DECISION ANALYSIS: A PRIMER

How to Use DecisionSpeak™ and Question Charts (Q-Charts™)

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EXECUTIVE SUMMARY

Decision analysis aims toward capturing and encoding the logic used to make decisions. These decisions are always **operational business decisions** – *not* programming, personal, strategic, or governance decisions. Operational business decisions are common in business processes. Examples:

- *Should an insurance claim be accepted, rejected, or examined for fraud?*
- *Which resource should be assigned to a task?*
- *Which service should be used to ship a package?*

As these examples suggest, decision analysis involves identifying and analyzing key questions arising repetitively in day-to-day business activity.

The end-product is the explicit **decision logic** used to answer each question, which can take the form of **decision structures**, **decision tables**, and **business rule** statements. This decision logic is rendered in a form that is **practicable** (ready for deployment whether to staff or ultimately to machines), enterprise-robust, and business-friendly.

Externalizing decision logic from processes reduces their complexity significantly. It also results in decision logic that is far more accessible, adaptable (easier to change), and re-usable (in other processes or for multiple use cases). Overall, externalizing and single-sourcing decision logic is essential to achieving business agility.

This Primer focuses on top-down decision analysis and explains how to:

- Analyze and define the key elements of operational business decisions.
- Diagram operational business decisions and their dependencies.

It introduces and explains:

- **Q-Charts™**, an effective brainstorming and diagramming technique for operational business decisions.
- **DecisionSpeak™**, a set of conventions for expressing the meaning of operational business decisions, especially the questions they address. Refer to Appendix 1 for a quick overview of what DecisionSpeak is.

The natural follow-on activity after decision analysis is developing decision tables. For more, refer to the companion work, ***Decision Tables: A Primer – How to Use TableSpeak™***[1].

We believe decision analysis should be a key concern in business analysis. This discussion introduces business analysts to everything they need to know about this important discipline based on the BRS methodology, **IPSpeak®**.

[1] available (free) on **http://www.brsolutions.com/IPSpeakPrimers**

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WHAT DECISION ANALYSIS IS

Decision analysis means *identifying and analyzing some key question in day-to-day business activity and capturing the decision logic used to answer the question.* Examples of such questions:

- *Should this insurance claim be accepted, rejected, or examined for fraud?*
- *Which resource should be assigned to this task?*
- *Which service should be used to ship this package?*

Typical kinds or patterns of decisions appropriate for decision analysis include classification, evaluation, selection, approval, assessment, assignment, allocation, diagnosis, and prediction.

The end-product of decision analysis is **decision logic** in the form of decision structures, **decision tables**, and **business rule** statements. This answer-oriented decision logic is rendered in a form that is:

- **practicable**
- enterprise-robust
- business-friendly

A **decision** is *a determination requiring* **know-how** *or expertise; the resolving of a question by identifying some correct or optimal choice*. A decision should represent the best or most appropriate answer (outcome) among potential outcomes for some weighty (non-trivial) choice the business must make repetitively in day-to-day business activity.

Decisions appropriate for decision analysis are always **operational business decisions** – *not* programming, personal, strategic, or governance decisions.

To emphasize the point, this Primer always says *operational business decision*, not simply *decision*. There is much confusion in the field on this point. The practitioner is urged to carefully review the important target-problem clarifications presented in Appendix 2.

Decision analysis can be undertaken in either of two ways:

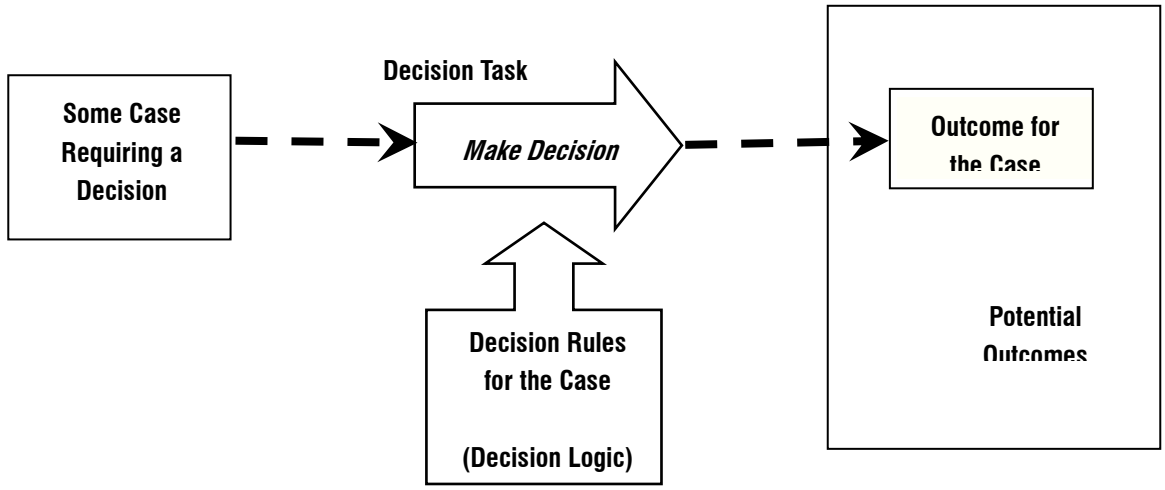
- *Stand-alone:* Undertaken on its own for some specific decision(s).
- *Embedded:* Undertaken as part of another initiative – e.g., business process re-engineering, web-based eCommerce, legacy system modernization, etc.

Decision analysis should be a central focus of business analysis. Decision analysis is a highly effective, business-oriented means to capture certain kinds of business rules – principally**,** **decision rules**.

By no means does decision analysis capture all business rules. Refer to Appendix 3 on the distinction between decision rules and other important kinds of business rules you need to capture and manage.

THE BASIC ELEMENTS OF OPERATIONAL BUSINESS DECISIONS

Figure 1: Basic Elements of Operational Business Decisions



In **DecisionSpeak** the basic elements of **operational business decisions** include those represented in Figure 1.

A **case** is some *particular matter or situation* requiring an operational business decision. Example: *John Smith* applies for auto insurance. Based on income, employment and experience, John is a typical or ordinary applicant.

A **potential outcome** is *some result, conclusion, or answer that might be deemed appropriate for a case.* Depending on the operational business decision, potential outcomes might be any of the kinds listed in Table 1 on page 8.

An operational business decision must always have at least two potential outcomes.

Business analysts should always endeavor to be very clear about potential outcomes. Shape and define them early; make sure they are not hazy or fuzzy; revisit and challenge them often.

An **outcome** is the *actual result, conclusion or answer from making a decision; that is, the result, conclusion or answer deemed appropriate for a given case*. Example: *John Smith*, an ordinary applicant in terms of income, employment, and experience, is deemed *eligible* for auto insurance (but could have been deemed *ineligible*).

A **decision rule** is a **business rule** *that guides the making of an operational business decision; specifically, a business rule that links a case to some appropriate outcome.* Example: The decision rule that links the case of an ordinary applicant like *John Smith* to the outcome *eligible*.

The **decision logic** is *the set of all decision rules for* **cases in scope** *of a given operational business decision.* Decision logic should be represented declaratively in the form of **decision table(s)**, business rule statement(s), or some combination thereof. Example of decision logic: *All the business rules for whether an applicant is eligible for auto insurance.*

A **decision task** is a *task or action in which an operational business decision is made*. The decision task corresponding to auto insurance decision logic might be *Determine Eligibility of Applicant for Auto Insurance*. Quite possibly this decision task is just one of many tasks in some business process. As Figure 1 illustrates, decision logic should be externalized from such decision tasks.

MORE ABOUT DECISION TASKS

Decision tasks, like all tasks, are **procedural**. A decision task does something; specifically, it makes an operational business decision. Without some decision task, nothing happens – that is, no decision is made.

The decision logic, in contrast, should be purely **declarative**. It indicates only what the outcome for each possible case *should* be; the decision logic cannot actually make the operational business decision. So there *always* has to be a task or action to make an operational business decision.

For the purpose of decision analysis, the need for a task or action to make a decision *can be taken as a given*. From this point forward, the discussion focuses exclusively on development of the relevant decision logic.

Externalizing decision logic from decision tasks, a form of **rule independence**, produces simple (or *thin*) decision tasks, which in turn produces *thin processes*. It also results in decision logic that is far more accessible, adaptable (easier to change), and re-usable (e.g., in other processes). Overall, we believe that **decision-smart business processes** are the key to business agility.

Table 1: Kinds of Potential Outcomes

Kind	Example	Comment
Boolean (yes/no; true/false)	whether eligible/ineligible	Actual outcomes can be expressed as facts – e.g., *The applicant John Smith is eligible.*
quantity	a dollar amount	If an appropriate quantity can be predicted by a formula or calculation, techniques other than decision analysis should be used.
category	silver, gold or platinum customer	Such categories usually, but need not always, fall under the same general concept.
real-world instance	a specific employee who is a candidate for representing a gold customer	Such instances usually, but need not always, fall into the same general concept (class).
course of action	on-site visit, teleconference, telephone call, email, fax	Such outcomes should not be expressed in a **procedural** manner (e.g., *Send a fax.*).

USING DECISIONSPEAK TO ASK QUESTIONS

The end-product of **decision analysis** is **decision structures**, **decision tables**, and **business rule** statements – that is, **decision logic** explicitly encoded *using words.* A goal is to ensure the design logic can be understood and managed by business people and business analysts. The underlying assumption is that business people and business analysts will want to know *why* particular answers are reached.

Decision analysis might also be suitable where the end-products are *non*-verbal – e.g., statistical models, neural nets, etc. – but these other forms are not covered in this discussion. In many respects the *why* is the hard part of the problem.

We follow a set of conventions in decision analysis called **DecisionSpeak**.

The first and perhaps most fundamental innovation in DecisionSpeak is how to properly ask the question that lies at the heart of an **operational business decision**. This question is so important for effective decision analysis that DecisionSpeak recommends the question to be *the one and only name* for the operational business decision.

Naming an operational business decision according to the question it answers:

- Provides a continuing checkpoint for testing what the operational business decision is really about.
- Serves as a constant reminder that the focus in decision analysis is on capturing **declarative** decision logic, not on how work is performed from a **procedural** point of view.
- Assists in delineating scope. For example, the decision logic addressing the question *Is an applicant eligible for insurance?* might not be about *all* kinds of insurance, perhaps just *auto* insurance. If so, the question can be sharpened to *Is an applicant eligible for auto insurance?*

Forming, testing, and continually shaping the question that decision logic answers are a critical success factor for decision analysis. In practice, the challenge is seldom as simple as it might seem.

BASIC DECISIONSPEAK CONVENTIONS FOR EXPRESSING THE QUESTION

The question an operational business decision addresses should be expressed clearly in business language that is natural for business people. It should use business terminology, not field names for stored data or any other form of ITSpeak. Examples of well-formed questions:

- *Should an insurance claim be accepted, rejected, or examined for fraud?*
- *Which resource should be assigned to a task?*
- *Which service should be used to ship a package?*

We strongly recommend basing questions directly on a **structured business vocabulary (concept model)**. Avoid words that are

ambiguous or undefined. Example: Is the term *service* clear and well-defined in the third question above?

In formulating and phrasing the question, think of **potential outcomes**. The question and set of potential outcomes *must* align. Example: Suppose the potential outcome *umbrella* is suggested for the question *What coat should be worn?* Something is amiss. Either the question is worded too narrowly or that potential outcome is inappropriate.

DecisionSpeak offers the following additional guidelines for expressing the question addressed by some decision logic:

- **Avoid the word *how*.** The interrogative *how* often suggests process or procedure. For example, a question worded as *How should an order be filled?* might be taken to mean *What steps are appropriate in actually filling orders?*. A better way to ask the question might be *What method should be used to fill an order?*.

  Steering clear of any potential confusion with process or procedure is always best for decision analysis. Note that this convention does not apply to *how much* or *how many*, both of which refer to some quantity rather than to some action.

- **Avoid the word *must* in favor of *should*.** Example: Instead of *What sales tax must be charged on an order?,* write *What sales tax should be charged on an order?.*

  The answers provided by decision logic simply indicate appropriate outcomes for given cases. How strictly these outcomes are to be applied in actual business activity is a separate concern.

- **Avoid conversational shortcuts** (e.g., *I, we, you, here, now, this,* etc.). Examples:

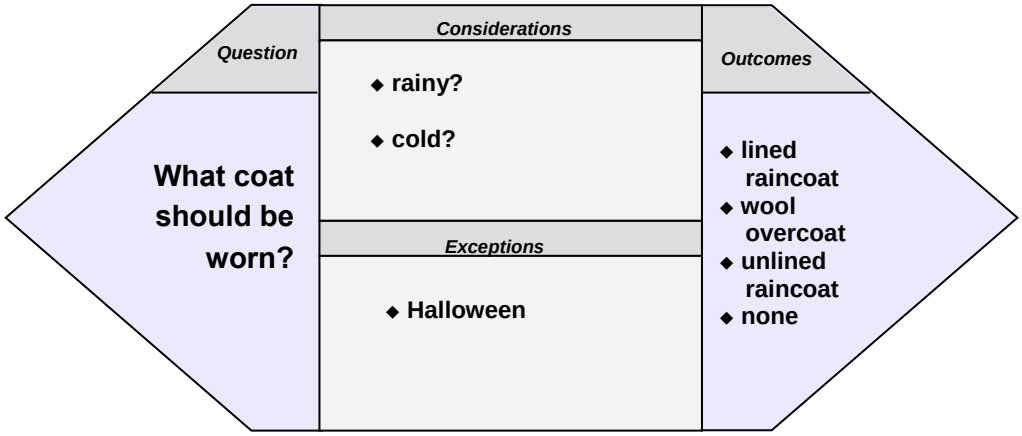
Instead of …	*Write this instead …*
What coat should I wear today?	*What coat should be worn?*
How should we price this order?	*How should an order be priced?*

  Using a conversational shortcut (also called *discourse shortcut*) in a question can result in ambiguity, misunderstanding and misuse. The reason is simply that when the question is read out of context (i.e., apart from any conversation) the reference point for the shortcut is unclear.

- **Avoid *and's* and *but's*.** Operational business decisions with conjunctions are unlikely to be atomic. For example avoid: *What is wrong with this machine and what approach should be used for fixing it?* The *and* indicates separate decisions, each of which should be analyzed in its own right.

ANALYZING A DECISION: Q-COE

Figure 2: Q-COE for the Operational Business Decision *What coat should be worn?*



In DecisionSpeak a **Q-COE™** is a graphic representation of an **operational business decision** indicating what question ("Q") is being asked, and usually one or more of the following: **considerations** ("C"), **outcomes** ("O"), and **exceptions** ("E"). Q-COEs often prove useful in facilitated sessions and other analysis work for brainstorming key elements of an operational business decision.

In a Q-COE an elongated hexagon stands for an operational business decision. The question representing the operational business decision is indicated inside the hexagon. Figure 2 above illustrates a simple Q-COE.

A Q-COE is an early step toward development of **practicable** decision logic (usually in the form of some **decision table(s)**). For example, the Q-COE in Figure 2 does not indicate:

- specific outcomes for particular cases
- any outcome for the exceptional case, *Halloween*.

A Q-COE simply offers some structure for brainstorming the key elements of an operational business decision. Both Q-COEs and **Q-Charts** should begin in 'sketch' mode. Too much 'rigorous' specification early-on will work against effective collaboration and dialog.

CONSIDERATIONS

In DecisionSpeak, a **consideration** is *a factor in making an operational business decision; something that can be resolved to two or more cases*. Such a factor always arises from the business side, not IT. In determining an applicant's eligibility for auto insurance, for example, considerations might include *driving history, evidence of insurance, insurance risk score, credit rating,* and *state/province.*

In Figure 2 two considerations are shown:

- *rainy?*
- *cold?*

Although these considerations are shown with question marks, a question format is not required in practice. Use whatever form works best.

Each of the two considerations in Figure 2 can be resolved to two or more **cases** respectively:

- Yes it is rainy, and no it is not rainy.
- Yes it is cold, and no it is not cold.

According to the Q-COE only these two considerations are needed (unless the special case Halloween applies) to answer the question, *What coat should be worn?*. Looking forward, you can imagine a **decision table** being designed to represent combinations of cases and their appropriate outcomes[2]. Figure 3 illustrates.

Figure 3: Decision Table for *What coat should be worn?*

		Is it rainy?	
	What coat should be worn?	***yes***	***no***
Is it cold?	***yes***	*lined raincoat*	*wool overcoat*
	no	*unlined raincoat*	*none*

Refer to Appendix 4 for more about considerations and cases.

EXCEPTIONS

The outcome for any given case is usually determined by a standard or typical set of considerations. If not, then the case is an *exceptional case*. An **exceptional case** (abbreviated *exception* in a Q-COE) is *a case in scope that does not use any of the considerations of a standard (normal) case.* Each exceptional case presumably uses some other consideration(s).

The Q-COE in Figure 2 indicates *Halloween* as an exception. Consequently the 'normal' considerations cannot be used to determine an appropriate outcome for that case. What considerations or special **decision rules** do apply is still to be determined.

As another example suppose, as before, that in determining eligibility for auto insurance the standard considerations are: *driving history, evidence of insurance, insurance risk score, credit rating,* and *state/province*. Apart from those considerations, suppose any applicant must be denied auto insurance if either a *felon* or *under 18 years of age*. Since *criminal status* and *age* respectively are not among the standard or typical considerations for the decision logic, these cases are deemed *exceptions*.

Exceptions can often be addressed by expressing some **business rule(s)**. The two exceptions above can be expressed by the following statement in **RuleSpeak**:

> *An applicant for auto insurance must be considered ineligible if one or more of the following are true:*
>
> - *The applicant has been convicted of a felony involving a motor vehicle.*
> - *The applicant is younger than 18 years of age.*

[2] Refer to the companion work, *Decision Tables – A Primer: How to Use TableSpeak*™, by Ronald G. Ross, available (free) on **http://www.brsolutions.com/IPSpeakPrimers**

It is important to note that exceptions *are* in scope. Definite outcomes are always given for exceptions, even if simply to deny (or accept) some result out-of-hand. Refer to Appendix 5 for additional discussion.

Cases that are not exceptional are considered *standard*. A **standard case** is a case that is:

- Regular or common,
- Based on some or all the usual considerations, and
- Subject to normal treatment and cannot be denied (or accepted) out-of-hand.

In DecisionSpeak typically at most 20% of all possible cases are exceptional. If the percentage of exceptional cases exceeds 20% for some decision logic, the standard or typical considerations should be re-examined.

Identifying exceptional cases early-on can hugely simplify 'normal' **decision logic** – and its eventual representation as decision tables as well.

DECISION DEPENDENCIES

Table 2: The Three Kinds of Decision Dependencies in DecisonSpeak

	Basis	Kind	Effect
1	question	*relevance dependency*	the outcome from one question can preempt another question
2	consideration	*consideration dependency*	the outcome from one question provides or supports a consideration for another question
3	outcome	*outcome dependency*	the outcome from one question can restrict the outcomes of another question

A dependency between **operational business decisions** occurs when one decision is logically a prerequisite for another. **DecisionSpeak** recognizes three kinds of **decision dependencies** as given in Table 2. Each kind of decision dependency is discussed individually below.

Frequently asked questions about this set of decision dependencies:

Why aren't *mathematical* dependencies among the decision dependencies shown in Table 2?

An example of a mathematical dependency:

A first expression *(C - D = E) depends on a second expression (A + B = C) in that the first expression depends on computation of C as prescribed by the second expression.*

Business rules for computation are best given by formulas featuring appropriate re-use of terms (e.g., 'C' in the two expressions above). Hierarchical visualization of mathematical dependencies between such expressions often does prove useful. To avoid confusion, however, **Q-COEs** and **Q-Charts** should not be used for that purpose. Mathematical dependency is not what they are about.

Must the two operational business decisions in a decision dependency have identical scope?

No, but their scopes do need to align. Refer to Appendix 5 for discussion of scope for decision analysis; refer to Appendix 6 for specific discussion of alignment in decision dependencies. A heads-up: *Scope is an important and often non-trivial matter in decision analysis(!).*

How are decision dependencies diagrammed?

Decision dependencies are a key feature of Q-Charts. Related Q-COEs are connected using *vertical* connectors. (Horizontal connectors might suggest process or flow. Since **decision logic** under DecisionSpeak is always **declarative**, horizontal connectors are avoided.)

Which operational business decision in a dependency connection is dependent on which?

The decision on the top (the upper decision) is always dependent on the decision below it. If a Q-Chart shows multiple levels of decision dependency (not unusual), the same is true pair-wise at each level below.

As illustrated in the discussion that follows, every depiction of a dependency connection includes a 'hitch point' (a solid circle) at the bottom end. The operational business decision on that end is always the one most able to stand on its own – i.e., the lower decision is always the more *independent*.

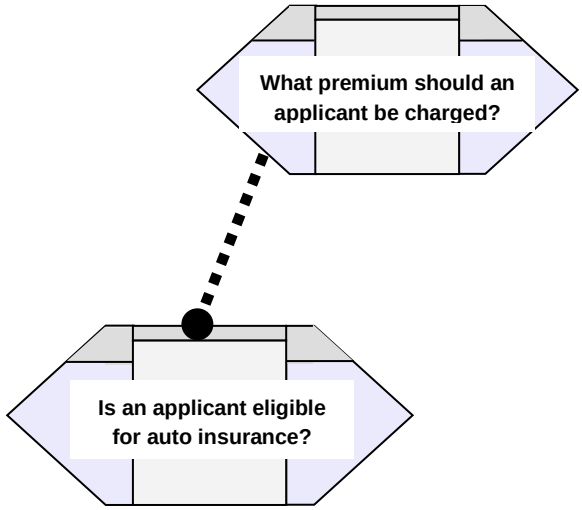
RELEVANCE DEPENDENCY

In **relevance dependency**, one operational business decision depends on the **outcome** of another operational business decision such that the outcome of the other decision may completely eliminate the need for any outcome from the dependent (upper) decision.

In other words, the dependent operational business decision can be *preempted* – indeed, made meaningless in certain cases.

In determining eligibility of applicants for auto insurance, for example, if an applicant is *not* eligible for coverage, there is no need to determine what to charge the applicant as a premium. This relevance dependency between operational business decisions is illustrated in Figure 4 using a dashed connector (with hitch point at bottom). The dashed line extends from the question area of the Q-COE representing the dependent (upper) decision.

Figure 4: Relevance Dependency between Operational Business Decisions

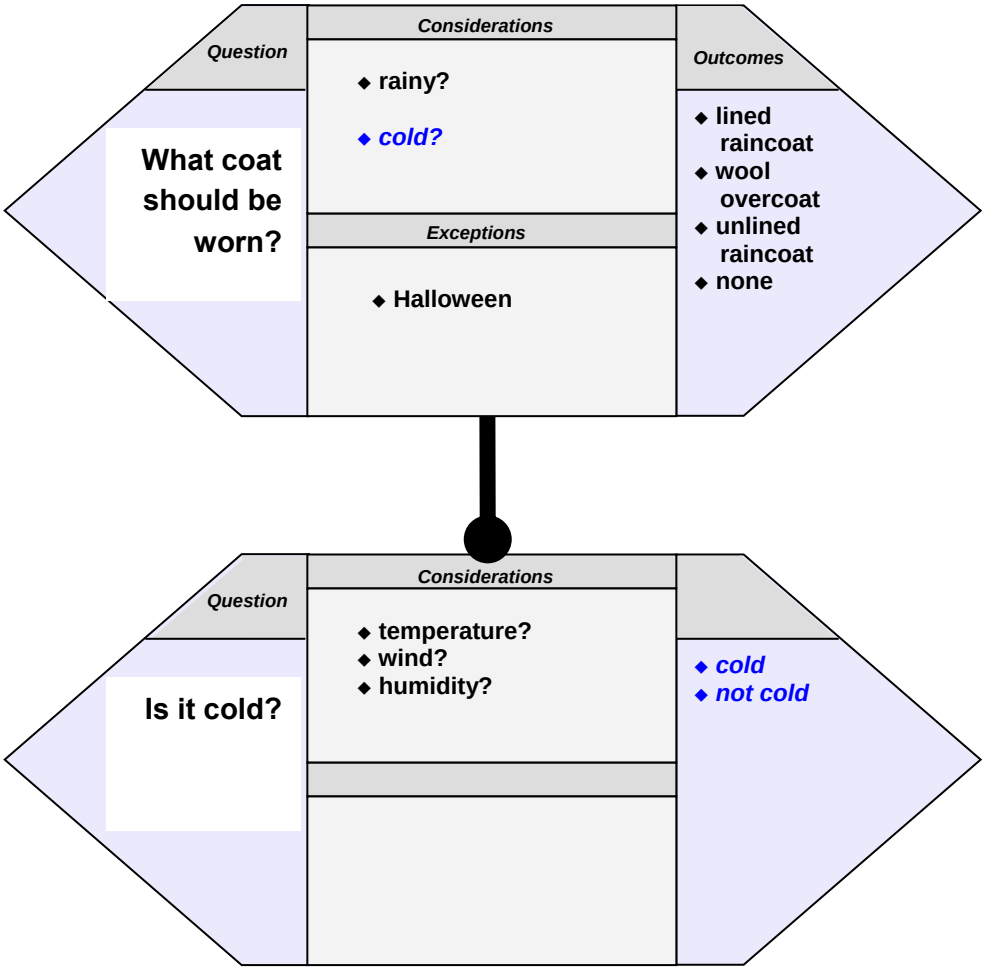


Do processes always have to address the questions involved in a relevance dependency in bottom-to-top sequence? *No,* but caution should be exercised.

For the questions in Figure 4, for example, a customer-friendly, web-based application might permit price-conscious consumers to ask about the premium *before* asking about eligibility.

If supported, however, including some disclaimer would probably be appropriate to indicate that securing coverage at the given price is subject to eligibility. An explicit **business rule** should be written for that purpose. The business rule ensures a disclaimer is given by any process or use case that supports a price-before-eligibility sequence.

Figure 5: Consideration Dependency between Operational Business Decisions



CONSIDERATION DEPENDENCY

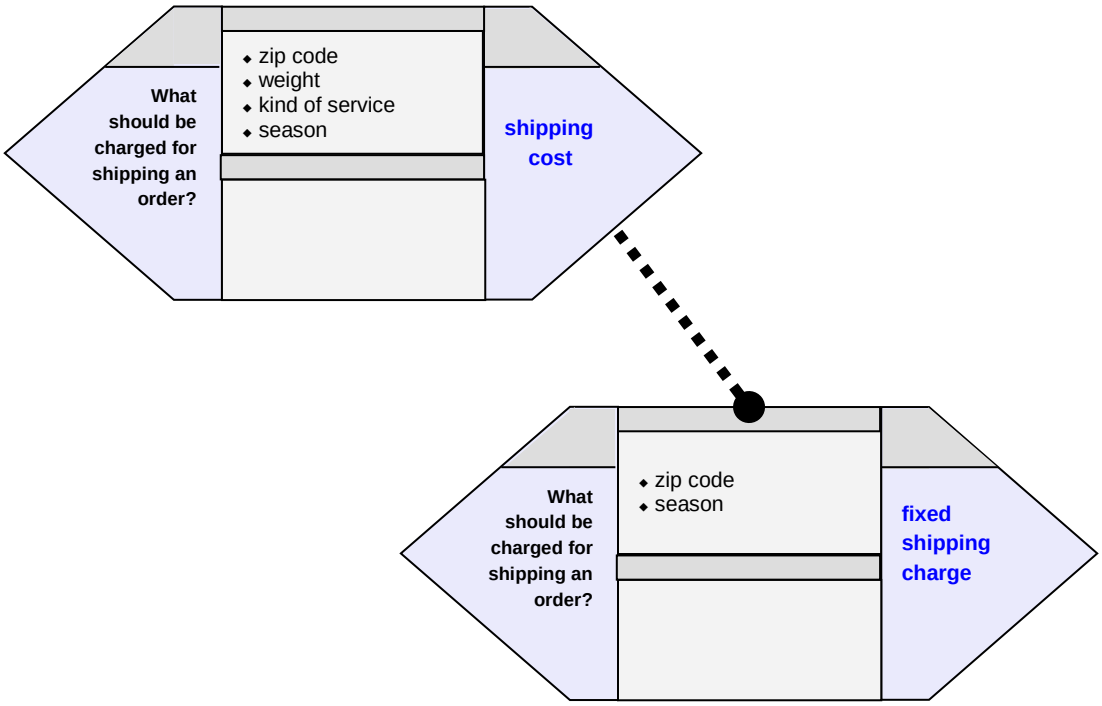
In **consideration dependency**, one operational business decision depends on the outcome of another operational business decision such that the outcome of the latter decision provides or supports one of the considerations for the dependent (upper) decision.

In the coat problem, for example, it might not be possible to decide what coat to wear unless you decide whether it is cold. Deciding whether it is cold might have considerations all its own. This consideration dependency is illustrated in Figure 5 above using a solid-line connector (with hitch point at bottom).

The consideration *cold?* in the dependent (upper) decision is conditional. Whether or not it is cold depends on the three considerations of the lower decision: *temperature, wind* and *humidity*.

If a consideration is not conditional in that sense (i.e., not based on other considerations), a consideration dependency is not needed. For example, suppose you can say *Yes, it's cold.* or *No, it's not cold.* without needing to know anything about the *temperature, wind* and *humidity.* Then the lower decision *Is it cold?* is not needed.

Figure 6: Outcome Dependency Between Operational Business Decisions



OUTCOME DEPENDENCY

In **outcome dependency**, one operational business decision is dependent on the outcome of another decision such that the outcome of this other (lower) decision dictates some outcome(s) of the dependent (upper) decision. Two essential rules always apply to outcome dependencies:

- Both decisions must have the same *kind* of outcome.
- The set of considerations of the less dependent (lower) decision must be the same as, or a subset of, the set of considerations of the more dependent (upper) decision. Refer to Appendix 7 for explanation.

Figure 6 above illustrates an outcome dependency using a dashed connector (with hitch point at bottom). The dashed line extends from the outcome area of the Q-COE for the dependent (upper) decision.

Observations:

- The lower (independent) Q-COE represents the question *What set charges are there for shipping an order?* and has the outcome *fixed shipping charge*.
- The upper (dependent) Q-COE represents the question *What should be charged for shipping an order?* and has the outcome *shipping cost*.
- The **structured business vocabulary** (**concept model**, not shown) must indicate *fixed shipping charge* and *shipping cost* to be the same kind of thing.
- The lower Q-COE uses the considerations *zip code* and *season,* a proper subset of the

four considerations for the upper (dependent) Q-COE.

- The net effect is that the lower Q-COE will dictate ("set") some (but presumably not all) outcomes for the upper (dependent) Q-COE. For example, if the *zip code* is in Alaska, and the *season* is winter, all *shipping costs* might be $250, regardless of *weight* or *kind of package*. This **business rule** might be just one of many that dictate ("set") shipping cost for multiple cases.

RELEVANCE DEPENDENCY VS. OUTCOME DEPENDENCY

Relevance dependencies and outcome dependencies are alike in one important way – they both represent dependencies that can eliminate the need to ask the question for the upper (dependent) decision. Because of this similarity, a dashed line is used to represent both.

Relevance dependencies and outcome dependencies are different, however, in the following fundamental way:

- For relevance dependencies, the outcome from the lower (independent) decision makes any outcome from the upper (dependent) decision *meaningless* in certain cases. In other words the upper (dependent) decision simply cannot produce *any* valid outcome for those cases.

- For outcome dependencies, the outcome from the lower (independent) decision *dictates* the outcome for the upper (dependent) decision in certain cases. That outcome is the *only* one the upper (dependent) decision can produce for those cases.

In DecisionSpeak, relevance dependencies and outcome dependencies are always distinguishable by the *form* of the question specified for the lower (independent) decision. In other words, the question is always worded distinctly.

- A relevance dependency always asks a yes/no question (e.g., *eligible/ineligible?*).

- An outcome dependency always asks about a *fixed* or *set* outcome (e.g., *fixed shipping charge*).

Finally, in Q-Chart notation the dashed line for a relevance dependency properly attaches to the *question* area of the top Q-COE. The dashed line for an outcome dependency, in contrast, properly attaches to the *outcome* area of the top Q-COE.

REPRESENTING A COMPLETE DECISION STRUCTURE: Q-CHART

In DecisionSpeak a **Question Chart** (**Q-Chart** for short) is *a graphic representation of two or more* **operational business decisions** *indicating how they are related (dependent)*. A Q-Chart enables practitioners to capture, visualize, and analyze the structure (**decision structure**) of related operational business decisions in **declarative** form.

Q-Charts serve a very different purpose than business process models. Q-Charts comprise:

- **Q-COEs**, which capture the basic elements of operational business decisions.
- **Decision dependencies**, which show how Q-COEs relate logically.

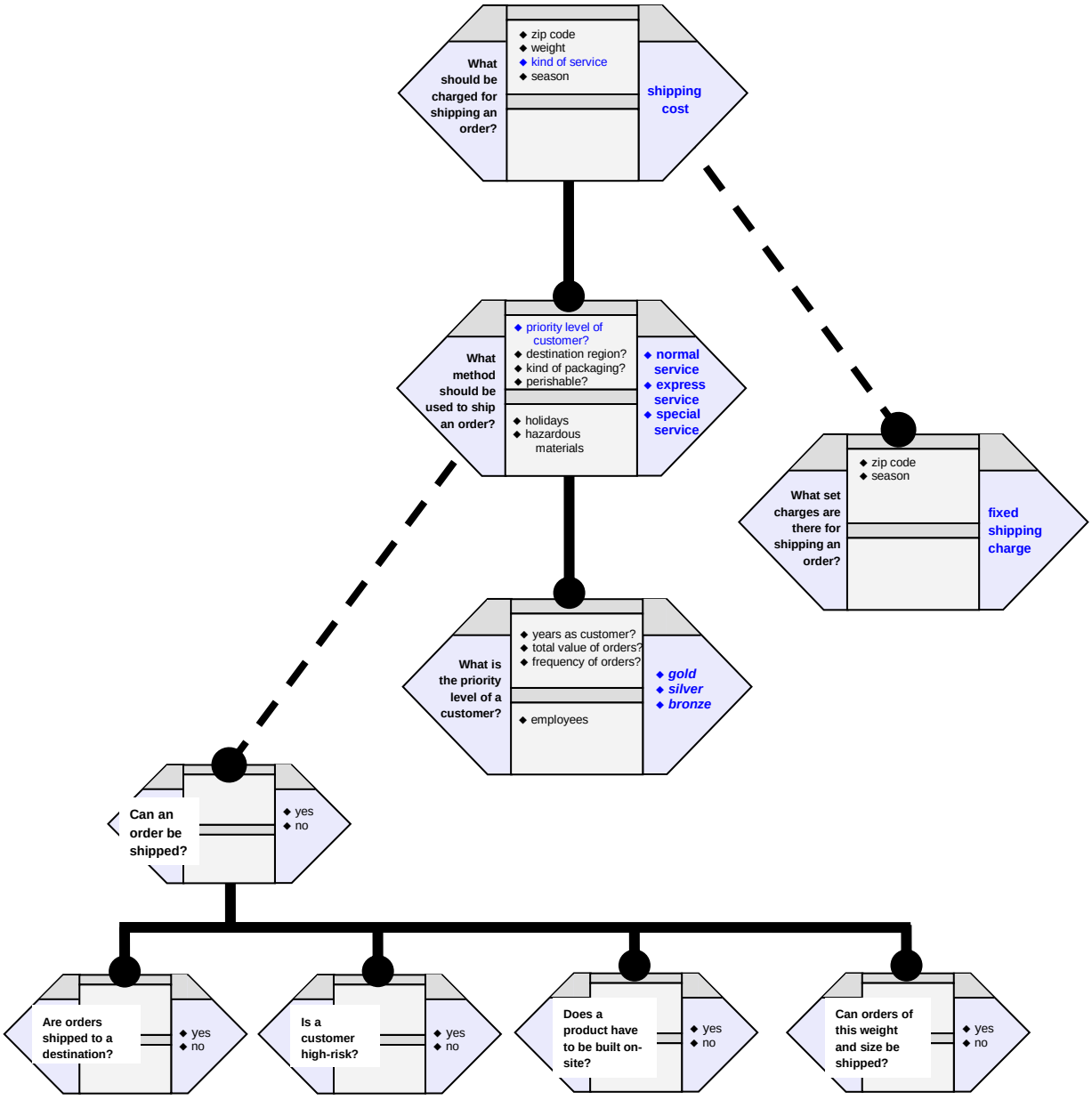
Operational business decisions often prove much more complex than they first seem(!). Developing a Q-Chart is an important step before jumping with both feet into **decision tables**. Q-Charts also focus practitioners on scope, always a critical issue in business analysis. Refer to Appendix 5 for important discussion of defining scope for decision analysis under **DecisionSpeak**.

Figure 7 on page 20 presents a more or less typical Q-Chart for discussion. Note the vertical arrangement of dependency connectors and Q-COEs. Since many notations for modeling process show flow or sequence horizontally, DecisionSpeak always orients Q-Charts *vertically*.

Observations about the Q-Chart illustrated in Figure 7:

- The highest **Q-COE**, representing the most dependent decision, represents the question *What should be charged for shipping an order?.* Four **considerations** are used in determining the **outcome** *shipping cost*.
- A **consideration dependency** connects the top Q-COE with the Q-COE beneath it *What method should be used to ship an order?.* The outcome of the lower Q-COE provides the consideration *kind of service* for the upper (more dependent) Q-COE.
- The Q-COE *What method should be used to ship an order?* is connected via another consideration dependency to the Q-COE beneath it *What is the priority level of a customer?.* The outcome of the lower Q-COE provides the consideration *priority level of customer* for the upper (more dependent) Q-COE.
- The Q-COE *What method should be used to ship an order?* is also connected via a **relevance dependency** to the Q-COE (lower left) *Can an order be shipped?.* If an order cannot be shipped, it is meaningless to ask *How should an order be shipped?.*

Figure 7: Q-Chart for Deciding How Much to Charge for Shipping an Order



- The Q-COE *Can an order be shipped?* has four independent subdecisions beneath it, each presumably based on its own considerations.
- Finally, the **outcome dependency** presented earlier in Figure 6 connects the top Q-COE with the Q-COE beneath it (middle right) *What set charges are there for shipping an order?*. This lower Q-COE will dictate certain outcomes for the upper (dependent) Q-COE.

HYBRID DEPENDENCY DIAGRAMS

A proper **Q-Chart** includes only hexagons (**Q-COEs**) each representing a distinct question. The Q-COEs implicitly indicate probable links to external **decision tables** (often not yet developed).

Other forms of dependency diagrams may be used to show **logical dependencies** between business rules – i.e., where the expression of one **business rule** references something computed or derived by another business rule. Two simple examples:

- *Mathematical dependency:* The expression of one business rule references *age*, which is computed by another (computation) business rule based on *birthdate*.
- *Derivation dependency:* The expression of one business rule references *gold customer*. Whether a customer is *gold* or not is derived (determined) by another (derivation) business rule based on a dollar threshold of orders shipped.

An operational business decision may be based on *both*:

- computation or derivation rules for certain well-defined **cases**.
- **subdecisions** for all other cases in scope.

In such cases a mixed or *hybrid* dependency diagram can prove extremely useful. Such a diagram can portray the fundamental structure of highly complex **decision logic** in a single diagram. Refer to Appendix 8 for a complete, real-life example.

APPENDIX 1: WHAT DECISIONSPEAK IS

DecisionSpeak is a set of conventions for business-friendly representation of **operational business decisions**, diagramming **decision structures**, and expressing their meaning (semantics) in **declarative** fashion. Central to DecisionSpeak are:

- Guidelines for expressing the questions that operational business decisions address.
- **Q-COEs** and **Q-Charts**.

DecisionSpeak optimizes for readability by non-IT professionals and business people.

- Sequential dependencies are removed in favor of logical dependencies.
- Business vocabulary is always carefully used.

No compromises are ever anticipated, however, in the accuracy and completeness of the **decision rule(s)** with respect to the subject matter. There is never any hidden or assumed interpretation semantics.

DecisionSpeak is fundamentally based on words (semantics) and explicit rules. It is suitable for **decision analysis** anytime you need to know why you get the results you get *in words*. See Appendix 2 for additional discussion.

APPENDIX 2: KINDS OF DECISION APPROPRIATE FOR DECISION ANALYSIS UNDER DECISIONSPEAK

Decisions appropriate for **decision analysis** under **DecisionSpeak** share five essential characteristics in common, collectively called *'DOORS'*:

- **D**eterministic (always a definite best or optimal outcome).
- **O**perational, rather than tactical or strategic.
- **O**bjective (encodable as explicit rules), rather than subjective.
- **R**epetitive, rather than one-off or infrequent.
- **S**ingle-point of determination, rather than multi-point.

Will decision analysis enable you to capture every relevant **business rule**? *No.*

Does every business rule fit into some **decision table**? *No.*

A great number of business rules cannot be captured effectively using decision analysis or decision tables. Other techniques are still needed for capturing business rules (e.g., **pattern questions**) and expressing business rules (e.g., **RuleSpeak**).

Decision analysis is *not* appropriate for decisions that are:

- Removed from day-to-day business activity or abstract. Examples: *Are we following our business rules correctly? Is our business process optimized or well-coordinated? Are we aligned with our business strategy?* Such questions pertain to governance. Decisions appropriate for decision analysis are always directly in-line to a business process (whether modeled or not).
- Ones that can be resolved or predicted by a formula or calculation – i.e., by some equation(s). Examples: *How much is owed for an order? How much business has a customer done in the last 12 months? What is a student's cumulative grade point average?* Decisions appropriate for decision analysis do not have **outcomes** that can be calculated mathematically based on circumstances or cumulative history.

SIMULATED VS. "FOR REAL" DECISIONS

A *simulated decision* essentially asks what would be the outcome if a decision about a particular matter were made at a particular point in time.

A simulated decision does not decide the matter "for real"; it simply reveals what the results would have been if the decision *had* been made then. These results provide feedback that can then be used to improve results from the future *"for real" decision*. Tasks calling for simulated decisions are valid and valuable in business processes.

Examples:

- *Submitting a health insurance claim for a proposed procedure to determine what is covered and for how much rather than submitting the claim "for real".* Result: A more informed decision about treatment of the patient can subsequently be made.
- *Submitting a request for a product part to ascertain current pricing and availability rather than submitting the request "for real".* Result: An optimal decision about sourcing or repairing the part can subsequently be made.

DecisionSpeak can be applied to analyze both simulated decisions and "for real" decisions. In all cases, however, meaningful analysis can be conducted only where the decision logic is under the business jurisdiction of the organization itself. For example, it would probably *not* be meaningful for:

- A health clinic to use DecisionSpeak to understand the decision logic of an insurance company.
- A manufacturing or engineering company to use DecisionSpeak to understand the decision logic of an external parts supplier.

On the other hand, decision logic that must be interpreted from regulatory bodies and similar governing bodies *is* under business jurisdiction. DecisionSpeak is quite useful in such circumstances.

To continue, let's assume some decision logic is under business jurisdiction of an organization. Especially important then is recognizing situations in which that decision logic is essentially the same for both a simulated and "for real" decision. Examples:

1. An insurance company uses the same decision logic both to:
    - answer queries about coverage for particular treatments.
    - adjudicate actual claims.
2. A manufacturing company uses the same decision logic to assess pricing and availability for parts both in:
    - composing bids for work.
    - conducting the actual work itself.

In situations like these, decision analysis needs to be performed *just once* since the same decision logic supports both decisions. Unification of the analysis saves significant resources and ensures consistency in the eventual decisions.

Unification of the analysis, however, does not imply that the decision logic must remain completely static between every simulated and "for real" decision for any given **case**.

Often feedback from a simulated decision can lead directly to insights about potential improvement in the decision logic before the subsequent "for-real" decision is made. Such adjustments are certainly possible and frequently desirable.

For many business problems the volatility in the decision logic between simulated and "for real" decisions for given cases can become quite high. At what threshold does DecisionSpeak cease to be useful?

The rule of thumb is as follows. DecisionSpeak is fundamentally based on words (semantics) and explicit rules. It will always remain applicable for decision analysis as long as you need to know why you get the results you get *in words*.

Sometimes the path and pace of simulation and change-in-the-rules becomes quite rapid, experimental or personal.

At the point you no longer need to trace and communicate the 'why' *in words*, then statistics or other forms of non-verbal modeling will probably prove better suited to the problem.

PERSONAL VS. ORGANIZATIONAL DECISIONS

An important issue for decision analysis is: *Whose decision is it?*

Suppose an organization has the business rule:

> *An employee must fly economy class on domestic flights while on company business.*

Any given employee can potentially decide to violate this business rule for any given domestic flight by booking a first-class or business-class ticket. (Likely though, the business has some prescribed sanction waiting if it catches the violation – e.g., the employee must pay the difference in the fare).

As humans, employees always have a choice about whether to obey such business rules.

Because choice is involved, there *is* a decision. But it's the employee's *personal* or *individual* decision, not an **operational business decision**.

Business rules that involve personal choice, conformance, and potential sanction for violations are called **behavioral rules**. They are quite different from **decision rules.** Refer to Appendix 3 for additional discussion.

Organizational decisions are of course often made by individuals.

In decision analysis under DecisionSpeak, however, decisions are always organizational decisions, never personal decisions in the sense above. If some decision is made by an individual, the individual must be acting in a legitimate organizational capacity (role) and making the decision on the behalf of the organization.

This issue touches on a frequent and often subtle source of confusion. Artificial intelligence (AI) generally tries to emulate intelligent behavior no matter what its source. DecisionSpeak in contrast addresses only organizational decisions.

The latter problem is hard enough, but it doesn't begin to approach the difficulty of emulating the intelligent behavior *of individuals*.

APPENDIX 3: DECISION RULES VS. BEHAVIORAL RULES

An **operational business decision** focuses on determining the best or most appropriate answer to an operational business question.

For a particular matter (**case**) the question generally needs to be answered only once ("for real") at some particular point in time. Consequently, the relevant **decision rules** are likely to be evaluated only at a *single* **point of determination**.

Example: Consider the operational business decision *What should be charged for shipping an order?.* For any particular order all decision rules relevant to the decision might be evaluated only when that order is taken.

Behavioral rules in contrast:

- Do not pertain directly to determining the best or most appropriate answer (**outcome**) among alternatives. Instead, they are about guiding or shaping on-going business activity – i.e., behavior.
- Usually need to be applied at *multiple* points of determination for the very same matter. Their purpose is to prevent undesirable situations that could occur at any of *various* (multiple) points in time.

These differences from decision rules are pronounced. Three simple (but typical) examples illustrate.

1. Behavioral Rule: *A customer that has ordered a product must have an assigned agent.*

   This business rule:

   - Is *not* about selecting the most appropriate agent for a customer – i.e., *not* about the decision, *Who is the most appropriate agent for a customer?.*
   - Does *not* apply only at a single point of determination – e.g., when an order is taken.

   Instead, the business rule is meant to be enforced continuously – for example even if the agent assigned to a customer retires or leaves the company.

2. Behavioral Rule: *A work group posted to a union site must include a union liaison.*

   This business rule:

   - Is *not* about selecting the most appropriate work group to post to a site – i.e., *not* about the decision, *What work group should be posted to a union site?*.
   - Does *not* apply only at a single point of determination – e.g., when a posting occurs.

   Instead, the business rule is meant to be enforced continuously – for example, if the current union liaison drops out of a work group, or if a non-union site to which a work group is posted subsequently becomes union.

3. Behavioral Rule: *A student with a failing grade must not be an active member of a sports team.*

This business rule:

- Is *not* about selecting the most appropriate sports team for a student –i.e., *not* about the decision, *Which sport team is best for a student?.*
- Does *not* apply only at a single point of determination – e.g., when a student joins a team.

Instead, the business rule is meant to be enforced continuously – for example, if a student who is already active on some sports team should let his or her grades fall.

Business rules like the three in these examples generally fit no particular pattern. For that reason they cannot be effectively managed in a **decision table** along with other parallel rules.

Instead, they need to be expressed as individual business rule statements following appropriate conventions (e.g., **RuleSpeak**). Your organization has hundreds or thousands of such business rules.

Decision rules and **behavioral rules** are fundamentally different.

- Decision rules simply produce answers; behavioral rules indicate what you must or must not do. (Behavioral rules always carry the sense of *obligation* or *prohibition*.)
- Decision rules can usually be applied at a single point of determination; behavioral rules usually apply at multiple points of determination.

These differences are stark. Many approaches gloss over them, or ignore them completely, causing great harm.

Avoid force-fitting a decision-oriented approach to every business rule problem. *It simply doesn't work.*

APPENDIX 4: MORE ABOUT CONSIDERATIONS AND CASES

The relation of **considerations** to **cases** is generally *class* to *instance*.

- A consideration is a *kind* of circumstance that some **decision logic** addresses.
- A case is some *particular* circumstance(s) the decision logic addresses.

For example, suppose *state/province* is a consideration for an **operational business decision**. Then the particular instances *Texas* and *British Columbia* are cases of that consideration.

As this example illustrates, a case can be as simple as a single instance for just one of the decision's considerations. Such a case is very *general*.

More often, cases addressed by an operational business decision represent combined instances of many or all of the decision's considerations. Such a case is very *specific*.

For example, the instances below might combine to represent *one specific case* addressed by an operational business decision.

CONSIDERATION	INSTANCE	
driving history	*good*	} *one specific case*
evidence of insurance	*acceptable*	
insurance risk score	*154*	
credit rating	*poor*	
state	*Texas*	

APPENDIX 5: SPECIFICATION OF SCOPE FOR DECISION ANALYSIS UNDER DECISIONSPEAK

Managing any project effectively requires clearly defined scope. Projects involving **decision analysis** are no different in that regard.

In decision analysis, scope is always ultimately based on **cases**. Two fundamental **DecisionSpeak** principles:

1. The **decision logic** produced from decision analysis must be able to give a definite **outcome** for every case provably in scope.

2. A case that is not in scope must be handed off (to some expert, manager, process, or other decision logic).

Definite outcome (in the first principle) means a *real* business answer to the question being asked. An outcome such as *unable to determine* is *not* a real business answer. Any such case is not in scope and must be handed off.

Two additional principles for decision analysis under DecisionSpeak:

3. Scope must be specified *explicitly*.

4. Scope is based on three essential elements:
   - The question the decision logic answers.
   - Limitations about the kinds of cases covered.
   - **Exceptions**.

The first two elements in this last principle are highly intertwined.

For example, the question for some decision logic might be expressed in either of the following two ways:

(a) Is an applicant eligible for auto insurance?

(b) Is an applicant eligible for insurance?
Cases in Scope: *auto insurance*

The resulting scope is the same for either form of specification.

Refinements to scope mean adding additional limitations that narrow the range of cases the decision logic handles (i.e., should give definite outcomes for).

For example, the scope of the decision logic above might be further refined in either of the following ways:

(a) Is an applicant eligible for auto insurance for USA under $1 million?

(b) Is an applicant eligible for insurance?
Cases in Scope:
- *auto insurance*
- *USA*
- *under $1 million*

Two more limitations, *USA* and *under $1 million,* have been added to each of the original expressions above.

An implicit AND is understood to exist among all three scope items in each expression. (If there is any doubt about the intended ANDing, the

ANDing should be given explicitly.) As before, both forms of specification result in exactly the same scope.

As scope is increasingly refined, listing limitations on scope separately (as in *b*) usually proves more effective, especially if the expressions are coordinated with a **structured business vocabulary** (**concept model**) – *strongly recommended in DecisionSpeak*. For example:

Question: *Is an applicant eligible?*

Cases in Scope: *Any application submitted by an applicant that:*

- *is for the product 'auto insurance'*
- *is for a policy covering the 'USA'*
- *requests a coverage amount less than $1 million*

To complete specification of scope for some decision logic, some **business rule(s)** for handling exceptions must be given. For example:

An applicant for auto insurance must be considered ineligible if one or more of the follow are true:

- *The applicant has been convicted of a felony involving a motor vehicle.*
- *The applicant is younger than 18 years of age.*

SIMPLIFYING THE EXPRESSION OF DECISION LOGIC FOR STANDARD CASES

DecisionSpeak simplifies expression of decision logic for **standard cases** in two important ways:

- By listing limitations for scope separately. (As discussed above, this can be accomplished either by including the limitations in the question representing the decision logic or by listing them apart from, but associated with, the question.)
- By writing some **business rule(s)** for the exceptional cases. Such business rules handle the special circumstances in which the exceptions apply.

Specifying these two components separately allows them to be *assumed* by any representation of the decision logic for standard cases – e.g., in **decision tables**. The two components do not need to be addressed again or built-into the decision tables.

The resulting simplification produces *slim* decision logic. Since decision logic can be quite complex, such a priori simplification proves very helpful. Two additional points:

- How the overall configuration of decision logic is implemented 'under the covers' should not be a concern. All components of the decision logic needed for correct evaluation of cases from a business point of view have been addressed.
- Wherever the decision logic is re-used, *all* the logic must be applied (deployed), including the separate specifications for scope items and exceptions. The decision logic for standard cases depends on the whole; re-use of just some subset can easily produce inappropriate or incorrect results.

SIMPLIFYING THE ANALYSIS OF DECISION LOGIC FOR STANDARD CASES

A key to simplifying the analysis of decision logic for standard cases is to *divide and conquer*. Projects should be carved out that can be undertaken separately and, if resources permit, in parallel. DecisionSpeak supports this.

Example: Suppose the considerations used to determine eligibility for auto insurance in the USA for *well-heeled applicants* differ from those for *ordinary applicants* in terms of income, employment, and experience.

The decision logic for the two kinds (subsets) of cases in this example can be developed separately if both the following are true:

- The two subsets of cases are non-overlapping. (Otherwise, some cases could be decided by either decision logic, resulting in potentially inconsistent results.)
- The two sets of considerations are not exactly the same. (If the same, there is no particular advantage in treating the cases separately.)

The divide-and-conquer strategy leads to *independent subdecisions*.

In DecisionSpeak, an **independent subdecision** is *one of a collection of two or more operational business decisions on which another operational business decision is dependent via* ***consideration dependencies****.* Each subdecision has a distinct outcome and a different set of considerations (usually non-overlapping) from its peers in the collection.

Example 1. *The launching of a rocket.*

Before the ultimate operational business decision *Should the rocket be launched?* is addressed, an entire checklist of subdecisions is addressed, each with its own outcome and set of considerations. These subdecisions pertain to weather, fuel systems, communications, down-field recovery, etc.

At first glance, the outcome for each subdecision might seem the same as for the other subdecisions – *launch is currently acceptable/unacceptable*. That common first-cut impression is inaccurate. Each outcome is actually selective and distinct:

- *launch is currently acceptable/unacceptable given the weather conditions*
- *launch is currently acceptable/unacceptable given the fuel status*
- *launch is currently acceptable/unacceptable given down-field recovery readiness*
- etc.

Example 2. *Is an applicant eligible for auto insurance for USA under $1 million?*

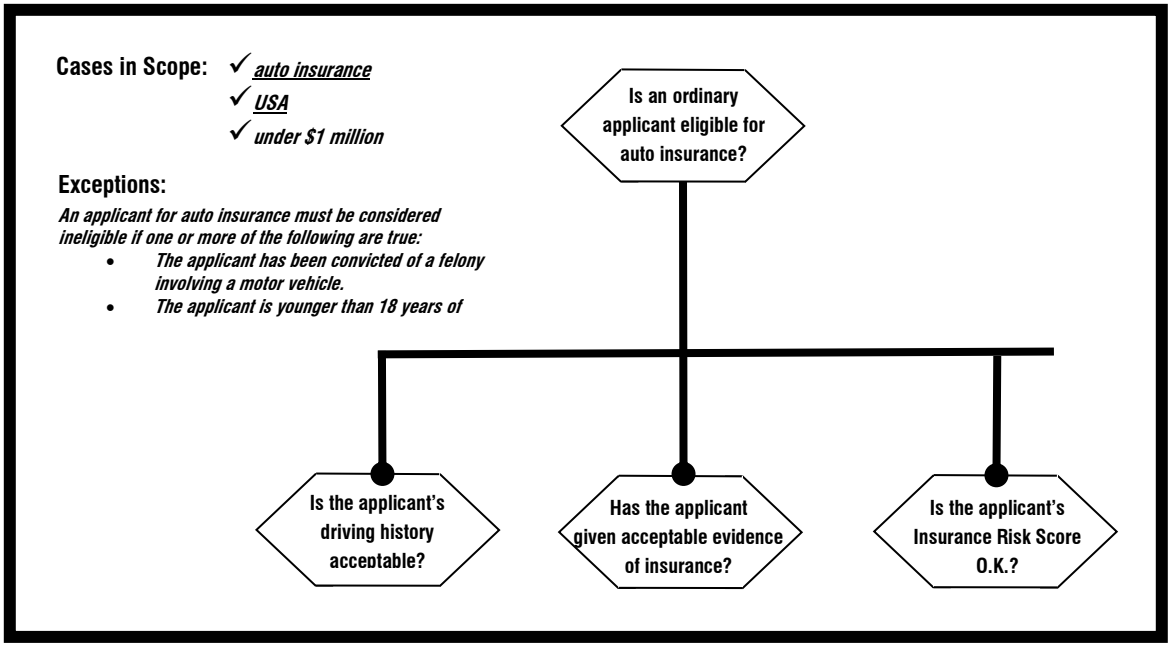
Independent subdecisions might be:

- *Is the applicant's driving history acceptable?*
- *Has the applicant given acceptable evidence of insurance?*
- *Is the applicant's Insurance Risk Score O.K.?*
- etc.

Each of these subdecisions would have a distinct outcome and probably a non-

overlapping set of considerations. The overall decision logic is portrayed in Figure 8.

Figure 8: Q-Chart for the operational business decision *Is an applicant eligible for auto insurance for USA under $1 million?*



APPENDIX 6: ALIGNMENT OF SCOPE IN DECISION DEPENDENCIES

DecisionSpeak principles for scope in **decision dependencies** between **operational business decisions** are the following:

1. Every operational business decision has a given scope. (Refer to Appendix 5 for discussion.)

2. *The means of expressing scope for an operational business decision is immaterial.*

   It should make no difference whether specification of scope for an operational business decision is:

   - externalized – i.e., defined as some scope item(s) and/or included in the question the operational business decision answers.
   - internalized – i.e., defined as **considerations** and **cases**.

   For verification purposes, the result is the same either way.

3. *The scope of an operational business decision is limited only by what is stated explicitly.*

   An operational business decision is assumed to cover all cases based on terms and wordings (for verb concepts) the operational business decision does *not* reference.

   In other words, the scope of an operational business decision is limited only by what is stated *explicitly*. (Terms and wordings come from a **structured business vocabulary** – a **concept model**.)

4. *In any given decision dependency, the scope for the top operational business decision and the scope for bottom decision can be different.*

5. *In any decision dependency where the scopes for the operational business decisions are different, the scope of the top (more dependent) operational business decision must align with the scope of the bottom (less dependent) decision.*

   Specifically, given each term or fact in the structured business vocabulary (concept model), the scope of the bottom decision must be *broader* than (or the same as) the top decision in the decision dependency.

MISALIGNMENT OF SCOPE

Misalignment of scope in decision dependencies can arise in the ways discussed below. For simplicity this discussion considers only pairs of operational business decisions. A top decision having multiple bottom decisions is examined later.

Exclusion. Suppose the decisions in a decision dependency both use the **consideration** *person*. Furthermore:

- The scope of the top decision is specified to be the *person* called *Henrietta*.

- The scope of the bottom decision is specified as *not Henrietta*.

Clearly, the scopes of these decisions are not aligned; the **cases** they consider with respect to *person* are disjoint. The bottom decision should therefore not be used as a basis for the top decision. Reasoning in that fashion is simply unjustified (logically wrong).

Generality. Suppose the decisions in a decision dependency again use the consideration *person*. Furthermore:

- The scope of the top decision specifies *person*.
- The scope of the bottom decision is specified as only the *person* called *Henrietta*.

The scopes of these decisions are poorly aligned; the cases considered by the top decision are far more general than the (single) case considered by the bottom decision. Reasoning over these operational business decisions would essentially be *inductive*. Inductive reasoning is not addressed by the end-products of decision analysis under DecisionSpeak.

Omission. In a given decision dependency suppose:

- The bottom decision mentions *person* or a specific *person*, say *Henrietta*.
- The top decision does not mention *person* at all.

The result is that the scope of the bottom decision is narrower than that of the top decision. Reasoning over these operational business decisions would again be inappropriate; such reasoning runs from more narrow to more general.

Note the reverse situation, reasoning from more general to more narrow, is acceptable.

For example suppose the top decision mentions *person* or a specific *person*, say *Henrietta*, but the bottom decision does not mention *person* at all. The result is that the scope of the top decision is narrower than that of the bottom decision. Reasoning over these operational business decisions is therefore appropriate.

MULTIPLE BOTTOM OPERATIONAL BUSINESS DECISIONS

A given top operational business decision may participate in multiple decision dependencies; that is, it might have multiple bottom decisions.

In that circumstance, any given bottom decision might not satisfy the fifth principle above, but taken jointly with one or more other bottom decisions, it might.

For example, suppose the top operational business decision uses the consideration *person*. One bottom decision specifies *male person*; another bottom decision specifies *female person*.

If no other scope factors contravene, the collective scope of the bottom decisions is the same as the scope of the top decision; therefore the fifth principle is satisfied.

APPENDIX 7: ABOUT CONSIDERATIONS IN OUTCOME DEPENDENCIES

Two rules always apply to outcome dependencies in DecisionSpeak:

1. Both operational business decisions must have the same *kind* of outcome.

2. The set of considerations of the less dependent (lower) decision must be the same as, or a subset of, the set of considerations of the more dependent (upper) decision.

Why is the second rule appropriate?

- If the less dependent (lower) operational business decision had *all* the considerations of the dependent (upper) operational business decision, the less dependent (lower) decision would obviate the need for the dependent (upper) decision.

  In other words, the less dependent (lower) decision would cover and dictate the outcome of every case covered by the dependent (upper) decision.

- If the less dependent (lower) operational business decision had *none* of the considerations of the dependent (upper) operational business decision, the less dependent (lower) decision would be toothless (without any effect) and therefore inappropriate.

  In other words, the less dependent (lower) decision would not cover any case covered by the dependent (upper) decision.

- If the less dependent (lower) operational business decision had *one or more considerations in addition to a proper subset of* the considerations of the dependent (upper) operational business decision, the less dependent (lower) decision could produce multiple outcomes for individual cases addressed by the dependent (upper) decision.

  Multiple outcomes without discrimination almost surely would not have been intended.

APPENDIX 8: EXAMPLE OF A HYBRID DEPENDENCY DIAGRAM

A *hybrid dependency diagram* includes a mix of individual **decision rules** (represented by boxes) and **subdecisions** (shown as **Q-COEs**), all based on a single (complex) question (**operational business decision**).

The goal is to represent the associated **decision logic** in a unified, highly approachable form and to provide a visual aid to help readers absorb **know-how** that is intrinsically complex.

In Figure 9 on page 37 the operational business decision (at the top) asks *What is the best antigen series for the patient?*

Immediately beneath the question is a 'stub' for a derivation rule, *An antigen series is the best patient series if … .*

- On the left side of the diagram are four boxes indicating **cases** in which the correct or optimal answer can be determined directly (i.e., without reference to **decision tables**).

  The text in each box simply completes the rule 'stub'. See additional discussion following the diagram.

- On the right side of the diagram are three cases in which the correct or optimal answer cannot be determined directly – so the answer is based on subdecisions.

  These subdecisions (and the associated decision tables – not shown) determine the 'winner' based on the highest number of points scored.

At the bottom of the diagram is a derivation rule given in **RuleSpeak** that provides the meaning for the special vocabulary *wins on points*.

The four boxes on the left side of the diagram can be viewed as either representing four individual business rules, or better, as a single business rule. Using **RuleSpeak** tabulation[3] the unified business rule could be expressed as:

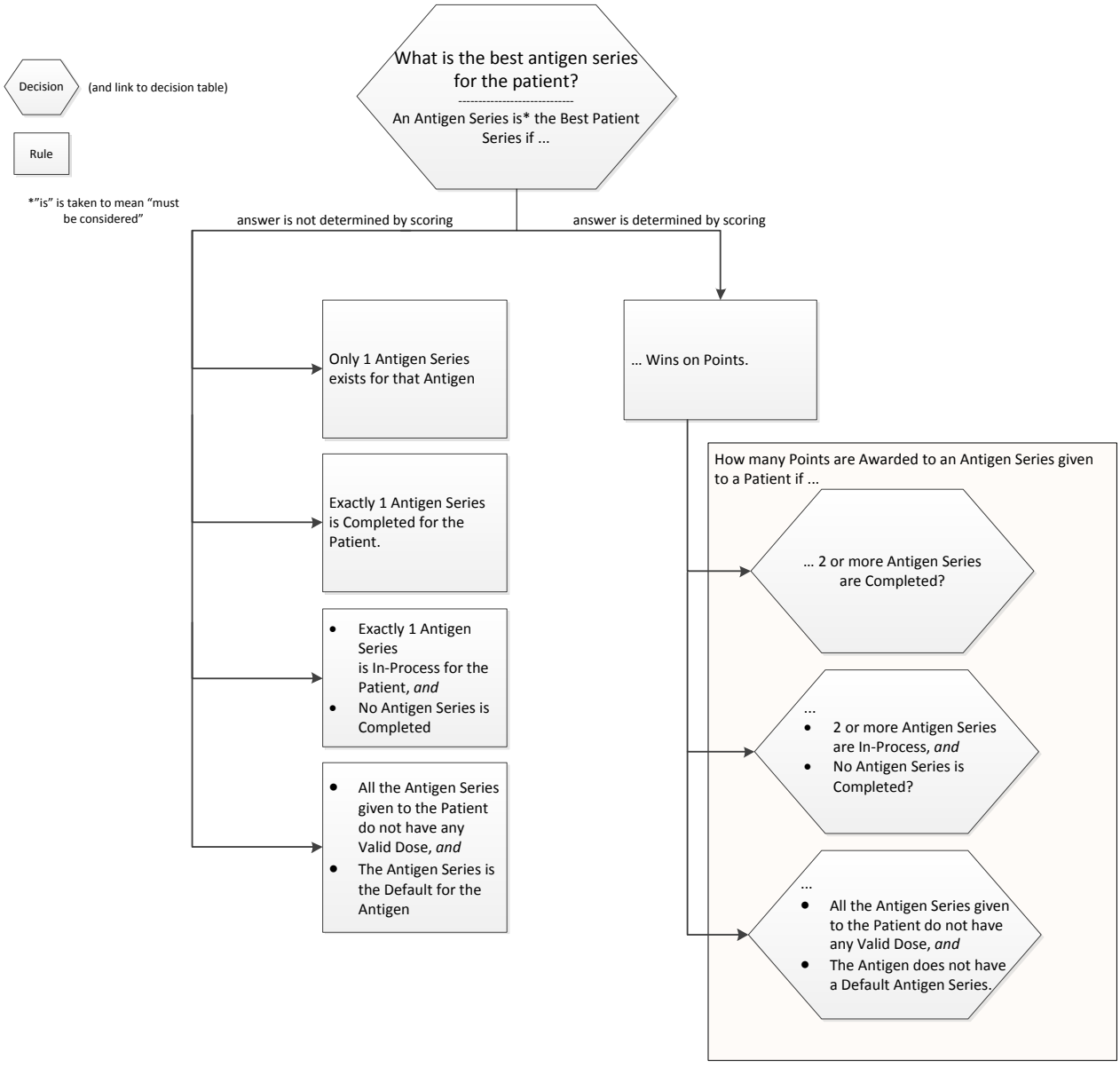
An antigen series must be considered the best patient series if any of the following is true:

- *Only one antigen exists for that antigen series.*
- *Exactly one antigen series is completed for the patient.*
- *Exactly one antigen series is in-process for the patient, and no antigen series is completed for the patient.*
- *All the antigen series given to the patient do not have any valid dose, and the antigen series is the default for the antigen.*

Specification of this business rule separately from the diagram, however, is not necessary – the left side of the diagram is already **practicable** as shown.

[3] Refer to *Tabulation of Lists in Rulespeak®: A Primer – Using "The Following" Clause,* available (free) on **http://www.brsolutions.com/IPSpeakPrimers**.

Figure 9: Hybrid Dependency Diagram



An Antigen Series must be considered to Win on Points if any of the following are true:

- It is the only Antigen Series that scores the highest total of points awarded, *or*
- It:
  - scores the highest total of Points Awarded, and
  - ties another Antigen Series, *and*
  - is Preferred.

GLOSSARY

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
action	that which someone or something does	A. Put clothes on B. Determine sales tax		*3: the process of doing : exertion of energy*
behavioral rule	a **business rule** indicating an obligation concerning conduct, action, practice, or procedure; a **business rule** whose purpose is to shape (govern) day-to-day business activity and prevent undesirable situations (states) that could occur at any of various points in time	A service representative must be assigned to a customer that has placed an order.	1. From the OMG standard *Semantics of Business Vocabulary and Business Rules* (SBVR). 2. **Operational business decisions** are always based on **decision rules**, not **behavioral rules**. 3. Contrast to **decision rule**. 4. Refer to ***Business Rule Concepts: Getting to the Point of Knowledge*** (4th ed, 2013), by Ronald G. Ross.	
business rule	a **rule** that is under business jurisdiction		From the OMG standard *Semantics of Business Vocabulary and Business Rules* (SBVR).	
case	a particular situation	A1. It's rainy today. A2. Today it's cold and rainy and it's a workday. B. A purchase is made in Harris County during 2013.	1. A **case** is simply some matter arising in day-to-day business operations. **Cases** are of interest in **decision analysis** when an **operational business decision** needs to be made. 2. **Case** (particular situation) is to **consideration** (factor in making an **operational business decision**) as *instance* is to *class.*	*1b: a set of circumstances constituting a problem: a matter for consideration or decision: as (1): a circumstance or situation*
case in scope	any **case** that satisfies the **considerations** used to establish scope for an **operational business decision**		1. **Decision logic** can handle only **cases** within scope. Other **cases** must be handed off (to some expert, manager, process, or other **decision logic**). 2. **Decision logic** should be able to give **outcomes** for all **cases** provably within scope. 3. **Cases in scope** include both **standard cases** and **exceptional cases** (if any).	
concept model	the semantic blueprint of a **structured business vocabulary**		Refer to ***Business Rule Concepts: Getting to the Point of Knowledge*** (4th ed, 2013), by Ronald G. Ross.	

[4] Examples designated "A" and "B" pertain to aspects of the same problem in multiple entries.

[5] All definitions are from *Merriam-Webster Unabridged Dictionary*.

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
ConceptSpeak™	the Business Rule Solutions, LLC (BRS) set of conventions, guidelines and techniques for representing **operational business decisions** in business-friendly fashion, diagramming **decision structures**, and coordinating them with **structured business vocabulary** (**concept models**)		1. For more about **ConceptSpeak** refer to the chapters on concept models in ***Business Rule Concepts: Getting to the Point of Knowledge*** (4th ed, 2013), by Ronald G. Ross. 2. **ConceptSpeak** is part of **IPSpeak**.	
consideration	a factor in making an **operational business decision**; something that can be resolved to two or more **cases**	A1. Whether it is cold today. A2. Whether today is a work day. B1. Which county is a purchase made in. B2. What year is a purchase made in.	1. A **consideration** can be posed as an individual question to be answered; however, **DecisionSpeak** does not require this. 2. Also known as *condition*. **Consideration** is preferred in **DecisionSpeak** because it is more business-friendly and intuitive.	*[consideration] 3a: something that is considered as a ground of opinion or action* *[consider] 1: to reflect on : think about with a degree of care or caution*
consideration dependency	one **operational business decision** being dependent on the **outcome** of another **operational business decision** such that the **outcome** of the latter **decision** provides or supports one of the **considerations** for the dependent **decision**	You can't decide what to wear unless you decide whether it's cold.	1. Note on the example: For certain **cases** relevant to a given **operational business decision** (e.g., *What should be worn today?*), the appropriate **outcome** (e.g., what to wear) depends on some **consideration(s)** that can be resolved only by evaluating the **decision logic** for another **operational business decision** (e.g., *Is it cold?*). So deciding whether it is cold (based on appropriate **considerations**) is a prerequisite for determining what to wear. 2. Contrast with **relevance dependency** and **outcome dependency**.	
decision	a determination requiring **know-how** or expertise; the resolving of a question by identifying some correct or optimal choice		Contrast to **operational business decision**.	*[decision] 1b: a determination arrived at after consideration* *[determination] 2: the resolving of a question by argument or reasoning*

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
				[decide]; to dispel doubt on *a: to arrive at a choice or solution concerning which ends uncertainty or contention* *c: to infer or conclude from available indications and evidence*
decision analysis	identifying and analyzing some key question arising in day-to-day business activity and capturing the **decision logic** used to answer the question		1. **Decision analysis** focuses on **operational business decisions** in day-to-day business activity whose answers need to be determined, inferred or concluded. 2. The deliverable of **decision analysis** is **decision logic** in the form of **decision tables**, **business rule** statements, and **Q-Charts** that are: • deployment-ready • anomaly-free • business friendly	
decision logic	the set of all **decision rules** for **cases in scope**	For every county in Texas, the applicable sales tax for every year, as well as any **exceptions**.	1. So that determinations made in **operational business decisions** can be consistent, traceable, manageable, and repeatable, **decision logic** should be captured and represented in the form of: • **decision table(s)** • **business rule** statements(s) • some combination thereof. 2. **Decision logic** includes **decision rules** for both **standard cases** and **exceptional cases**.	
decision rule	a **business rule** that guides the making of an **operational business decision**; specifically, a **business rule** that links a **case** to some appropriate **outcome**	A. *A wool suit must be worn on a cold workday when it isn't raining.* B. *The applicable sales tax for a purchase must be 8.25% in Harris County during 2011.*	1. A **decision table** represents a collection of **decision rules**. 2. Although usually not necessary, any **decision rule** represented in a **decision table** can also be written as a textual statement. 3. Contrast to **behavioral rule**.	
decision-smart business process	a business process in which **decision tasks** are recognized explicitly and their **decision logic** is externalized		A **decision-smart business process** is one whose **decision logic** is agile.	

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
DecisionSpeak™	the Business Rule Solutions, LLC (BRS) set of conventions, guidelines and techniques for defining terms, designing a **concept model**, and developing a **structured business vocabulary**		1. Refer to ***Decision Analysis: A Primer – How to Use DecisionSpeak™ and Question Charts (Q-Charts™)***, available (free) 2013 on www.BRSolutions.com. 2. Central to **DecisionSpeak** is expressing the questions that **operational business decisions** address. 3. **Q-COEs** and **Q-Charts** are part of **DecisionSpeak**. 4. **DecisionSpeak** optimizes for readability by non-IT professionals and business people. • Sequential dependencies are removed in favor of logical dependencies. • **Structured business vocabulary** is always carefully used. No compromises are made, however, in the accuracy and completeness of the **decision rule(s)** with respect to the subject matter. There is never any hidden or assumed interpretation semantics. 5. **DecisionSpeak** is fundamentally based on words (semantics) and explicit **rules**. It is suitable for **decision analysis** anytime you need to know why you get the results you get *in words*. 6. **DecisionSpeak** is part of **IPSpeak**. 7. The natural follow-on to **DecisionSpeak** is **TableSpeak**, with which **DecisionSpeak** is closely aligned.	
decision structure	how one or more **operational business decisions** are formally organized		1. A **decision structure** should indicate **operational business decisions** that are dependent – i.e., **consideration**-dependent, relevance-dependent, and/or **outcome**-dependent. 2. A **Q-Chart** visually organizes a **decision structure**.	
decision table	a structured means of visualizing **decision rules** in rows and columns		A **decision table** identifies the appropriate **outcome** for each **case** it covers.	
decision task	a task centered on making an **operational**	A. Determine clothes to wear	1. As recommended for all tasks, a **decision task** should be named	

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
	business decision – that is on deciding something rather than on doing something	B. Determine sales tax on purchases	using a verb + noun (or noun phrase). 2. A **decision task** always involves a determination of some kind – hence, **DecisionSpeak** recommends using the convention "*Determine …*" to name a **decision task**. 3. A **decision task** often appears in a business process model (but does not have to).	
declarative	constituting an expression or representation that can be either true or false		1. There is no implicit meaning (semantics) in **declarative** expressions or representations. 2. Contrast to **procedural**. 3. In graduate school in the early 1970s (the days of punch cards) I learned a highly pragmatic test for determining whether specifications are **declarative**: • Take each statement of the specifications and type it on an individual punch card. • Assemble the deck. • Test it to make sure it works. • Throw the whole deck up in the air. • Pick up all the cards in random order. • Re-test it. If the logic still works, the statements are **declarative**. If not, they are **procedural**. The point is that in **declarative** specifications no logic is lost 'between the lines' – i.e., none is intrinsic to the sequence of presentation. In other words, there is no hidden meaning (semantics).	*2: constituting a statement that can be either true or false*
exception	*see* **exceptional case**			
exceptional case	a **case in scope** that does not use the **considerations** of a **standard case**; i.e., a **case in scope** that is based on some **consideration(s)** that is/are not among the **considerations** for a **standard case**	A. Halloween B. Food C. Auto insurance: • An applicant is convicted of a felony involving a motor vehicle. • An applicant for auto insurance is not 18 years of age or older. • The applicant is the boss's daughter.	1. Special **decision logic** must be developed for each **exceptional case**. 2. The **decision logic** for an **exceptional case** might be as simple as a single **decision rule** (e.g., *The boss's daughter must be accepted for auto insurance.*), or significantly more complex.	*[exception] 2: one that is excepted or taken out from others* *[except - transitive verb] 1: to take or leave out (something) from a number or a whole : exclude or omit*

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
independent subdecision	one of a collection of two or more **operational business decisions** on which another **operational business decision** is dependent via **consideration dependencies**	Determining the overall eligibility of a candidate for auto insurance depends on the **independent subdecisions**: • *Eligible according to proof of insurance?* • *Eligible according the driving history?* • *Eligible according to risk score?* • etc.	1. Each subdecision in the collection may be evaluated (a) separately, and (b) in parallel or in any sequence. 2. Each subdecision has a distinct **outcome** and a different set of **considerations** (usually non-overlapping) from its peers in the collection.	
IPSpeak™	the Business Rule Solutions, LLC (BRS) methodology for capturing, expressing, analyzing, and managing operational-level intellectual property (IP) of the business, specifically **business rules**, **decision logic**, **structured business vocabulary** (**concept models**), and strategy		1. Creating and managing operational-level intellectual property (IP) is what provides competitive advantage for the organization and makes it smart. 2. **IPSpeak** includes **RuleSpeak**, **DecisionSpeak**, **TableSpeak**, **ConceptSpeak™**, and StrategySpeak™. 3. For more about **business rules**, **concept models**, and **ConceptSpeak** refer to ***Business Rule Concepts: Getting to the Point of Knowledge*** (4th ed, 2013), by Ronald G. Ross. 4. For more about capturing **business rules** and about strategy refer to ***Building Business Solutions: Business Analysis with Business Rules***, by Ronald G. Ross with Gladys S.W. Lam, 2011.	
know-how	accumulated practical skill or expertness; especially technical knowledge, ability, skill, or expertness of this sort			*... accumulated practical skill or expertness ... especially: technical knowledge, ability, skill, or expertness of this sort*
operational business decision	a determination requiring operational business **know-how** or expertise; the resolving of an **operational business question** by identifying some correct or optimal choice	A. *What clothes should be worn today?* B. *What sales tax needs to be paid on a purchase?*	1. Contrast to **decision**. 2. In **DecisionSpeak**, an **operational business decision** is always identified and analyzed from the business point of view, not IT. 3. An **operational business decision** can always be posed as a question. **DecisionSpeak** prescribes using this question as the name for the **operational business decision**.	

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
			4. An **operational business decision** should always satisfy the DOORS criteria (deterministic, operational, objective, repetitive, single-point of determination). 5. An **operational business decision** involves determining the appropriate answer (**outcome**) for a **case** from among all **potential outcomes**.	
operational task	a task centered on doing something rather than on deciding something	• Take customer order. • Notify applicant of acceptance.	An **operational task** should involve nothing significant to decide, no significant choice between alternatives to make, just some **actions**.	
outcome	a **potential outcome** that is deemed appropriate for some **case**	A. *wool suit* B. *8.25%*	1. **Decisions** addressed by **decision analysis** generally feature exactly one **outcome** for each **case**. 2. **Outcomes** are often single terms or values, but may also be mathematical formulas, natural-language expressions or sentences, etc. 3. Also known as *conclusion*. **Outcome** is preferred in **DecisionSpeak** because it is more business-friendly and intuitive.	*[conclusion] 1a: a reasoned judgment or an expression of one : INFERENCE*
outcome dependency	one **operational business decision** being dependent on the **outcome** of another **operational business decision** such that the **outcome** of the latter **decision** dictates some **outcome(s)** of the dependent **decision**	The **operational business decision** *What should be charged for shipping an order?,* is **outcome**-dependent on the **operational business decision** *What set charges are there for shipping an order?*.	1. In an **outcome dependency**, kinds of **outcome** for the respective **operational business decisions** must align. 2. Contrast with **consideration dependency** and **relevance dependency**.	
pattern question	a thinking tool that assists in developing **business rules**, especially **behavioral rules**, from business design artifacts (e.g., business process models, **concept models**, etc.)		1. Each **pattern question** focuses on a particular topical concern and some particular construct (pattern) found frequently in artifacts of a given kind. The questions are designed to assist in asking the right kinds of questions in the right ways to capture **business rules**. 2. Refer to ***Building Business Solutions: Business Analysis with Business Rules***, by Ronald G. Ross with Gladys S.W. Lam, 2011.	

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
point of determination	a point in operational business activity where one or more **business rules** are evaluated or applied in a particular matter		All the **decision rules** for an **operational business decision** (e.g., *What should be charged for shipping an order?*) would likely be applied only at a single **point of determination** (e.g., when an order is taken). A **behavioral rule** in contrast generally should be applied at multiple **points of determination**. Consider the **behavioral rule** *A student with a failing grade must not be an active member of a sports team.* This **business rule** does not apply only at a single **point of determination** (e.g., when a student joins a team). Instead, the **business rule** is meant to be enforced continuously – for example, if a student who is already active on some sports team should let his or her grades fall.	
potential outcome	some result, conclusion, or answer that might be deemed appropriate for some **case** addressed by some **decision**	A. *wool suit, dress, pants,* etc. B. *Applicable sales tax* could be *8.25%, 7%, 9.5%*, etc.		
practicable	an element of guidance (e.g., **business rule**) that is ready to deploy into business operations such that it can satisfy the following test: [it is] sufficiently detailed and precise that a person who knows [about it] can apply it effectively and consistently in relevant circumstances to know what behavior is acceptable or not, or how something is understood	The statement *Safety is our first concern. …* is not **practicable**. The statement (**business rule**) *A hardhat must be worn on the head in a construction site.* … is **practicable**.	1. From the OMG standard *Semantics of Business Vocabulary and Business Rules* (SBVR). 2. The results for a **practicable** statement should be the same no matter whether deployed to staff or ultimately to machines.	*1: possible to practice or perform : capable of being put into practice, done, or accomplished* *2a: capable of being used : USABLE*
procedural	an expression or representation meant to be included in a series of other expressions or representations to specify a procedure		1. There is meaning (semantics) implicit in the sequence that the expressions or representations of a procedure are indicated. 2. Contrast to **declarative**.	*[procedure]1b(3): a series of steps followed in a regular orderly definite way*
Q-Chart™	a visualization of some **decision structure**		1. The "Q" stands for 'question' – that is, the question(s) the **decision structure** addresses. 2. A **Q-Chart** organizes **Q-COEs**.	
Q-COE™	a graphic representation		**Q-COEs** can be used on their own	

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
	of an **operational business decision** indicating what question ('Q') is being asked, and possibly one or more of the following: • **considerations** ('C') • **outcomes** ('O') • **exceptions** ('E')		for brainstorming, or included in **Q-Charts**.	
question chart	*see* **Q-Chart**			
relevance dependency	one **operational business decision** being dependent on the **outcome** of another **operational business decision** such that the **outcome** of this other **decision** may eliminate the need for any **outcome** from the dependent **decision**	1. If you decide not to have breakfast, you don't need to decide where to get it. 2. If a company decides not to ship anything to Puerto Rico, then it does not need to determine the cost of shipping there.	1. For certain **cases**, the less dependent **operational business decision** (e.g., *Can an order be shipped to a location?*) can pre-empt a dependent **operational business decision** (e.g., *How much does it cost to ship to a location?*). In those **cases**, the dependent **decision** becomes meaningless. 2. Contrast with **consideration dependency** and **outcome dependency**.	
rule	a guide for conduct or action; a standard on which a **decision** or judgment may be based		From the OMG standard *Semantics of Business Vocabulary and Business Rules* (SBVR).	*1a: guide for conduct or action* *1f: one of a set of usually official regulations by which an activity (as a sport) is governed e.g.,*the infield fly rule* *the rules of professional basketball** *['criteria'] 2a: standard on which a decision or judgment may be based*
rule independence	the externalization, unification, and management of **business rules** separately from processes		1. Refer to ***Business Rule Concepts: Getting to the Point of Knowledge*** (4th ed, 2013), by Ronald G. Ross. 2. Refer to the Business Rules Manifesto, http://www.businessrulesgroup.org/brmanifesto.htm	
RuleSpeak®	the Business Rule Solutions, LLC (BRS) set of guidelines and conventions for expressing **business rules** in concise, business-friendly fashion using structured natural		1. Refer to www.RuleSpeak.com for more about **RuleSpeak** (free). 2. **RuleSpeak** is part of **IPSpeak**.	

Term	Definition	Example(s)[4]	Note(s)	Dictionary Basis[5]
	language			
smart business process	a **decision-smart business process** in which violation actions are specified for **behavioral rules** separately, rather than embedded in the process itself		A **smart business process** is an all-around agile process.	
standard case	a **case in scope** that is regular or common, and cannot be excluded from normal treatment or rejected out-of-hand	A. It's a *cold, rainy* workday. B. A purchase is made in *Harris County* during *2011*.	**Standard cases** generally make up the bulk of **cases in scope**.	*[standard - adjective] 3a: regularly and widely available : readily supplied : not unusual or special*
structured business vocabulary	the set of terms and their definitions, and all wordings, that organize operational business **know-how**		Refer to ***Business Rule Concepts: Getting to the Point of Knowledge*** (4th ed, 2013), by Ronald G. Ross.	
TableSpeak™	the Business Rule Solutions, LLC (BRS) set of conventions, guidelines and techniques for representing **decision tables** in the most business-friendly fashion		1. Refer to the companion work, ***Decision Tables: A Primer – How to Use TableSpeak***™, available (free) 2013 on **www.BRSolutiions.com**. 2. **TableSpeak** shows how to express the meaning (semantics) of **decision tables** and to identify applicable restrictions. 3. **TableSpeak** is part of **IPSpeak**. 4. **TableSpeak** is closely aligned with **DecisionSpeak** and is **DecisionSpeak**'s natural follow-on.	

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Ronald G. Ross is Principal and Co-Founder of Business Rule Solutions, LLC, where he actively develops and applies the IPSpeak™ methodology including RuleSpeak®, DecisionSpeak™ and TableSpeak™.

Ron is recognized internationally as the "father of business rules." He is the author of ten professional books including the groundbreaking first book on business rules *The Business Rule Book* in 1994. His newest is *Building Business Solutions: Business Analysis with Business Rules* with Gladys S.W. Lam (2011, An IIBA® Sponsored Handbook).

Ron serves as Executive Editor of BRCommunity.com and its flagship publication, *Business Rules Journal*. He is a sought-after speaker at conferences world-wide. More than 50,000 people have heard him speak; many more have attended his seminars and read his books.

Ron has served as Chair of the annual International Business Rules & Decisions Forum conference since 1997. He was a charter member of the Business Rules Group (BRG) in the 1980s, and an editor of its *Business Rules Manifesto*. He is active in OMG standards development, with core involvement in SBVR.

Ron holds a BA from Rice University and an MS in information science from Illinois Institute of Technology. For more information about Mr. Ross, visit www.RonRoss.info which hosts his blog.

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ABOUT BUSINESS RULE SOLUTIONS

Business Rule Solutions, LLC

Business Rule Solutions, LLC is the recognized world leader in the advancement of business rules and decision management. Co-founders Ronald G. Ross and Gladys S.W. Lam are internationally acclaimed as the foremost experts and practitioners of related techniques and methodology.

Since its inception in 1996, BRS has helped pilot the worldwide growth of business rules. BRS offers IPSpeak™, its groundbreaking methodology for business rules, decision logic, and business vocabulary (concept models), including the popular RuleSpeak®, DecisionSpeak™, TableSpeak™ and ConceptSpeak™. BRS services include consulting, online interactive training, in-house workshops, publications, and presentations. For more information about BRS, visit www.BRSolutions.com.