporal information about the current state of Resources and influence Tactic Evaluations (see Context and Evaluations below).
Evaluations consider the context of a Transaction or Interaction and determine appropriate Outcomes, which are predefined for any given Undertaking. A decomposition of a business process into these constructs is illustrated in the following example:

**Scenario:**
Sample tactics for the University Self Assessment are:
Tactic: “Honour year Students are not eligible for POL and must apply through Apply On-line”
Tactic: “POL not available if qualification is unrecognisable”
Tactic: “POL not available for UAC qualifications”

The following diagram maps the University Recruitment and Admissions process model to CAPSICUM Constructs:

---

**Figure 22 – Scenario Business Process**

The Tactic “Honour year Students must apply through Apply On-Line” would be specified as:
**Figure 23 – The structure of a Tactic**

- **Tactic**: POL not available to Honour Year candidates
- **Activity**: Record Study Intention
- **Strategy**: Implement an online self-assessment capability for prospects seeking to study at UNSW
- **Condition**: Honour Year Only
- **Evaluation**: Evaluate Honour Year
- **Intent**: Study Intention
- **Outcome**: Apply Online
- **Role**: Prospect
- **Assertion**: Honour Year
- **Resource**: Person

---

Chapter: The CAPSICUM Framework Design
Strategic Purpose – Directives

Like Courses of Action, Directives are also Means in that they address behaviour; however their focus is on the Governance of behavioural decisions. Directives facilitate organisational control by specifying “which” choices should be made and “when” (Lupu, 1998).

A Directive always has to do with governance or guidance. Directives delimit boundaries within which Courses of Action should, or should not be carried out. Specifically, a Directive defines, constrains or liberates some aspect of an enterprise. It is intended to assert business structure or to control or influence the behaviour of the business (OMG, 2007). Directives are stated in declarative form as Policies and Rules.

It is well recognised that abstracting Directives away from Courses of Action achieves an important and powerful outcome in providing business stakeholders with the flexibility to adapt business systems in line with dynamic business requirements simply by changing the policies and rules which govern behavioural decisions (Bandara, 2005, Damianou et al., 2001). Researchers into Policy Management approaches and tools over the past few decades have pursued mechanisms for specifying, deploying and enforcing policies that separate the control of management actions from their implementation (Lupu, 1998, Bandara, 2005, Damianou et al., 2001, Sloman, 1994). By isolating Policy and Rule specifications (Governance) from the implementation of Processes and Activities (Behaviour) as well as the definitions for Role and Resource attributes (Domain), modifications to the context of desired business behaviour can be controlled and managed through the manipulation of Policy and Rule variables.
Policies

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLICY</td>
<td>Procedures that the organisation intends to enforce that guide decisions in support of rational outcomes</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>A policy that governs the permissible behaviour of Roles</td>
</tr>
<tr>
<td>COMPLIANCE</td>
<td>Constraints that determine permissible States of Attributes</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLICY</td>
<td>designatedBy</td>
<td>ENTITLEMENT</td>
</tr>
<tr>
<td>POLICY</td>
<td>enforcedBy</td>
<td>COMPLIANCE</td>
</tr>
</tbody>
</table>

Figure 24 – Mapping of Policies to the Business View

Policies define behavioural procedures that the organisation intends to enforce. A Policy is a non-actionable Directive whose purpose is to provide broad governance or guidance that is not directly actionable. Compared to a Business Rule, a Business Policy tends to be less structured, less discrete, and usually not atomic — that is, not focused on a single aspect of governance or guidance. Policies also tend to be less compliant with standard business vocabulary, and less formally articulated (OMG, 2007).
Whereas BMM Policies are captured as unstructured statements, CAPSICUM Strategic Purpose proposes structured definitions for business Policies. There are two categorises of Policies:

1. **Entitlements**
   In the CAPSICUM Business View Entitlement policies govern Courses of Action by granting a right or responsibility to a Role. An Entitlement policy will always identify the Role which is being granted the Entitlement. The Entitlement may control access to information (ie the ability for a Role to view or update information relating to the state of a Resource) or services (ie the ability for a Role to execute or participate in an Activity). Entitlements are arbitrated by Conditions which qualify contextual authorisations relating to the states that a Resource should obtain, for a Role to be granted an Entitlement.

   Entitlement policies grant permissions, sometimes called rights or authorisations, which specify what information or actions a subject is permitted to perform (Sloman, 1994). Entitlements can be both positive, allowing a behaviour or negative, constraining a behaviour. Entitlements are often identifiable in a Policy specification by modal verbs MAY, CAN, COULD and their negatives (IETF, 1997) or by explicit statements to PERMIT, or PROHIBIT (Lupu, 1998);

2. **Compliance**
   Compliance policies define the conditions that must be met for certain activities to take place (Bandara, 2005). Compliance policies are obligations, which specify what properties a subject or object is required to have (Sloman, 1994). In the CAPSICUM Business View, Compliance Policies govern Resources, enforcing obligations relating to possible states of Resource attributes. A Compliance policy validates the instantiation of state for either the Subject or Object Resource involved in an Activity.

   Like Entitlements, Compliance can be both positive, allowing a behaviour or negative, constraining a behaviour. Compliance is often identifiable in a Policy specification by modal verbs MUST, SHALL, SHOULD and their negatives (IETF, 1997) or by explicit statements to REQUIRE or OBLIGATE.

Sloman suggests a structure for a policy specification (Sloman, 1994) which can be mapped to CAPSICUM Business View constructs as follows:

- A Subject (a Role assigned to a Resource)
- An Object (a Role assigned to a Resource)
- An Activity
- Any Conditions which apply to the Activity
- Modality: +ve or –ve Entitlement (authorisation) or Compliance (obligation)

All of these components map directly to CAPSICUM Business View constructs.

**Scenario:**
Provisional Offers for a given semester should only be considered up until a certain cut-off date prior to the Application deadline for that semester (assume 30 days for this example).

This policy would be specified as:
Figure 25 – The structure of a Compliance Policy

Policy: Provisional Offers must only be considered up to 30 days prior to the application closing date for the semester

Strategy: Implement an online self-assessment capability for prospects seeking to study at UNSW

Compliance: POL cut-off

Resource: Person

Role: Prospect

Offer: Provisional Offer

Undertaking: Self-Assessment

Policy: Provisional Offers must only be considered up to 30 days prior to the application closing date for the semester

Offer: Provisional Offer < ApplicationCloseDate - 30

Where the variable ApplicationCloseDate is defined by an Assertion
**Rules**

**Definitions:**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>RULE</td>
<td>A regulation governing conduct</td>
</tr>
<tr>
<td>ASSERTION</td>
<td>A definition or statement of fact in the business vocabulary</td>
</tr>
<tr>
<td>CONDITION</td>
<td>An interpretation of policies that govern a particular situation</td>
</tr>
</tbody>
</table>

**Defining Relationships:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>RULE</td>
<td>definedBy</td>
<td>ASSERTION</td>
</tr>
<tr>
<td>RULE</td>
<td>appliedBy</td>
<td>CONDITION</td>
</tr>
</tbody>
</table>

**Figure 26 – Mapping of Rules to the Business View**

A Business Rule is a Directive, intended to govern, guide or influence business behaviour, in support of Business Policy. Business Rules provide specific, actionable governance or guidance to implement Business Policies. ‘Actionable’ means that a person who understands a Business Rule could observe a relevant situation (including his or her own behaviour) and decide directly whether or not the business was complying with the rule (OMG, 2007).

In contrast to a Business Policy, a Business Rule is highly structured and is carefully expressed in terms of standard vocabulary. A Business Rule should be discrete and atomic — that is, represent only a single aspect of governance or guidance. It is a single Directive that does not require additional...
interpretation to undertake Strategies or Tactics. Often, a Business Rule is derived from Business Policy. A rule always introduces an obligation or necessity (OMG, 2007).

Rules are represented in the Business View by Assertions and Conditions. Assertions are facts and definitions which establish the business vocabulary. The Assertion identifies the Attributes and associated states a Resource should hold to meet a vocabulary definition.

Conditions are contextual rules which qualify the evaluation of Directives based on the temporal state of a Resource attribute. The application of a Policy may vary under certain conditions, for example in the self assessment scenario there might be a Policy to stop issuing provisional offers once a certain threshold of POLs have been issued for a particular study programme. As each new self-assessment is evaluated, this Condition would validate the current number of POLs issued against the conditional limit.

**Scenario:**

*Self-Assessment outcomes are evaluated based on a number of configurable attributes which identify specific cohorts of prospects by a combination of demographic, study intention and qualification related characteristics. To achieve this, Prospect Profiles are defined by Assertions which categorise prospects by a predefined set of attributes. These could include (naming a few):*

- Academic Term
- Study Mode
- Academic Career
- Residency

*An example of such an Assertion for the profile “International Undergraduates” is specified as:*
Figure 27 – The structure of an Assertion Rule
**CAPSICUM Business View**

The CAPSICUM Business View defines a standard model for business architectures. It decomposes abstract concepts relating to the operation of a business into a structured classification of operational constructs and their relationships. The Business View is intended to be sufficiently abstract to support any business or industry domain.

Positioned in the framework between the Strategic Purpose and the Technical View, the Business View serves two alignment perspectives:

1. To establish explicit relationships and traceability between the business architecture and a model of strategy (expressed in a Business Motivation Model)
2. To support the alignment of the business architecture with an architecture of the technology designs for an enabling information system

An instantiated Business View provides detailed definitions of the business architecture at a level of abstraction that facilitates a variety of technical design approaches, most significantly:

- the design of a service oriented computing model
- semantic expressions of an enterprise architecture

In an analogy with MDA, the Business View is a Computational Independent Model. It is intended to provide a foundation for the subsequent design of a Platform Independent Model (Technical View) and Platform Specific Model (Platform View) although these are not addressed in this paper.
The Business View – Domain

The Strategic Purpose, Desired Results describe the end state the business intends to achieve. Goals establish the boundaries of the business domain, determining what will be done, who will do it and where it will happen. Objectives set quantifiable Metrics, targets for Outcomes that the organisation wishes to measure or monitor. Metrics are delegated to Roles.

Goals and Objectives establish the business Domain. The Business View Domain is represented by:

- **Roles** - responsibilities assigned to the resources in an Undertaking;
- **Outcomes** – measurable results that the organisation will pursue;
- **Undertakings** - the business endeavours that the organisation will engage in;
- **Resources** - the people (individuals, agents, companies, organisational units), things (products, services, materials, assets) or places (properties, sites, addresses, external systems) that are involved in a business Undertaking.

The relationships between Desired Results in the Strategic Purpose and the Business View Domain are summarised in the following diagram:

![Diagram of Business View - Courses of Action](image)

**Figure 28 – Business View - Courses of Action**

The Business View Domain is best explained by beginning with a description of a Resource.
Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESOURCE</td>
<td>Things and their properties that define the vocabulary of the business Domain</td>
</tr>
<tr>
<td>COMPLIANCE</td>
<td>Constraints that determine permissible States of Attributes.</td>
</tr>
<tr>
<td>UNDERTAKING</td>
<td>A business activity that an organisation engages in to realise a Goal.</td>
</tr>
<tr>
<td>ROLE</td>
<td>A capacity assigned to a Resource which establishes its relationships with other Resources</td>
</tr>
<tr>
<td>CONDITION</td>
<td>The temporal State of a Resource</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOAL</td>
<td>enabledBy</td>
<td>RESOURCE</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>deployedBy</td>
<td>UNDERTAKING</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>describedBy</td>
<td>CONDITION</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>obligatedBy</td>
<td>COMPLIANCE</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>capacitatedBy</td>
<td>ROLE</td>
</tr>
</tbody>
</table>

Resources are the things that a business will mobilise to enable achievement of Goals. Resource definitions describe the domain specific vocabulary of the business; a language for doing business. CAPSICUM takes a very broad definition of a Resource, which may include:

- Physical artefacts such as Assets, Materials and Products;
- People or groups of people such as Individuals, Companies and Business Units;
- Sites or locations such as physical Properties, Websites and External Systems.
The business vocabulary can be defined as a structured taxonomy of Resource definitions that organises and clarifies the business Domain. Resources are identified by an Address. An Address in this context means any identification of how to communicate/identify/locate/query the resource. This may include physical addresses, IP addresses or any type of contact method for a person.

Resources have Attributes, the properties that uniquely describe the Resource. Attribute definitions determine what information is required to adequately describe a Resource. Attribute definitions are obligated by Compliance Policies which govern such things as required fields when creating a new Resource instance and valid values that an attribute might contain (see Compliance below). Resources are dynamic, meaning their properties can and do change over time. To support this Resource attributes have states, dynamic representation of the temporal condition of the Resource. States are represented by the Context cell which maintains the value of a Resources attribute at a given moment in time. In this way, Resources are described by their Context.

A Resource will typically have multiple attributes, which can be represented as triples (Subject, Predicate, Object) in a directed graph as follows (Note that the Object in a triple can be either an attribute or a nested relationship of another triple, illustrated by the shaded box for the Compliance requirement of the Programme Resource below):

![Resource graph](image)

**Figure 30 – Extracts of Resource definitions**

*(Note: The ATAR illustrated as an attribute of the Person Resource is the Australian Tertiary Admission Rank, a standardised national ranking system for comparison of High School Certificate qualifications. International equivalency tables would need to be defined under Assertions to cater for other admission ratings, but for simplicity are not contemplated in the instantiation example)*

Resources are deployed by an Undertaking. Resources are associated with an Undertaking via an offer with one Resource in the capacity of a Subject and the other the Object of the offer. The Undertaking aims to convert the offer into an agreement, a committed relationship between two or more Resources.

Resources are capacitated by Roles. Resource Roles are explained in more detail in the following section.
Business View – Role

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROLE</td>
<td>A capacity assigned to a Resource which establishes its relationships with other Resources</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>Things and their properties that define the vocabulary of the business Domain</td>
</tr>
<tr>
<td>INTERACTION</td>
<td>An Interface with a Role which communicates Intent</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>One of a prescribed set of possible results associated with an Undertaking</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>A policy that governs the permissible behaviour of Roles</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECTIVE</td>
<td>delegatedTo</td>
<td>ROLE</td>
</tr>
<tr>
<td>ROLE</td>
<td>expressedAs</td>
<td>INTENT</td>
</tr>
<tr>
<td>INTENT</td>
<td>expressedBy</td>
<td>ROLE</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>grantedTo</td>
<td>ROLE</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>capacitiatedBy</td>
<td>ROLE</td>
</tr>
<tr>
<td>ROLE</td>
<td>committedBy</td>
<td>OUTCOME</td>
</tr>
</tbody>
</table>

Figure 31 – The structure of a Role

Resources are *capacitated* by Roles, temporal assignments which define the capacity which the Resource will exercise in a particular Undertaking. Some Resource types can interact with an organisation in more than one way and may have a different capacity under different scenarios. For example different instances of the same Resource type Person will exercise the Role of an Employee...
as well as a Prospect in the University Self-Assessment Scenario. Role capacities are fluid and the Role that a Resource has been assigned may evolve during the course of an Undertaking or during the lifecycle of the relationship with the organisation. For example University Prospects will evolve into Applicants, which in turn may become Students and later Alumni and possibly Employees. The Role that the same person holds at different times in her relationship with the University will have a significant effect on the Undertakings in which she will be entitled to participate.

The Role a Resource exercises, establishes the relationships it holds with other Resources. For example an Employee Role will hold a multitude of relationships in an organisation defined by Business Units, Teams, Territories and Management reporting lines, as well as the assignment of business activities and objectives. An entire organisation structure and the complex semantics of the hierarchy of relationships and responsibilities can be defined by an ontology of organisational Roles. See example:

The capacity a Role exercises in an Undertaking defines the specific function a Resource will play in a given Undertaking. Role capacities assign Resources with one of the three possible functions which a Role can exercise:

- Stakeholder: the agents of the business that represent the organisation and that are responsible for an Undertaking and measured by the achievement its Outcomes;
- Subject: the 3rd party to the negotiation of an Undertaking/Outcome;
- Object: the thing which is under negotiation in the undertaking/Outcome.

Every Undertaking has a Stakeholder, a Subject and an Object (at least one of each). The Resource to whom an offer is being made is the Subject of the relationship. Ultimately it is the Subject that will be bound by any agreement that is reached. The agent representing the organisation in the negotiation and to whom responsibility for the Undertaking has been delegated, is the Stakeholder. The Resource under offer is the Object.
In each Undertaking Resources will participate as Subjects, Objects and Stakeholders of the Undertaking. In some Undertakings (for example many internal activities relating to Human Resources Management), the same Role type such as Employee may be both a Subject (eg Employee Expense Claim) as well as a Stakeholder (eg Manager, Approver, Accounts Payable Clerk).

Roles enjoy privileges and permissions that are granted by Entitlement Policies. Entitlements determine what part the Role has authority for in the Undertaking by associating Entitlement terms with a Role. In the negotiation of a sales agreement, the Entitlements of a Subject (customer) will stipulate terms such as product eligibility, payment terms and discount levels which might be different for different customers. Role Entitlements are also granted to Stakeholders and govern their authority in the Undertaking such as approval limits on discounts etc. (see Entitlements below).

Roles communicate with the organisation via interactions; a type of business Activity. An interaction involves an expression of Intent. The Intent is contained in a message and indicates a request to or a response from a Role in relation to the negotiation of an Undertaking. Interaction messages can be inbound from the Role or outbound to the Role. The interaction occurs through an interface (user, system or service interface), which in CAPSICUM is specified in the Technical View. Intent at the business view is only concerned with the content and context of the message (see Intent below).

Roles are committed by an Outcome, the end result of an Undertaking. This is explained in more detail in the following two cells.
**Business View – Undertaking**

**Definitions:**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDERTAKING</td>
<td>A business activity that an organisation engages in to realise a Goal.</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>One of a prescribed set of possible results associated with an Undertaking.</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>Things and their properties that define the vocabulary of the business Domain</td>
</tr>
<tr>
<td>TRANSACTION</td>
<td>A discrete, repeatable business function (a service)</td>
</tr>
</tbody>
</table>

**Defining Relationships:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOAL</td>
<td>formulatedBy</td>
<td>UNDERTAKING</td>
</tr>
<tr>
<td>UNDERTAKING</td>
<td>orchestratedBy</td>
<td>OUTCOME</td>
</tr>
<tr>
<td>UNDERTAKING</td>
<td>accomplishedBy</td>
<td>TRANSACTION</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>deployedBy</td>
<td>UNDERTAKING</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>fulfillmentOf</td>
<td>UNDERTAKING</td>
</tr>
</tbody>
</table>

![Fig 33 – The structure of an Undertaking](image)

Undertakings represent the functional activities in which the business invests Resources and through which the organisation will pursue its Goals. Examples of high-level Undertakings in the area of customer relationship management include Marketing Management, Sales Management, Order Management and Service Management.

Resources are deployed by an Undertaking via an offer. Each Undertaking involves the negotiation of an offer relating to the deployment of a Resource. The Resource being offered exercises the capacity of the Object of the relationship throughout the negotiation of the Undertaking. The Resource to whom the offer is being made is the Subject of the relationship. The terms and conditions of the offer...
are formulated from the Entitlement terms and Compliance obligations associated with the Resources and their Roles (via Entitlement and Compliance policies see below).

In a sales example the Object is a product or service and Compliance defines the restricting circumstances relating to the product (for example any warranties or restrictions, where it is being offered and any qualifications that a customer should have to be eligible to purchase the product). In this sales example, the Subject is a customer whose privileges will be determined by Entitlements terms associated with the customer Role.

Undertakings are accomplished by sequences of Activities (synonymous with Services in a Service Oriented Architecture). Undertakings are organised into a hierarchical inventory or taxonomy of business activities. Higher level Undertakings in the hierarchy are achieved through the coordination of more granular Undertakings at lower levels in the hierarchy. Activities can be either a transaction or an interaction and are discussed in more detail below.

Undertakings are fulfilled by Outcomes. Each Undertaking has a finite set of predefined Outcomes. An Outcome may initiate another Undertaking, may conclude the Undertaking via a commitment to an agreement or may conclude the Undertaking with no agreement having been reached. Outcomes are discussed in more detail in the following section.

Scenario:

The inventory of Undertakings for the University Recruitment and Admissions is represented by:

Figure 34 – Scenario Undertakings

This inventory of Undertakings is represented in the following directed graph:
The following directed graph illustrates the structure of an Undertaking with some of the attributes that the example Undertaking: Self Assessment would include:

Figure 35 – An Undertakings Inventory for Recruitment & Admissions

Figure 36 – Extract of an Undertaking Definition
Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTCOME</td>
<td>One of a prescribed set of possible results associated with an Undertaking.</td>
</tr>
<tr>
<td>UNDERTAKING</td>
<td>A business activity that an organisation engages in to realise a Goal.</td>
</tr>
<tr>
<td>ROLE</td>
<td>A responsibility assigned to a Resource which establishes relationships.</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>The logical consideration of a premise that orchestrates the invocation an action (Interaction, Transaction or Outcome decision)</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECTIVE</td>
<td>achievedBy</td>
<td>OUTCOME</td>
</tr>
<tr>
<td>ROLE</td>
<td>committedBy</td>
<td>OUTCOME</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>determinedBy</td>
<td>EVALUATION</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>fulfillmentOf</td>
<td>UNDERTAKING</td>
</tr>
<tr>
<td>UNDERTAKING</td>
<td>orchestratedBy</td>
<td>OUTCOME</td>
</tr>
</tbody>
</table>

![Diagram of Outcome](image)

**Figure 37 – The structure of an Outcome**

Outcomes represent decision points, key milestones that can be measured in the progression or conclusion of an Undertaking. The Undertaking is fulfilled by an Outcome. The possible fulfilments for an Undertaking are represented by its finite set of associated Outcomes.

At some point in the negotiation of an Undertaking, a decision is made to commit to one of the available Outcomes, determined by an Evaluation (see Evaluation below). Since Undertakings are
nested in a hierarchical structure, there might be many steps to conclude the entire process. An Outcome of one Undertaking may well be to transition to another Undertaking in the recursive nature of negotiating Undertakings. A valid Outcome at any point could also be to reject the Undertaking and to stop any further investment of Resources. Generally, the ultimate desired Outcome of an Undertaking is to reach an agreement with the Subject regarding the offer.

The following graph illustrates valid Outcomes that fulfil the Self Assessment Undertaking:

![Graph illustrating valid Outcomes](image)

**Figure 38 – Outcomes associated with an Undertaking**

A committed agreement is a record of a transaction that identifies the Subject and Object Resources that are party to the agreement and commits them into a relationship. Committing to an agreement involves:

- Associating the Subject and Object of the Undertaking into a relationship (eg a sales agreement would evolve the subject Resource: Customer to include a new relationship hasPurchased with the object Resource: Product);
- Instantiation of terms and conditions as attributes of the newly related Object (the terms and conditions are derived from the Entitlement and Compliance Policies associated with each of the Roles).

Committing to an agreement will also typically contribute towards the achievement of an Objective.

**Scenario:**

*An Outcome specification for the Undertaking Online Self Assessments is shown below for the following scenario:*

*An international Prospect enquiring about an Undergraduate Bachelor of Commerce programme - eligible for a Provisional Offer Letter provided his qualification met the minimum requirement (qualification conditions are discussed below under Compliance).*
Figure 39 – Extract of an Outcome: Issue Provisional Offer Letter
Business View – Behaviour

Courses of Action enable achievement of Desired Results by defining the means by which the organisation will achieve results. Whereas Desired Results determine what the business will do, Courses of Action describe how the business will function. Strategic Purpose Courses of Action are aligned with Business View Behaviour, which elaborates how a Course of Action is executed by the business.

Behaviour is typically represented by business process models. Process models are very useful representations for business stakeholders to describe and understand the dynamics of executing a business strategy. A great number of tools, techniques and approaches have been developed for the design of business process models. BPMN a graphical notation for expressing process definitions from OMG, is a one example of a well accepted notation for designing process maps based on semantic symbols that are intended to be intuitive to business people yet support complex process semantics (OMG, 2009).

The intent of the CAPSICUM is not to propose yet another design for a process model, but rather to identify common abstract concepts into which the elements of a process model can be broken down. The Business View Behaviour provides a template for the decomposition of process model definitions (such as BPMN) into abstract constructs, which can then be integrated into a comprehensive model of business operations with explicit relationships to the Business Domain. At the same time Policies and Rules implicit in a process model are extracted from the model definitions into distinct Governance taxonomies, providing greater flexibility and control for managing, exposing and manipulating Governance in a single location (this is explained in more detail in the following section Business View – Governance).

The Business View - Behaviour is represented by the following cells:

- **Intent** - the content of a communication with a Role (input or output);
- **Evaluations** - events that validate contextual Behaviour decisions against Governance;
- **Activities** - the discrete tasks or functions that support a Course of Action;
- **Context** - temporal Conditions of State that describe the Attributes of Resources.

The relationships between Courses of Action in the Strategic Purpose and Behaviour in the Business View are summarised in the following diagram:
Behaviour in the Business View is best explained by beginning with a description of an Activity.
**Business View – Activity**

**Definitions:**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY</td>
<td>A discrete, repeatable business function (a service)</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>The logical consideration of a premise that determines an Outcome decision</td>
</tr>
<tr>
<td>UNDERTAKING</td>
<td>A business activity that an organisation engages in to realise a Goal</td>
</tr>
<tr>
<td>ASSERTION</td>
<td>A definition or statement of fact in the business vocabulary</td>
</tr>
<tr>
<td>CONTEXT</td>
<td>The temporal State of a Resource</td>
</tr>
</tbody>
</table>

**Defining Relationships:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY</td>
<td>triggeredBy</td>
<td>Event</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>restrictedBy</td>
<td>Constraint</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>fulfilledBy</td>
<td>Instantiation</td>
</tr>
<tr>
<td>Operation</td>
<td>executedBy</td>
<td>ACTIVITY</td>
</tr>
</tbody>
</table>

**Figure 41 – The structure of an Activity**

Undertakings are *accomplished by* Activities. Activities are business functions or services; finite, repeatable tasks that execute an Undertaking. Transactions may be atomic (a single task) or compound (a collection of tasks) and may be nested in an iterative, composite structure (OMG, 2009). Activities inherit from the Undertaking various relationships, including the Subject and Object of the Undertaking and the Outcomes associated with the Undertaking.

Activities have two possible types, Transactions and Interactions. The following graph shows how Undertakings are made up of a collection of Activities.
Transactions
Transactions are operations that execute a business function and result in the manipulation of information. The information being manipulated will be attributes of Resources involved in the Undertaking which the Transaction accomplishes. The temporal state of the attributes is maintained in Context and as a result of the Transaction these states may be instantiated by the Transaction with new states. The scope of the Transaction is constrained by Assertions, definitions and rules that determine contextual constraints that the Transaction must observe (see Assertions below).

Interactions
The second type of Activity is an Interaction. Interactions are special kinds of Activities that involve an input or output of information through an interface with a Role. An Interaction always has two parties with one being the organisation, represented by the Stakeholder and the other a 3rd party, representing the Subject of the Interaction. The Subject is a Resource, (a person, organisation, location or system) that will receive (expressTo) or submit (expressBy) a message. The message will contain (or request) information about an Attribute of a Resource involved in the Undertaking. The Resource described in the message could be the Subject itself, or the Object of the Undertaking. The predicate 'expressionOf' indicates which Resource is being described (see Graph: Extract of an Interaction below)

Interactions communicate via inbound or outbound interfaces which may be user interfaces, system interfaces or any other means of transmission of a message to or from the Subject. The design of the Interface and details on how it is invoked and transmitted are considerations for the Technical View. In the Business View an Interaction specification simply includes:

- the Interaction (describing what the Interaction is about)
- the Subject (the Role with whom the Interaction is expressed)
- the Object (the Resource and Attribute to which the Interaction refers)
- the Intent (the message created as a result of the Interaction)
The message is an expression of Intent with regard to the current Undertaking. Intent is discussed in more detail in the next section.

Whilst the logic in an Activity is defined by the Transaction or Interaction, the execution of an Activity will vary based on the temporal states contained in Context and Intent. Each Activity will therefore need to trigger an Evaluation of these temporal states against a derivation of conditional Policies and Rules (see Evaluation and Condition below).

Scenario:
The Self-Assessment Undertaking involves several Activities which are inbound Interactions. Prospects submit information through an on-line interface which communicates their profile personal details, qualifications and study intentions. An example of a Business View definition for the Interaction “Record Study Intention” is represented by:

![Diagram](image)

Figure 43 – Extract of an Activity - Interaction
**Business View – Intent**

**Definitions:**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTENT</td>
<td>A state of an Attribute of a Resource, communicated via an Interaction</td>
</tr>
<tr>
<td>ROLE</td>
<td>A capacity assigned to a Resource which establishes its relationships with other Resources</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>The logical consideration of a premise that determines an Outcome decision</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>A policy that governs the permissible behaviour of Roles</td>
</tr>
</tbody>
</table>

**Defining Relationships:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTENT</td>
<td>expressedBy</td>
<td>ROLE</td>
</tr>
<tr>
<td>ROLE</td>
<td>expressedAs</td>
<td>INTENT</td>
</tr>
<tr>
<td>INTENT</td>
<td>authorisedBy</td>
<td>ENTITLEMENT</td>
</tr>
<tr>
<td>INTENT</td>
<td>consideredBy</td>
<td>EVALUATION</td>
</tr>
</tbody>
</table>

**Figure 44 – The structure of Intent**

During the course of an Undertaking, Interaction Activities enable a flow of information between Roles. The communicated content of an Interaction is expressed as Intent. Intent is simply the state of a Resource attribute communicated by an Interaction. (Intent and Context are similar cells, in that they both represent temporal states of attributes.) An Interaction can invoke a request for a communication of Intent or can contain a response communicating Intent.

Transaction Activities differ from Interactions in that they do not involve an interface with an external role. However a Transaction will usually result in an intention to Instantiate the state of a Resource (Context). This represents a similar situation as a flow of information via an input/output with a Role, so a Transaction can also communicate Intent.

Intent is expressed by (inbound) or expressed to (outbound) a Role. Intent is authorised by the Entitlement terms associated with the Subject of the Interaction. For example an approval of a pricing
discount issued by a manager would be authorised against the discount levels that he is entitled to approve.

Intent (as with Context) provides a contextual connotation to the execution of an Activity. This contextual situation is Evaluated against Policies and Rules to determine an appropriate Outcome for an Activity. The Evaluation of an expression of Intent is explained in the next section.

Scenario:
A Prospect who has indicated the Intent of “Bachelor of Commerce” as the degree of their Intended Programme is represented by:

Figure 45 – Extract of Intent
Business View – Evaluation

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVALUATION</td>
<td>The logical consideration of a premise that determines an Outcome decision</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>A discrete, repeatable business function (a service)</td>
</tr>
<tr>
<td>CONDITION</td>
<td>An interpretation of policies that govern a particular situation</td>
</tr>
<tr>
<td>INTENT</td>
<td>An Interface with a Role which communicates Intent</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>One of a prescribed set of possible results associated with an Undertaking</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVALUATION</td>
<td>triggeredBy</td>
<td>ACTIVITY</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>validatedBy</td>
<td>CONDITION</td>
</tr>
<tr>
<td>INTENT</td>
<td>consideredBy</td>
<td>EVALUATION</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>determinedBy</td>
<td>EVALUATION</td>
</tr>
</tbody>
</table>

Figure 46 – The structure of an Evaluation

Evaluations represent key events in the execution of a Course of Action, by interpreting business Directives relating to the situation at hand and determining an appropriate result.

Every Undertaking will have moments during its execution when the proposed execution of a business activity will need to be considered and approved. The Evaluation cell in the Business View represents this event. An Evaluation involves considering a premise proposed by an Activity (Interaction or Transaction) in light of the temporal states of inputs (Intent) and current Resource.
states (Context). This premise is evaluated against a contextual derivation of Policies and Rules pertinent to the situation. The dynamics of an Evaluation event occur as follows:

An Evaluation is triggered by an Activity and considers the contextual proposition posited by the Activity. There are 4 considerations which may occur in an Evaluation:
- An expression of Intent relative to a Role is authorised against Entitlement terms for that Role;
- An Evaluation determines an Outcome for an Undertaking, validated against defined conditions relevant to each possible Outcome option;
- The parameters of the Activity are constrained by Assertions, rules that interpret facts and definitions that the business has stipulated;
- Proposed instantiations to Resource Attributes are verified against Compliance obligations

This dynamic and the key function of an Evaluation is illustrated in the following diagram:

**Figure 47 – The dynamics of an Evaluation**

An Evaluation is comprised of:

- A Trigger: an event arising from the occurrence of a pending Interaction or Transaction;
- A Proposition: the current and/or proposed state of the attributes of the Resources participating in the Undertaking represented by Intent and/or Context
- The Conditions: a derivation of Entitlements and Assertions relating to the contextual proposition;
- An Outcome: a decision that orchestrates the flow of subsequent steps in an Undertaking.

**Scenario:**

The following graph illustrates an Evaluation ‘Consider Provisional Offer’ triggered by the Transaction ‘Select Outcome’. In this example the only Condition shown is an Entitlement policy which requires that Prospects for the
Intended Programme ‘Bachelor of Commerce’ should have a qualification ‘ATAR > 90’

Figure 48 – Extract of an Evaluation
**Business View – Context**

**Definitions:**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTEXT</td>
<td>The temporal state of a Resource</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>A discrete, repeatable business function (a service)</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>Things and their properties that define the vocabulary of the business Domain</td>
</tr>
<tr>
<td>COMPLIANCE</td>
<td>Constraints that determine permissible States of Attributes</td>
</tr>
</tbody>
</table>

**Defining Relationships:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESOURCE</td>
<td>describedBy</td>
<td>CONTEXT</td>
</tr>
<tr>
<td>CONTEXT</td>
<td>instantiatedBy</td>
<td>ACTIVITY</td>
</tr>
<tr>
<td>CONTEXT</td>
<td>verifiedBy</td>
<td>COMPLIANCE</td>
</tr>
</tbody>
</table>

Figure 49 – The structure of Context

Context describes the state of a Resource. States represent the current values associated with Resource attributes. States are instantiated by an Activity following the Evaluation of an Interaction or Transactions. Instantiations of an attribute are verified against Compliance policies which enforce governance over the permissible states that the respective Resource attribute may contain.

Context is considered in the Evaluation of an Activity to situate the current state of a Resource. For example on an order fulfilment Activity, the Evaluation would consider the current inventory level for the item, which is maintained as an attribute of the product being ordered.
A directed graph for Context is illustrated below:

![Diagram](image)

To simplify the depiction of this relationship in a directed graph, an abbreviated version of the same semantic representation is illustrated as:

![Diagram](image)

**Figure 50 – Extract of Context**
Business View - Governance

In the Strategic Purpose, Directives are made up of Policies and Rules which govern Courses of Action and support achievement of Desired Results. Directives are represented in the Business View as Governance. Governance controls Behaviour within the business Domain.

Policies lay down guidelines relating to a desired state in the business Domain. For example a Policy governing the use of a kitchen fridge might be: “There should always be cold water in the fridge”.

Rules provide guidance for Behaviour. They enforce policies and regulate decisions relating to Behaviour by defining relevant actions for a given context. A Rule to enforce the above fridge policy might be: “When the water bottle is approaching empty it should be refilled”.

The Business View extracts Policies and Rules away from the definition of a business process. This gives enormous power to business stakeholders who can manipulate the semantics of business operations simply by making alterations to Policies and Rules rather than embedding rules into process flow logic. Each of the cells in the Business View Governance is represented by a taxonomy of declarative statements about Resource attributes, which are evaluated in the execution of Behaviour.

The Business View – Governance is represented by the following cells:

- **Entitlements** - terms that govern the behaviour of Roles;
- **Conditions** - contextual interpretations of Policies and Rules relative to Activity Outcomes;
- **Assertions** - an ontology of Facts that semantically define the business vocabulary (distinct from the domain vocabulary defined by the Resource cell);
- **Compliance** - constraints that govern what states a Resource can or must obtain.


According to the Business Rules Group, Directives fall into 4 possible categories (Business Rules Group, 2000). These align with the CAPSICUM definitions in the Business View as follows:

- Terms – CAPSICUM Entitlements
- Facts – CAPSICUM Assertions
- Constraints – CAPSICUM Compliance
- Derivations – CAPSICUM Conditions
Business View – Entitlement

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTITLEMENT</td>
<td>A policy that governs the permissible behaviour of Roles</td>
</tr>
<tr>
<td>INTENT</td>
<td>A state of an Attribute of a Resource, expressed via an Interaction with a Role</td>
</tr>
<tr>
<td>CONDITION</td>
<td>An interpretation of policies that govern a particular situation</td>
</tr>
<tr>
<td>ROLE</td>
<td>A capacity assigned to a Resource which establishes its relationships with other Resources</td>
</tr>
<tr>
<td>COMPLIANCE</td>
<td>Constraints that determine permissible States of Attributes</td>
</tr>
</tbody>
</table>

Defining Relationships:

<p>|</p>
<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTITLEMENT</td>
<td>grantedTo</td>
<td>ROLE</td>
</tr>
<tr>
<td>INTENT</td>
<td>authorisedBy</td>
<td>ENTITLEMENT</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>validatedBy</td>
<td>COMPLIANCE</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>arbitratedBy</td>
<td>CONDITION</td>
</tr>
</tbody>
</table>

Figure 51 – The structure of an Entitlement

Through their association with Roles, the Resources participating in an Undertaking are granted Entitlements. Entitlement Policies govern:

- Permissions (what a Role is allowed to do)
- Obligations (what a Role is responsible to do)

An Entitlement is expressed as a term. In the acceptance of an Outcome agreement, the terms granted to the Subject and Object Resources, form the terms of the agreement.
In an Interaction with a Role, the message that is communicated is an expression of Intent. The Interaction and associated Intent are *authorised* against Entitlement Terms. The following diagram illustrates an Entitlement Term for a Stakeholder:

![Diagram of Entitlement Term](image)

**Figure 52 – Example of an Entitlement Term**

(Note: the variable Programme Qualification is defined by an Assertion – see below)

This Term determines that:
- the Employee with the Role Direct Admissions Officer
- has been granted an Entitlement permission
- to manually determine the Issue POL Outcome
- if the Prospect ATAR score is within 10% of the ATAR requirement for the Intended Programme.
Business View – Condition

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONDITION</td>
<td>An interpretation of policies that govern a particular situation</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>A policy that governs the permissible behaviour of Roles</td>
</tr>
<tr>
<td>ASSERTION</td>
<td>A definition or statement of fact in the business vocabulary</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>The logical consideration of a premise that determines an Outcome decision</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTITLEMENT</td>
<td>arbitratedBy</td>
<td>CONDITION</td>
</tr>
<tr>
<td>ASSERTION</td>
<td>predicatedOn</td>
<td>CONDITION</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>validatedBy</td>
<td>CONDITION</td>
</tr>
</tbody>
</table>

Figure 53 – The structure of a Condition

Conditions are Rules that regulate behaviour, based on the temporal states of attributes. Conditions allow for context sensitive decisions. Many rules in an organisation are based on the existence of a temporal circumstance. An Evaluation premise, triggered by an Activity will consider the temporal values of the Context and Intent associated with the premise and validate these against Condition Rules.

Entitlements may also be arbitrated by a Condition, so that the terms granted to a Role may vary under different state based circumstances. The Qualification Over-ride Entitlement example above could be arbitrated by a Condition that it is only granted under certain circumstances, for example:
  - limited to a specific list of programmes;
- only where the Intended Programme has not exceeded a certain maximum number of enquiries;
- limited to a time-frame during which the over-ride is allowed.

Each of these situations represents a temporal Condition based on the state of certain Resource Attributes associated with the Activity.

The third example above is illustrated as:

![Diagram](image)

**Figure 54 – Example of a Condition**

Likewise, Assertions (definitions and facts) can also be *predicated on* Conditions. For example, an Assertion defining the qualification requirements for a specific programme could be qualified by a Condition that is dependent on possible secondary qualifications the prospect might have.
**Business View – Assertion**

**Definitions:**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSERTION</td>
<td>A definition or statement of fact in the business vocabulary</td>
</tr>
<tr>
<td>CONDITION</td>
<td>An interpretation of policies that govern a particular situation</td>
</tr>
<tr>
<td>COMPLIANCE</td>
<td>Constraints that determine permissible States of Attributes</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>A discrete, repeatable business function (a service)</td>
</tr>
</tbody>
</table>

**Defining Relationships:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSERTION</td>
<td>predicatedOn</td>
<td>CONDITION</td>
</tr>
<tr>
<td>ASSERTION</td>
<td>satisfiedBy</td>
<td>COMPLIANCE</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>constrainedBy</td>
<td>ASSERTION</td>
</tr>
</tbody>
</table>

**Figure 55 – The structure of an Assertion**

Assertions are declarative statements of fact that articulate operational definitions for the organisation. An ontology of Assertions would organise these definitions into a hierarchical classification that semantically defines the unique vocabulary of the business operation.

Assertions give meaning to the variables and terms that are used elsewhere in the Business View. The execution of an Activity is constrained by Assertions which define terms and variable definitions used in an Activity. Some Assertions may be context specific, meaning that a definition may vary dependent state of a particular Resource attribute. In this case the Assertion is predicated on a Condition. Assertions are satisfied by Compliance policies (see Compliance below).
Scenario:

Sample Assertions for the Self-Assessment scenario would include:

- a definition of what constitutes an International student (which could be a complex consideration of Nationality, Country of Residence and Residence Status in Australia);
- qualification requirements for a programme (simplified version shown below but which would need to consider many different international equivalencies);
- definitions for start and end dates of semesters;
- territory definitions for recruiters or agents.

Example specifications of the above Assertions are shown below:

![Diagram showing examples of assertions]

Figure 56 – Examples of Assertions
Business View – Compliance

Definitions:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPLIANCE</td>
<td>Constraints that determine permissible States of Attributes</td>
</tr>
<tr>
<td>ASSERTION</td>
<td>A definition or statement of fact in the business vocabulary</td>
</tr>
<tr>
<td>CONTEXT</td>
<td>The temporal State of a Resource</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>A policy that governs the permissible behaviour of Roles</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>Things and their properties that define the vocabulary of the business Domain</td>
</tr>
</tbody>
</table>

Defining Relationships:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESOURCE</td>
<td>obligatedBy</td>
<td>COMPLIANCE</td>
</tr>
<tr>
<td>ASSERTION</td>
<td>satisfiedBy</td>
<td>COMPLIANCE</td>
</tr>
<tr>
<td>ENTITLEMENT</td>
<td>validatedBy</td>
<td>COMPLIANCE</td>
</tr>
<tr>
<td>CONTEXT</td>
<td>verifiedBy</td>
<td>COMPLIANCE</td>
</tr>
</tbody>
</table>

Figure 57 – The structure of Compliance

Compliance Policies enforce mandatory requirements. A Compliance Policy verifies an instantiation of Context against the permissible temporal states that attributes of Resources may hold at a point in time. Compliance is ascertained by evaluating instances of attribute states to ensure that they satisfy Assertions and are validated by Entitlements. Any Activity that attempts to instantiate Context with an update to the state of an attribute is verified against Compliance obligations associated with the Resource.
An example of a Compliance Policy for a programme qualification is represented in the following graph:

![Graph showing Compliance Policy]

**Figure 58 – Example of Compliance**
How CAPSICUM Business View Works

The following diagram illustrates the cycle of a business endeavour in the CAPSICUM Business View:

![Diagram of the Cycle of Business Endeavour]

**Figure 59 – The Cycle of Business Endeavour**

The starting point is an Undertaking. Undertakings are hierarchically arranged in an Ontology of business endeavour that supports the business Domain. When an Undertaking is initiated, appropriate Resources are identified and associated as Subject and Object of the Undertaking. Possible Outcomes for the Undertaking are already pre-determined.

The Undertaking is accomplished by Activities. Each Undertaking will identify the Activity or sequence of Activities that will need to be initiated. Activities inherit from the Undertaking various relationships, including the Subject and Object of the Undertaking, which become the Subject and Offer of the Activity.

The Activity can be envisaged as a black box that executes business logic. Activities are services which take as inputs the state of the relevant Resources via their Context, and may request need to communicate with a Role via a message expressed as Intent. The logic executed by the Activity will formulate a proposition, a proposal to instantiate the state of a Resource.

An Evaluation considers the proposition proposed by the Activity. This includes the associated Intent, the existing Context (state of the Resources) and the proposed instantiation to Context. This contextual proposition is evaluated against relevant Conditions to determine an appropriate Outcome.
Conditions apply contextual interpretations of existing Policies and Rules to the proposition. This includes a consideration of Entitlements associated with the Subject and Object and Assertions rules containing business definitions governing the Resources involved. Compliance policies confirm that requirements relating to the intended Activity and its proposed instantiations to any Resource Context are valid and acceptable.

This Evaluation results in a decision regarding the selection of one of the predetermined Outcomes. As mentioned above, this may involve moving on to a subsequent Undertaking (as in a process step), or may conclude the Undertaking and execute the appropriate instantiations of the Resources.
CAPSICUM Technical and Platform Views

As stated above, the focus of the thesis is the elaboration of the Business View. The Business View is intended to support further model definitions at the Technical and Platform Views. The following diagram illustrates an early draft of the alignment of the Business View with the underlying model constructs:

<table>
<thead>
<tr>
<th>Desired Results</th>
<th>Courses of Action</th>
<th>Directives</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Goals &amp; Objectives)</td>
<td>(Strategies &amp; Tactics)</td>
<td>(Policies &amp; Rules)</td>
</tr>
<tr>
<td>Role</td>
<td>Interaction</td>
<td>Entitlement</td>
</tr>
<tr>
<td>Outcome</td>
<td>Evaluation</td>
<td>Derivation</td>
</tr>
<tr>
<td>Undertaking</td>
<td>Transaction</td>
<td>Assertion</td>
</tr>
<tr>
<td>Resource</td>
<td>Context</td>
<td>Compliance</td>
</tr>
</tbody>
</table>

**Figure 60 – CAPSICUM Framework with Draft Technical and Platform Views**
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