



BUSINESS RULE SOLUTIONS
Enabling Operational Excellence

**Managing Business
Rules & Decisions:
*Making Knowledge Explicit***

AIRA Meeting

April 12, 2017

by Ronald G. Ross & Gladys S.W. Lam

Co-Founders & Principals, Business Rule Solutions, LLC
BRSolutions.com

Executive Editor & Publisher, Business Rules Journal
BRCommunity.com



About Ronald G. Ross



Ronald G. Ross is Co-Founder and Principal of Business Rule Solutions, LLC (BRSolutions.com). BRS provides consulting, training and mentoring in support of business analysis, business rules, decision engineering, concept modeling, and rule management.

Mr. Ross co-develops the landmark BRS methodology featuring numerous innovative techniques including the popular **ConceptSpeak™**, **DecisionSpeak™**, **TableSpeak™** and **RuleSpeak®** (free on RuleSpeak.com, now also in Spanish, German, Dutch, and Norwegian). These are the latest offerings in a 40-year career that has consistently featured creative, business-driven solutions.

Mr. Ross is also Executive Editor and regular columnist of **BRCommunity.com** and its flagship on-line publication, **Business Rules Journal**. Sponsored by BRS, BRCommunity.com is a non-commercial vertical community for professionals. Mr. Ross was formerly Editor of the *Data Base Newsletter* from 1977 to 1998.

Mr. Ross is recognized internationally as the 'father of business rules.'

Mr. Ross has served as Chair of the annual **Business Rules & Decisions Forum Conference** since 1997, now part of the **BBC Conference**. He was a charter member of the Business Rules Group (BRG) in the 1980s and an editor of the two landmark BRG papers, "*The Business Motivation Model: Business Governance in a Volatile World*" (2000) and the "*Business Rules Manifesto*" (2003). He is also active in OMG standards development including SBVR.

Mr. Ross is the author of ten professional books. His newest are **Business Rule Concepts: Getting to the Point of Knowledge** 4th ed. (2013) and **Building Business Solutions: Business Analysis with Business Rules** 2nd ed. with Gladys S.W. Lam (2015). *The Business Rule Book* (1994) was the seminal work in the field. Mr. Ross holds an M.S. in information science from the Illinois Institute of Technology and a B.A. from Rice University.



About Gladys S.W. Lam



Gladys S.W. Lam is a world-renowned authority on applied business rule and decision techniques. She is Principal and Co-Founder of Business Rule Solutions, LLC (www.BRSolutions.com), the most recognized company world-wide in business rules and decision analysis. Ms. Lam is co-creator of IPSpeak™, the BRS methodology. She is Co-Founder of BRCommunity.com, a vertical community for professionals and home of Business Rules Journal. She co-authored [Building Business Solutions: Business Analysis with Business Rules](#), with Ronald G. Ross.

Ms. Lam is widely known for her lively, pragmatic style. Ms. Lam is an internationally recognized expert on business rules and decision techniques. She speaks worldwide at conferences and other professional events. She co-presents interactive online seminars. She is also Executive Director of the [Building Business Capability \(BBC\) Conference](#), which includes the [Business Rules and Decisions Forum](#) and is the official conference of the IIBA®.

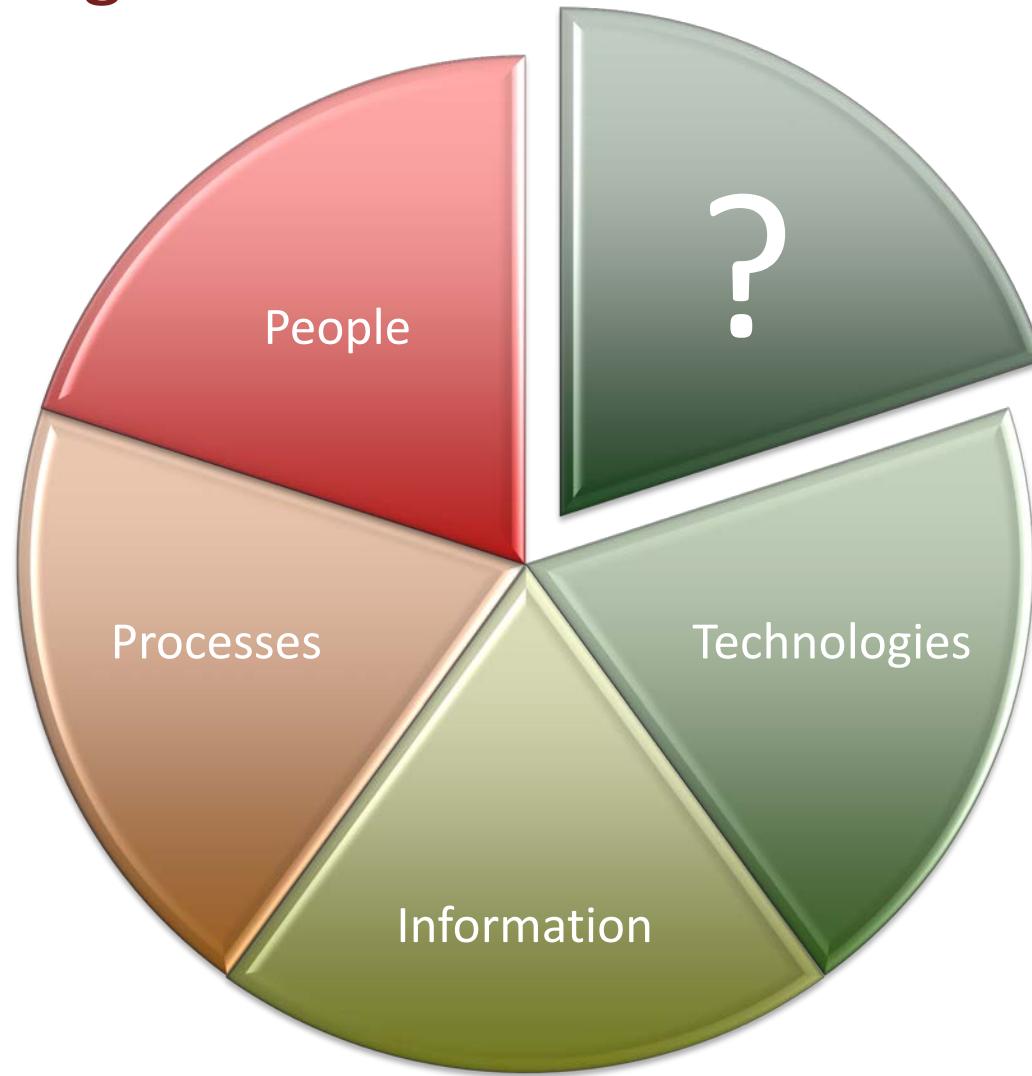
Ms. Lam is a world-renowned expert on business project management, having managed numerous projects that focus on the large-scale capture, analysis and management of business rules and decisions. She works comfortably with senior executives providing insights and advice. She advises senior management of large companies on organizational issues and on business solutions to business problems. She is most effective with mentoring and training business analysts worldwide.

Ms. Lam is most recognized for her ability to identify the source of business issues, and for her effectiveness in developing pragmatic approaches to resolve them. She has gained a world-class reputation for fostering positive professional relationships with principals and support staff in projects.

Ms. Lam graduated from the University of British Columbia with a B.S. in Computer Science.

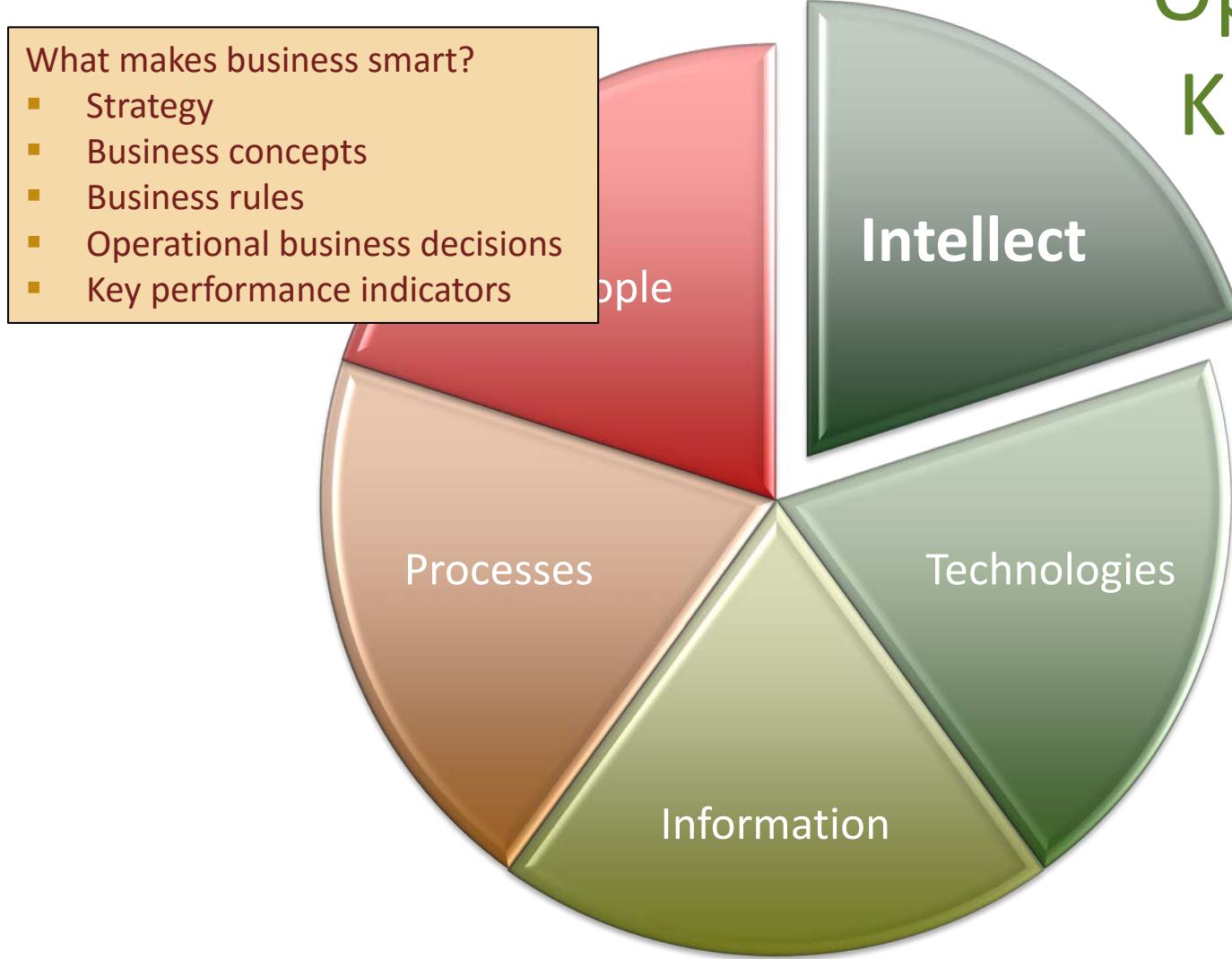


Business Capabilities: The Missing Piece



Business Capabilities: The Complete Picture

Operational Knowledge



Summer Palace, Beijing



Boats-for-Hire Notice

用/小时	预付押金			
100元	400元	Electric Battery Boats	6 persons	RMB ¥ 100
60元	400元	Pedal Boats	6 persons	RMB ¥ 60
				RMB ¥ 400

须知

1. 分钟按半小时收费；超过40分钟按1小时收费。
2. 按时结算费用。
3. 押金卡丢失不予结算、不退。
4. 预定人数。
5. 上禁止站立、打闹。

6. 97358
7. 员会监制

1. Business Hours: 8:30 – 16:30
2. Minimum hire time: one hour. Ten minutes over the hour is counted as half an hour. Forty minutes over the hour is counted as one hour.
3. Deposit is collected when hiring a boat. Fee is calculated on return of boat.
4. The deposit card is the only certificate for fee calculation. This card is valid for one day only. If the card is missing, the deposit will not be refunded.
5. Mind the deep water. Over-capacity is prohibited on the boats.
6. Boats should be returned to the original dock of hire.
7. No drinking, swimming, standing and rough behavior while on boat.
8. Compensation will be required for boats damaged during hire.

For complaints, dial: (8610) 62881144 ext. 6611, 6316
To complain about the prices to the city of Beijing, dial: (8610) 12358
To complain about the prices to Haidian District, Beijing, dial: (8610) 88497358

This billboard is erected under the supervision of Beijing Commission of Development and Reform. Serial No: GY06-15



Example: Taxes

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Form 1040 Department of the Treasury—Internal Revenue Service (99) 2012 CMW No. 1545-00014 IRS Use Only—Do not write or staple in this space. </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> For the year Jan. 1-Dec. 31, 2012, or other tax year beginning <input type="text"/> 2012, ending <input type="text"/> 2012 </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Your first name and initial <input type="text"/> Last name <input type="text"/> See separate instructions. Your social security number <input type="text"/> </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> If a joint return, spouse's first name and initial <input type="text"/> Last name <input type="text"/> Spouse's social security number <input type="text"/> </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Home address (number and street). If you have a P.O. box, see instructions. <input type="text"/> Apt. no. ▲ Make sure the SSN(s) above and on line 4c are correct. </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> City, town or post office, state, and ZIP code. If you have a foreign address, also complete spaces below (see instructions). <input type="text"/> Foreign postal code </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Presidential Election Campaign Check here if you, or your spouse if filing jointly, want \$1 to go to this fund. Checking a box below will not change your tax or refund. <input type="checkbox"/> You <input type="checkbox"/> Spouse </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Filing Status Check only one box. 1 <input type="checkbox"/> Single 2 <input type="checkbox"/> Married filing jointly (even if only one had income) 3 <input type="checkbox"/> Married filing separately. Enter spouse's and full name here. ► </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Exemptions 6a <input type="checkbox"/> Yourself. If someone can claim you as b <input type="checkbox"/> Spouse c <input type="checkbox"/> Dependents: <input type="checkbox"/> Depend (1) First name <input type="text"/> Last name <input type="text"/> Social security number <input type="text"/> </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> If more than four dependents, see instructions and check here ► </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Income Attach Form(s) W-2 here. Also attach Forms W-2G and 1099-R if tax was withheld. If you did not get a W-2, see instructions. Enclose, but do not attach, any payment. Also, please attach Form 1040-V. </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;"> Adjusted Gross Income 23 Educator expenses 24 Certain business expenses of residents, perform fee-basis government officials. Attach Form 210 25 Health savings account deduction. Attach Moving expenses. 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Do not include any social security benefits unless (a) you are married filing a separate return and you lived with your spouse at any time in 2012 or (b) one-half of your social security benefits plus your other gross income and any tax-exempt interest is more than \$25,000 (\$32,000 if married filing jointly). If (a) or (b) applies, see the instructions for lines 20a and 20b to figure the taxable part of social security benefits you must include in gross income. Gross income includes gains, but not losses, reported on Form 8949 or Schedule D. Gross income from a business means, for example, the amount on Schedule C, line 7, or Schedule F, line 9. But, in figuring gross income, do not reduce your income by any losses, including any loss on Schedule C, line 7, or Schedule F, line 9.</p> <p style="text-align: center;">***If you did not live with your spouse at the end of 2012 (or on the date your spouse died) and your gross income was at least \$3,800, you must file a return regardless of your age.</p>	IF your filing status is ...	AND at the end of 2012 you were* ...	THEN file a return if your gross income** was at least ...	Single (see the instructions for line 1)	under 65 65 or older	\$9,750 11,200	Married filing jointly*** (see the instructions for line 2)	under 65 (both spouses) 65 or older (one spouse) 65 or older (both spouses)	\$19,500 20,650 21,800	Married filing separately (see the instructions for line 3)	any age	\$3,800	Head of household (see the instructions for line 4)	under 65 65 or older	\$12,500 13,950	Qualifying widow(er) with dependent child (see the instructions for line 5)	under 65 65 or older	\$15,700 16,850
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Example: Mortgages

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Single-Family

- Making Home Affordable Program
- Underwrite and Process Loans
- Sell and Deliver Loans
- Mortgage Products**
 - List of Products
 - Home Possible Mortgages
- Service Loans
- Become a Freddie Mac Single-Family Customer
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Affordable Merit Rate Mortgage

An incentive rate reduction for on-time payments

For borrowers with weak credit reputations or past credit challenges, our Affordable Merit Rate® Mortgage provides more options for homebuyers who are traditionally consigned to a limited choice of higher-cost financing alternatives.

By taking advantage of efficiencies with Loan Prospector® automated underwriting technology, you can qualify borrowers for Affordable Merit Rate at an initial interest rate that may be closer to conventional rates – delivering more homeownership opportunities to borrowers in the communities you serve. And, borrowers benefit from an additional one percentage point interest rate reduction for making their mortgage payments on time for 24 consecutive months.¹

With Affordable Merit Rate Mortgages, borrowers will have a four-year period to make 24 consecutive on-time mortgage payments in order to qualify for a one-time, one percent interest rate reduction. If a late mortgage payment occurs in the first 24 months, borrowers will be re-evaluated on the 36- or 48-month anniversaries of the payment due date. Borrowers who meet the eligibility requirements will automatically receive the one-time rate reduction effective the month following the eligible anniversary date.

Product Features

Feature	Requirements
Property Type	<ul style="list-style-type: none">1- to 2-unit primary residences, including condominiums, PUDs, and manufactured homes.
Eligible Mortgage Products	<ul style="list-style-type: none">30-year fixed-rate mortgages
Transaction Type	<ul style="list-style-type: none">PurchaseNo cash-out refinances



Example: Immunization

CDC Home  Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

MMWR All CDC Topics
Choose a topic above

A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

Morbidity and Mortality Weekly Report (MMWR)

[MMWR](#)



 Recommend 34  Tweet 4  Share

General Recommendations on Immunization

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Please note: An erratum has been published for this article. To view the erratum, please click [here](#).

Recom **January** **Spacing of Multiple Doses of the Same Antigen**

Vaccination providers should adhere as closely as possible to recommended vaccination schedules ([Table 1](#)). Administration at recommended ages and in accordance with recommended intervals between doses of multidose antigens provide optimal protection.

Administration of doses of a multidose vaccine using intervals that are shorter than recommended might be necessary in certain circumstances, such as impending international travel or when a person is behind schedule on vaccinations but needs rapid protection. In these situations, an accelerated schedule can be implemented using intervals between doses that are shorter than intervals recommended for routine vaccination. The accelerated or minimum intervals and ages for scheduling catch-up vaccinations are available at <http://www.cdc.gov/vaccines>. Vaccine doses should not be administered at intervals less than these minimum intervals or at an age that is younger than the minimum age.*

Before administering a vaccine dose, providers might need to verify that all previous doses were administered after the minimum age and in accordance with minimum intervals ([Table 1](#)). In clinical practice, vaccine doses occasionally are administered at intervals less than the minimum interval or at ages younger than the minimum age. Doses administered too close together or at too young an age can lead to a suboptimal immune response. However, administering a dose a few days earlier the minimum interval or age is unlikely to have a substantially negative effect on the immune response to that dose. Vaccine doses administered ≤ 4 days before the minimum interval or age are considered valid; however, local or state mandates might supersede this 4-day guideline.† (Day 1 is the day before the day that marks the minimum age or minimum interval for a vaccine.) Because of the unique schedule for rabies vaccine, the 4-day guideline does not apply to this vaccine ([5](#)). Doses of any vaccine administered ≥ 5 days earlier than the minimum interval or age should not be counted as valid doses and should be repeated as age appropriate. The repeat dose should be spaced after the invalid dose by the recommended minimum interval ([Table 1](#)). For example, if the first and second doses of *Haemophilus influenzae* type b (Hib) were administered only 14 days apart, the second dose would be invalid and need to be repeated because the minimum interval from dose 1 to dose 2 is 4 weeks. The repeat dose should be administered ≥ 4 weeks after the invalid dose (in this case, the second). The repeat dose is counted as the valid second dose.

If the first dose in a series is given ≥ 5 days before the recommended minimum age, the dose should be repeated on or after the date when the child reaches at least the minimum age. If the vaccine is a live vaccine, ensuring that a minimum interval of 28 days has elapsed from the invalid dose is recommended. For example, if the first dose of varicella vaccine were inadvertently administered at age 10 months, the repeat dose would be administered no earlier than the child's first birthday (the minimum age for the first dose). If the first dose of varicella vaccine were administered at age 11 months and 2 weeks, the repeat dose should be administered no earlier than 4 weeks thereafter, which would occur after the first birthday.

Certain vaccines (e.g., adult tetanus and diphtheria toxoids [Td], pediatric diphtheria and tetanus toxoids [DT]; and tetanus toxoid) produce increased rates of local or systemic reactions in certain recipients when administered more frequently than recommended ([6, 7](#)). Careful record keeping, maintenance of patient



To Be Discussed

- What is a business rule
- Why business rules
- Audience participation
- Decision analysis and decision tables
- Case study



What is a Business Rule?



Is this a business rule?

Provide a feature to handle
electronic funds transfer.



Is this a business rule?

Provide a feature to handle
electronic funds transfer.

Requirement



Is this a business rule?

Customer provides account id.
System displays account.



Is this a business rule?

Customer provides account id.
System displays account.

Use case statements



Is this a business rule?

If the overdrawn flag is set to
'yes', reject transaction.



Is this a business rule?

If the overdrawn flag is set to
'yes', reject transaction.

System if/then statement



Definition

Business Rule: Criterion used in business operations to

- Guide behavior
- Make decisions



Requirement

Provide a feature to handle
electronic funds transfer

Business Rule

Every employee expense reimbursement
must be processed through electronic
funds transfer.



Use Case Statement

Customer provides account id.
System displays account.

Business Rule

A customer must have a valid account.



System if/then statement

If the overdrawn flag is set to 'yes',
reject transaction.

Business Rules

1. An account must not be overdrawn.
2. An account may be considered overdrawn only if cash withdrawal is greater than the current balance of the account.



Business Rule Statement

A vaccine dose administered must be considered an allowable vaccine if all the following are true:

- The vaccine type of the vaccine dose administered is one of the allowable vaccine types.
- The date administered is on or later than the allowable vaccine type begin age date.
- The date administered is earlier than the allowable vaccine type end age date.



Subject Vocabulary

Business Rule

The **vaccine lot number** must be reported for every **vaccination event**.



Definitions

Vaccination Event: administration of one **Vaccine** to a **Patient**

Vaccination Encounter: an interaction between a **Provider** and **Patient** resulting in one or more **Vaccination Events**

Provider: a medical practitioner (e.g., physician, nurse) who administers an immunization – i.e., conducts a **Vaccination Event**

Patient:

Vaccine:

Vaccine Lot Number:



Decision Tables

Can a vaccine dose administered be evaluated and why?

		Dose Condition Indicated?	
		Yes	No
Vaccination Expired?	Yes	Vaccine dose administered cannot be evaluated	Vaccine dose administered cannot be evaluated
	No	Vaccine dose administered cannot be evaluated	Vaccine dose administered can be evaluated

Definition:

Vaccination Expired means Vaccination Date > Lot Expiration Date



Why Business Rules?



1. Communicating





No jet-powered cars.

me

No car is allowed if it has a peacock on the top.

No peacock is allowed if it has a car at the bottom.

Gene Weng

A vehicle must not carry a Christmas tree on its roof if it's on fire.

Casper Yeow

No campfires on a car roof.

J John Jones

No car explosions allowed in the area.

Johannes van Schalkwyk



Should finish date be actual finish date or forecast finish date?

Name	Rule Statement	Status
Show all	contains finish date	Show all
Series 001	A patient series must be considered completable if the finish date is less than the maximum age date of the last target dose.	Proposed
Series 002	A complete patient series must be considered to be the earliest completing if the actual finish date is before the actual finish date for all other candidate patient series.	Proposed
Series 004	The actual finish date of a complete patient series must be the latest date administered of a vaccine dose administered with an evaluation status "valid."	Proposed
Series 008	A patient series must be considered to finish earliest if the patient series can be completed and the forecast finish date is earlier than the forecast finish date in all other candidate patient series.	Proposed



Better RFPs

Implementers often receive poorly structured content, producing significant problems in interpretation and completeness.



“We elicit business rules, express them in RuleSpeak®, and include them in RFPs. Implementers love it.”

Paul Franz



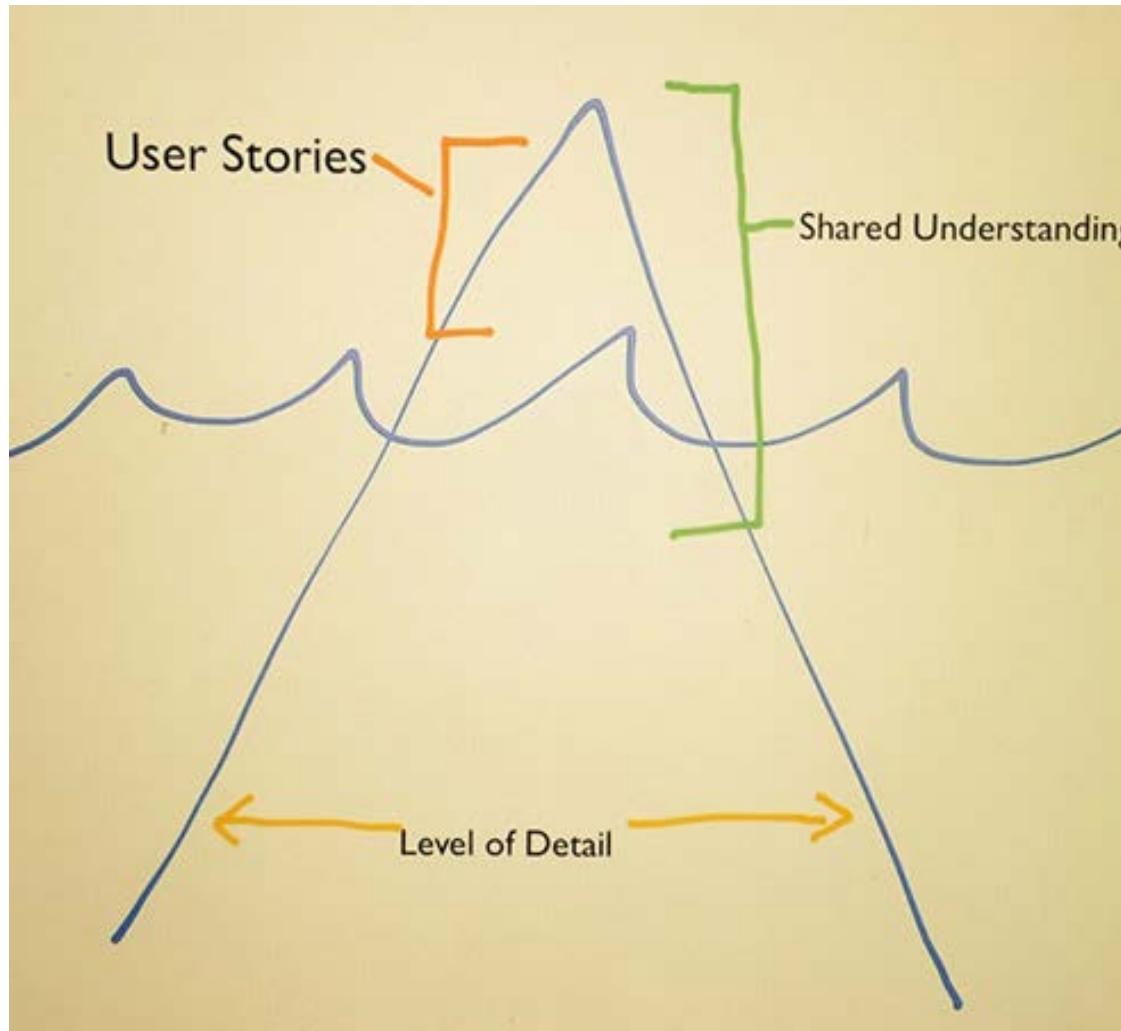
Business rules are about
business communication;
people communicating with
people, often displaced in
time, place & function.



2. Accelerating Projects



Benefit 2: Accelerate Projects



“We documented 75% savings in projects by having the business rules defined in advance and made available to the projects at the start.”

*manager
large Insurance company*



3. Knowledge Retention



“More than 60% of all our staff who know our tribal knowledge will retire in the next 3 years.”

Manager, insurance company



4. Compliance



Compliance people don't really want to know HOW you do what you do.

They want to know WHY you get the results you do.



“We have finally found an approach that really works:
compliance = interpretation & traceability of business rules.”

*compliance manager
financial company*



Audience Participation



No driving without a license.

Not ambiguous!



1

Original rule:

A team must have a manager.

Ask: What does “to have” mean?

↳ Be managed by a manager?

↳ Be sponsored by a manager?

↳ Be approved by a manager?

Ask about ambiguity

40



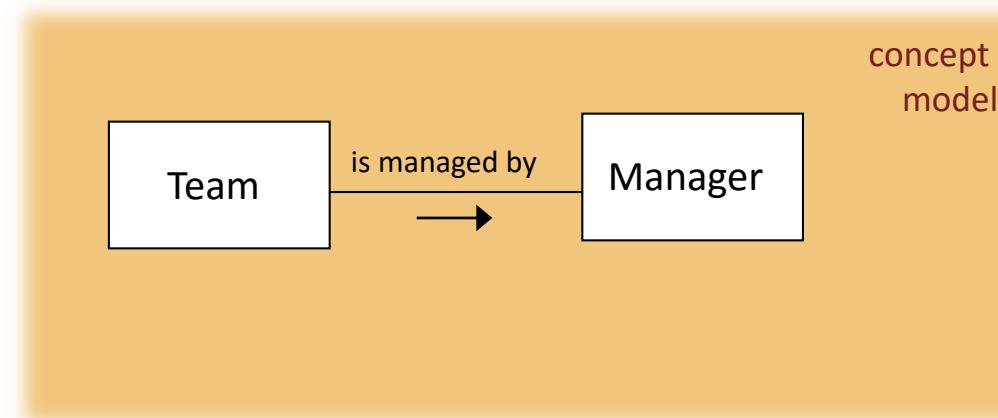
1

Original rule:

A team must have a manager.

Revised rule:

A team must be managed by a manager.



2

Original rule:

An order must not be shipped if the outstanding balance exceeds credit authorization.

Ask: Outstanding balance of what?

↳ Order? Customer? Account? Shipment?

Ask: Credit authorization of what?

↳ Order? Customer? Account? Shipment?



2

Original rule:

An order must not be shipped if the outstanding balance exceeds credit authorization.

Missing meanings:

customer places order

customer has credit authorization

customer holds account

account has outstanding balance

Revised rule:

An order must not be shipped if the outstanding balance of the account held by the customer that placed the order exceeds the credit authorization of the customer.



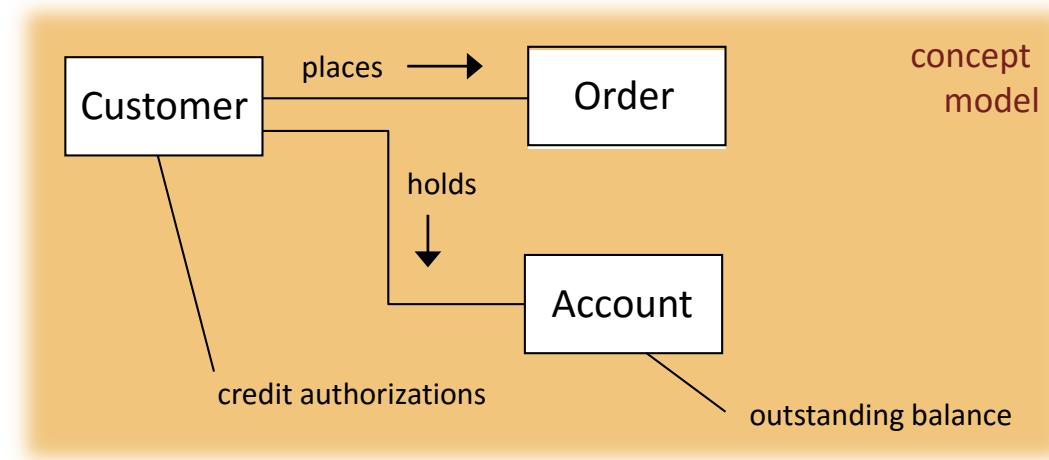
2

Original rule:

An order must not be shipped if the outstanding balance exceeds credit authorization.

Revised rule:

An order must not be shipped if the outstanding balance of the account held by the customer that placed the order exceeds the credit authorization of the customer.



Ask about ambiguity

44



3

Original rule:

A **customer** may make a withdrawal only if their account is active.

Ask: What about pre-authorized third parties?

↳ What about the bank itself?

↳ What about automated payment system?

Ask about ambiguity

45



3

Original rule:

A **customer** may make a withdrawal only if their account is active.

Revised rule:

A withdrawal for an account may be made only if the account is active.



4

Original rule:

A project must be considered active if it has manager, a budget, or a sponsor.

Ask: How many?

↳ At least one?

↳ Exactly one?

↳ What if the threshold changes to “any 2 of the 3”?

Ask about ambiguity

47



4

Original rule:

A project must be considered active if it has a manager, a budget, or a sponsor.

Revised rule:

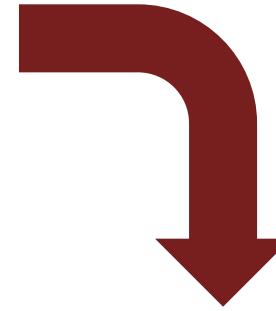
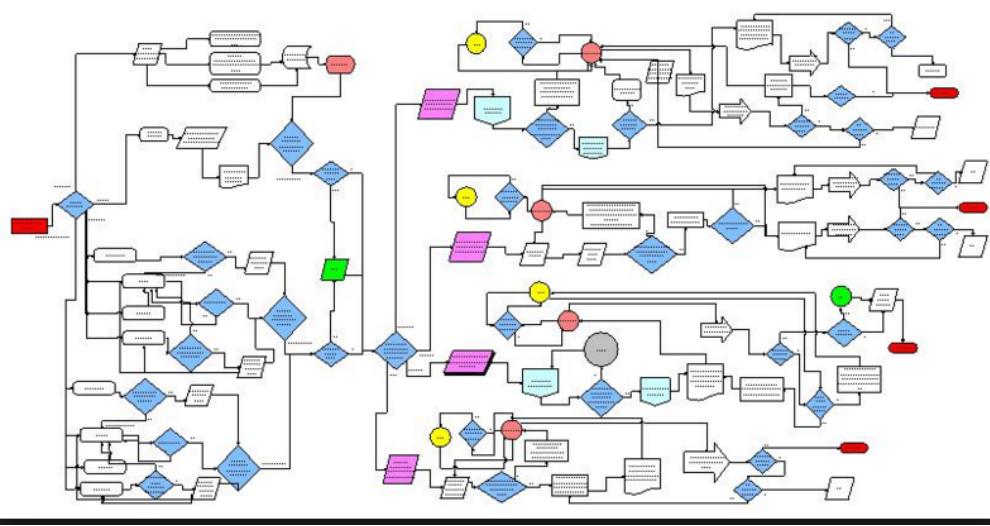
A project must be considered active if at least one of the following is true:

- It has a manager.
- It has a budget.
- It has a sponsor.

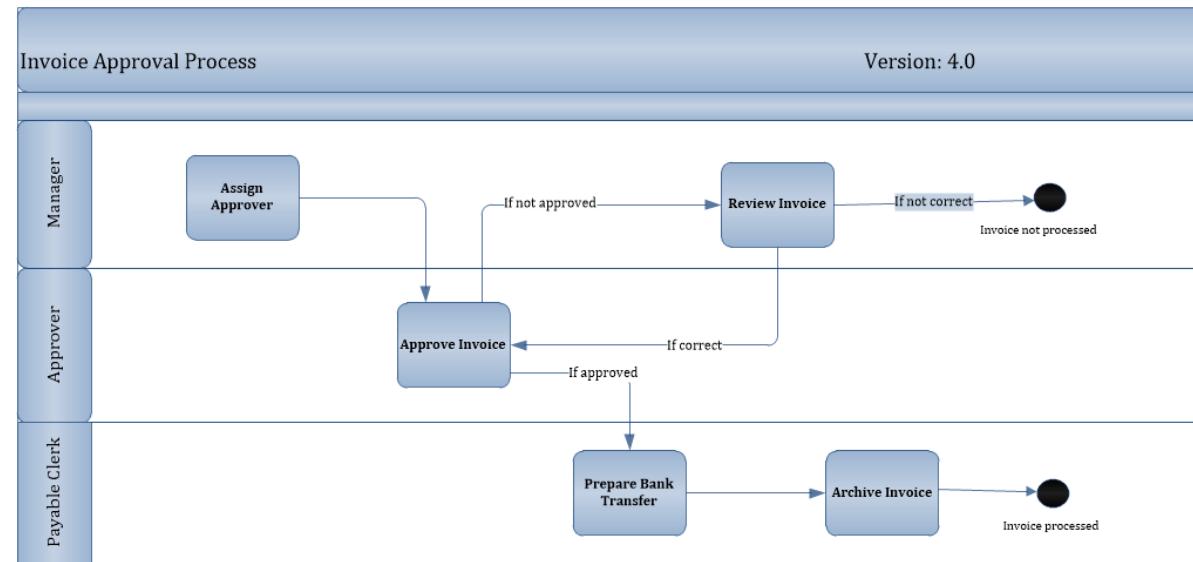


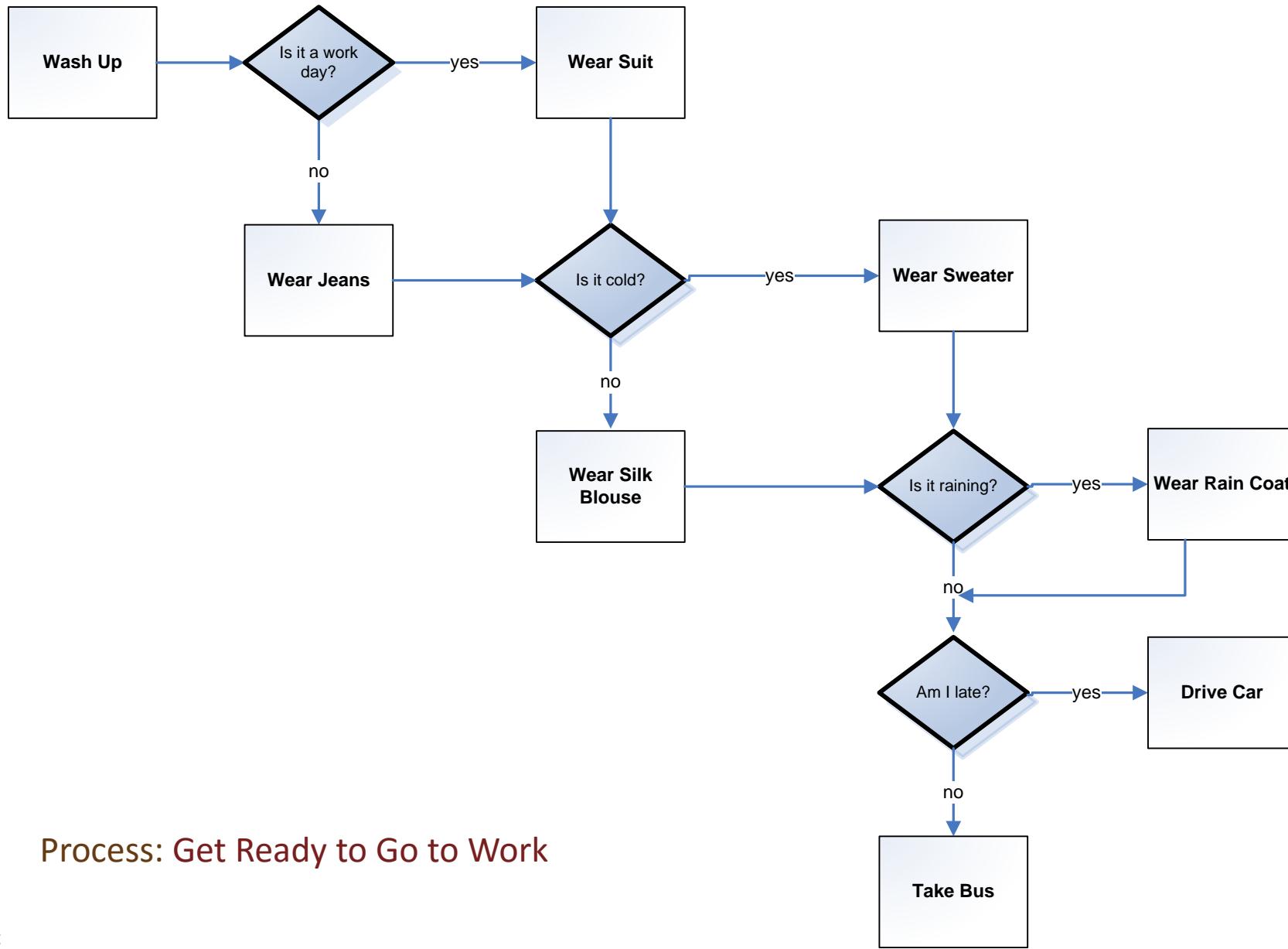
Decision Analysis & Decision Tables

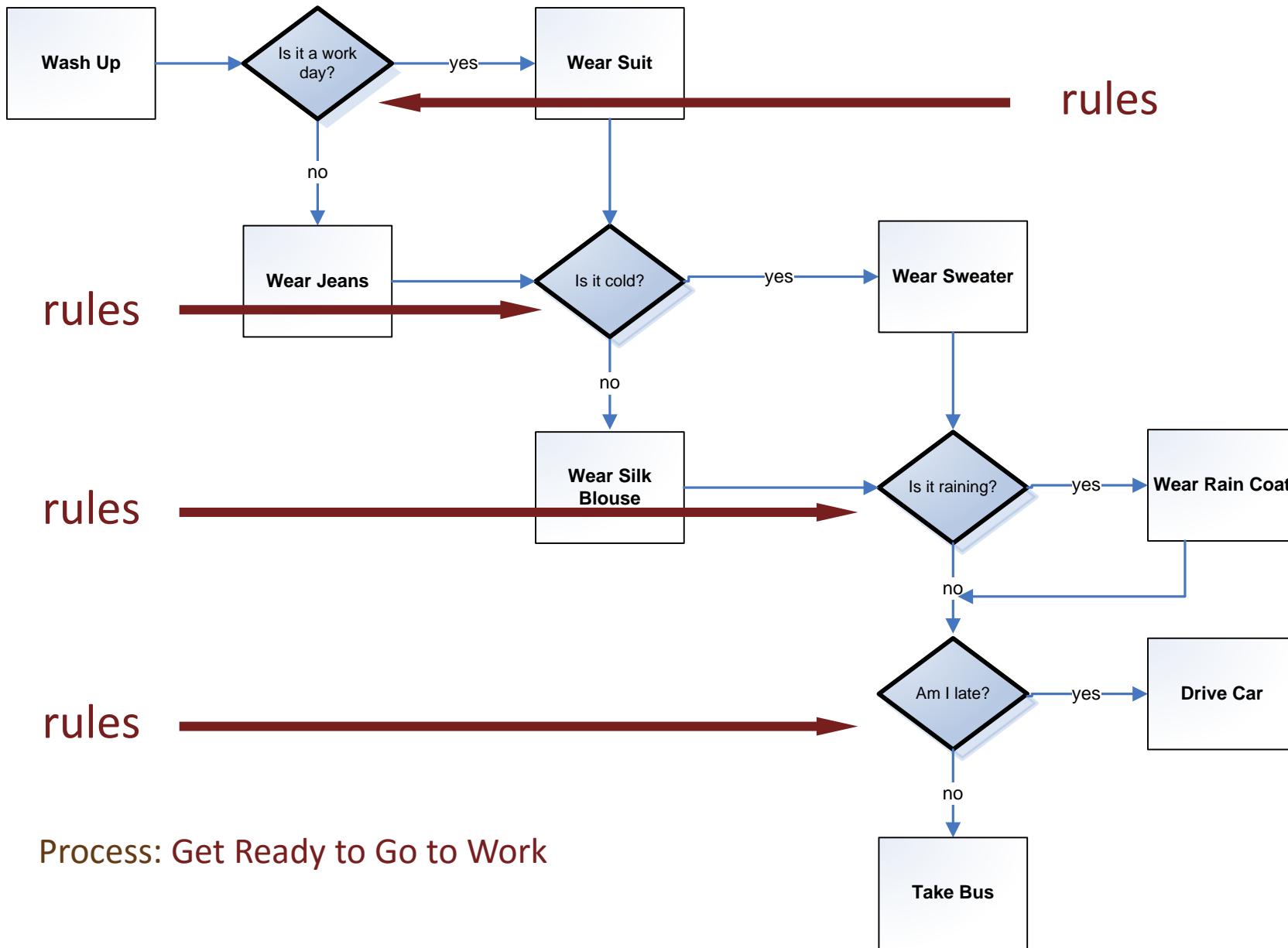


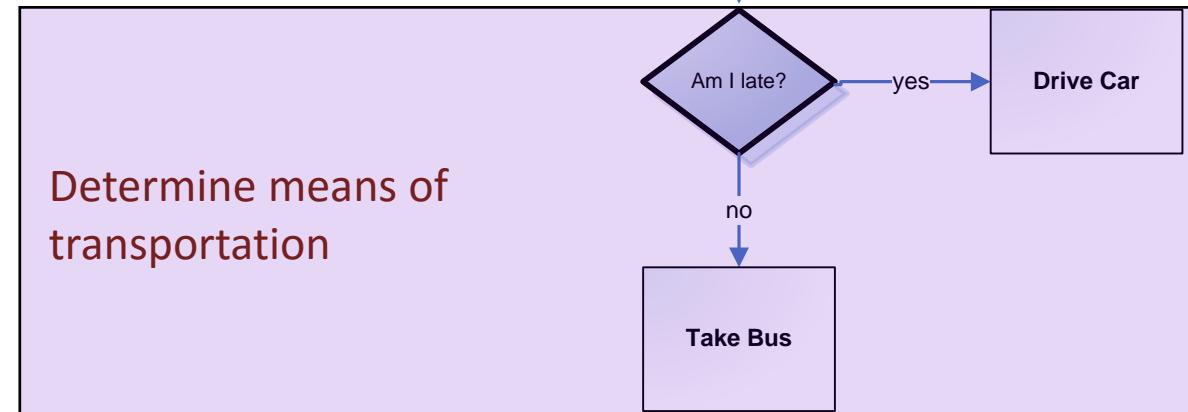
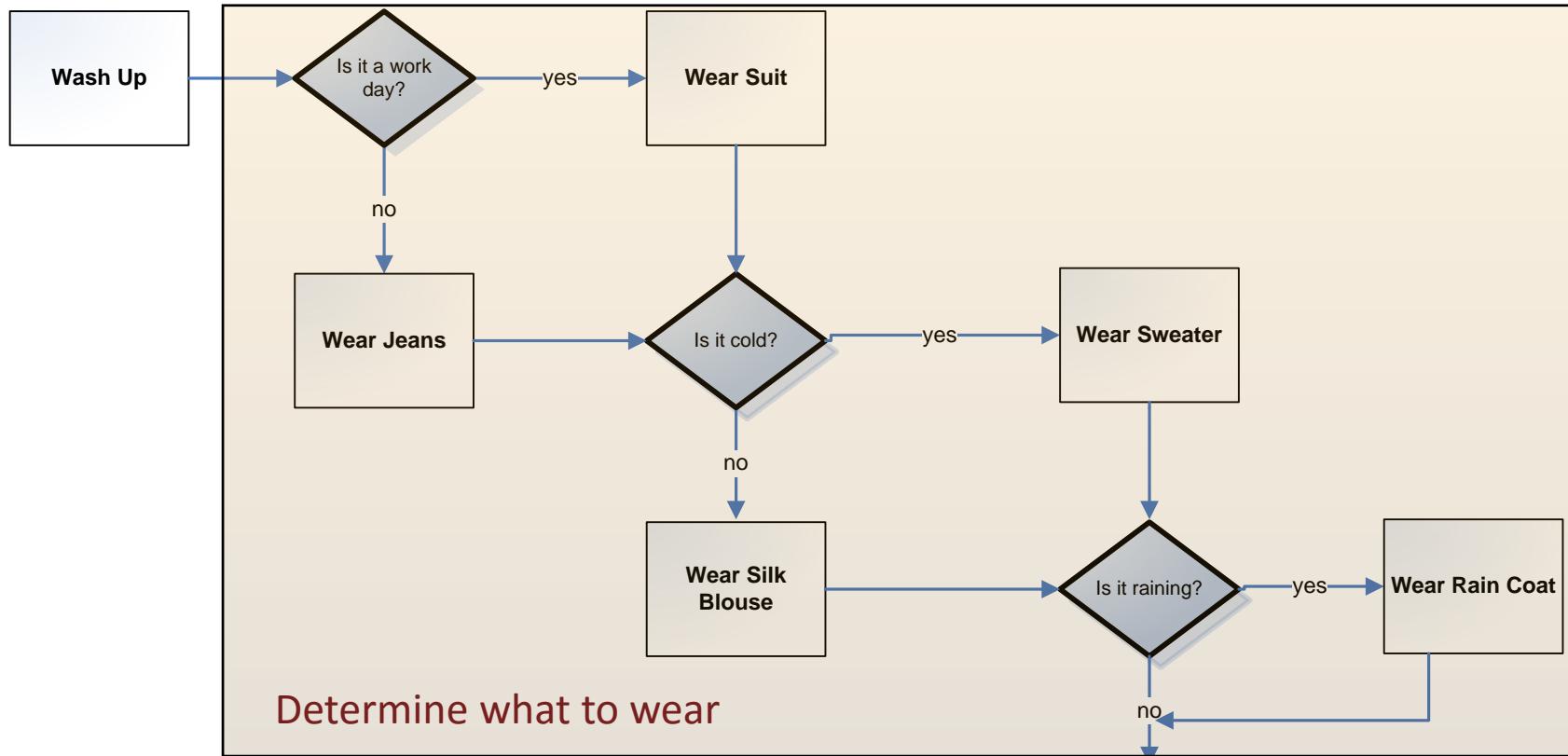


Externalize Business Rules











Result using a decisioning approach

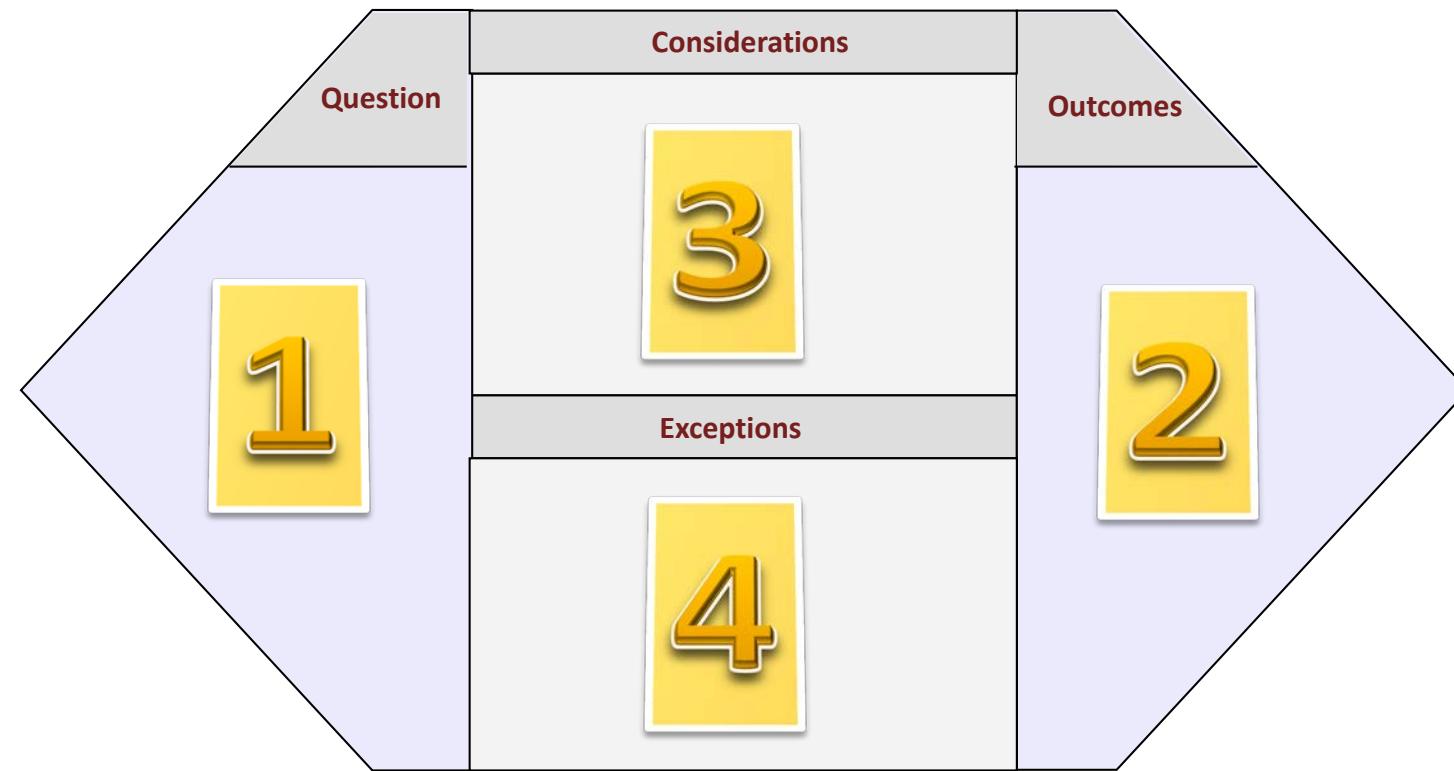
54



Q-COE



Q-COE: Question, Considerations, Outcomes, Exceptions



1

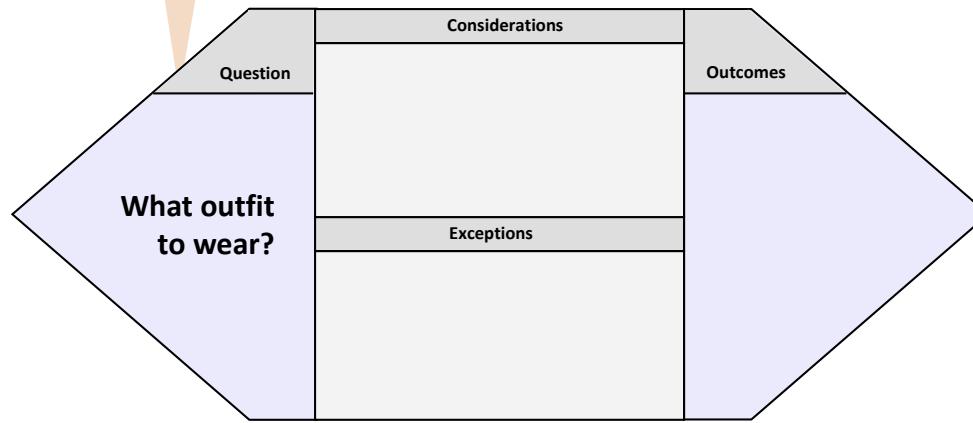
What decision needs to be made?



1

What decision needs to be made?

Decision: What outfit to wear?

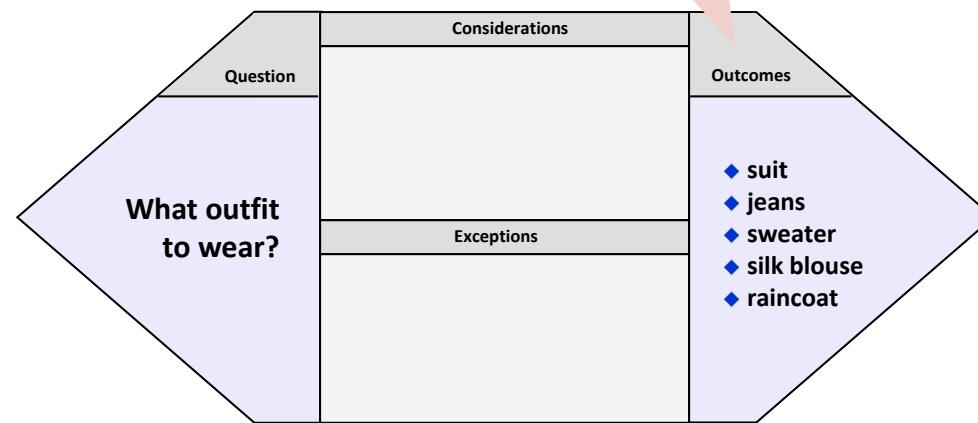


2

What are all the potential outcomes?

Decision: What outfit to wear?

Potential Outcomes: Suit, jeans, sweater, silk blouse, raincoat



3

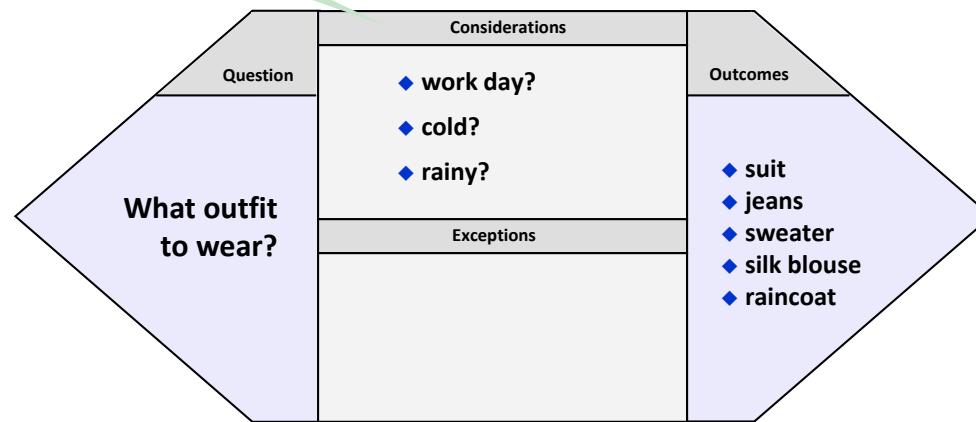
What considerations should I base the decision on?

Decision: What outfit to wear?

Potential Outcomes: Suit, jeans, sweater, silk blouse, raincoat

Considerations:

1. Is it a work day?
2. Is it cold?
2. Is it rainy?



Develop decision logic



Identify decision



Identify outcomes



Identify considerations



Articulate consideration questions



Identify consideration answers



Structure decision rules



3a

Articulate consideration
questions

3b

Identify consideration
answers

Is it a work day? → yes / no

Is it cold? → yes / no

Is it raining? → yes / no

3c

Structure decision rules

Decision table(s)

	Suit	Jeans	Sweater	Silk Blouse	Rain Coat
Work	Y	N	-	-	-
Cold	-	-	Y	N	-
Rainy	-	-	-	-	Y

or

Business rule statement(s)

A suit must be worn on a work day.

A pair of jeans must be worn on a day that is not a work day.

A sweater must be worn on a cold day.

A silk blouse must be worn on a day that is not a cold day.

A rain coat must be worn on a rainy day.

or

Combination of business rule statement(s) and decision table(s)



3a

Articulate consideration questions

3b

Identify consideration answers

Is it a work day?



work day / day off

Is it cold?



cold / hot

Is it raining?



rainy / sunny

Combination of business rule statement(s) and decision table(s)

3c

Structure decision rules



A red arrow points to the top-left cell of the decision table.

	Cold	Hot
Work Day	Suit & Sweater	Suit & Silk blouse
Day Off	Jeans & Sweater	Jeans & Silk blouse

A rain coat must be worn on a rainy day.

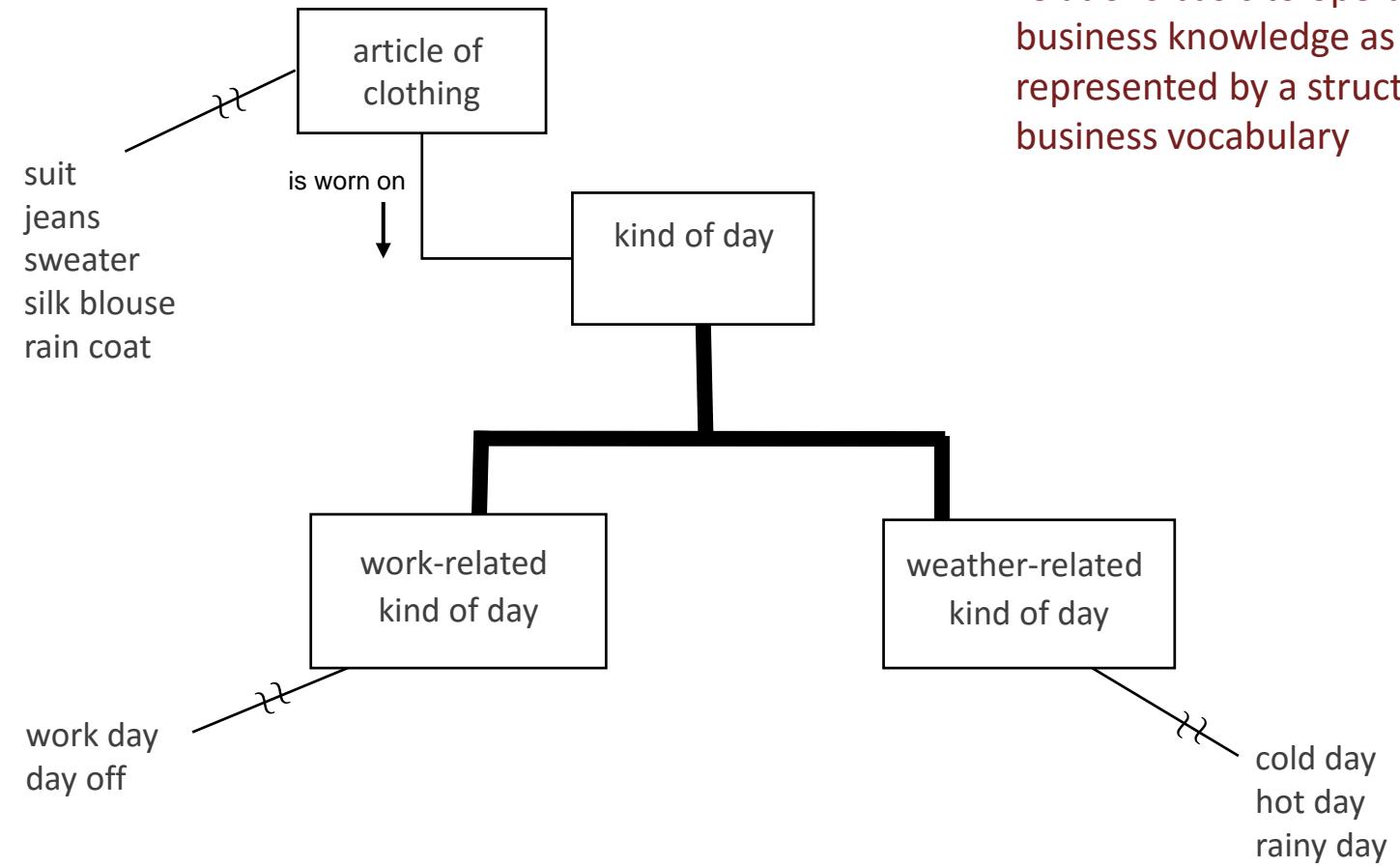
or

Business rule statement(s)

A suit must be worn on a work day.
A pair of jeans must be worn on a day off.
A sweater must be worn on a cold day.
A silk blouse must be worn on a hot day.
A rain coat must be worn on a rainy day.



Concept model: operational business concepts and their relations basic to operational business knowledge as represented by a structured business vocabulary



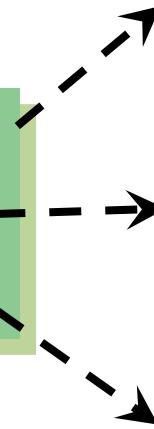


The quality of your decision logic depends on the precision of your answers.

3b

Identify consideration answers

work day / day off
cold / hot
rainy / sunny



How is work day defined?
Is a half day of work
considered a work day?

What is cold?
60 degrees?
50 degrees?

What is rainy?
Is occasional light drizzle
considered rainy?

half day?

warm?

drizzle?
shower?
thunderstorm?

Additional answers means more rules



3b

Identify consideration answers

Decision table(s)

	Cold	Hot
Work Day	Suit & Sweater	Suit & Silk blouse
Day Off	Jeans & Sweater	Jeans & Silk blouse

~~A rain coat must be worn on a rainy day.~~

or

Business rule statement(s)

A suit must be worn on a work day.
 A pair of jeans must be worn on a day off.
 A sweater must be worn on a cold day.
 A silk blouse must be worn on a hot day.
~~A rain coat must be worn on a rainy day.~~

New rules ...

or

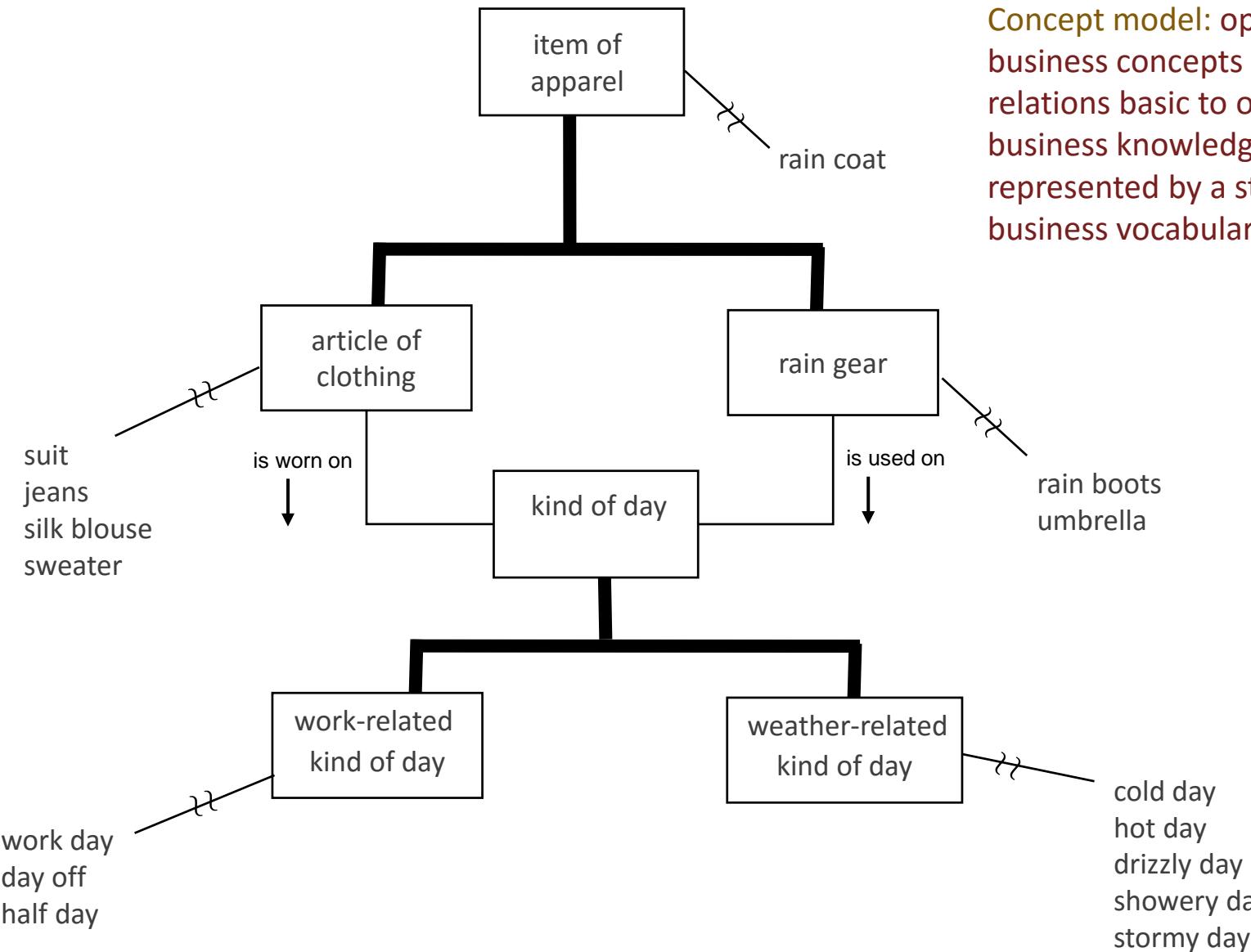
	Cold	Hot	Warm
Work Day	Suit & Sweater	Suit & Silk blouse	Suit & Cotton blouse
Day Off	Jeans & Sweater	Jeans & Silk blouse	Jeans & Cotton blouse
Half Day	Skirt & Sweater	Skirt & Silk blouse	Skirt & Cotton blouse

Kind of Day	Rain Gear
Drizzly Day	Umbrella
Showery Day	Rain Coat
Stormy Day	Rain Boots

A umbrella must be used on a drizzly day.
 A rain coat must be worn on a showery day.
 A pair of rain boots must be worn on a stormy day.

A skirt must be worn on a half day.
 A cotton blouse must be worn on a warm day.





Concept model: operational business concepts and their relations basic to operational business knowledge as represented by a structured business vocabulary



4

What exceptions are within scope?

Decision: What outfit to wear?

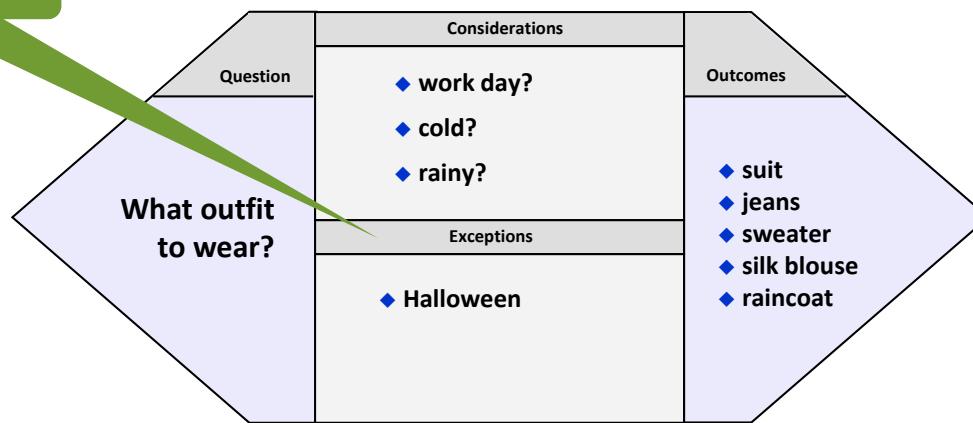
Potential Outcomes: Suit, jeans, sweater, silk blouse, raincoat

Considerations:

1. Is it a work day?
2. Is it cold?
2. Is it rainy?

Exceptions:

1. Halloween



Case Study



Immunization Rules for Children



Translating ACIP Recommendations



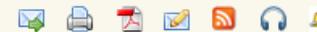
Specification





A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

Morbidity and Mortality Weekly Report (MMWR)

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General Recommendations on Immunization

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Please note: An erratum has been published for this article. To view the erratum, please click [here](#).

Recommendations and Reports

January 28, 2011 / 60(RR02);1-60

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Corresponding preparer: Andrew Kroger, MD, National Center for Immunization and Respiratory Diseases, 1600 Clifton Rd., MS E-52, Atlanta, GA 30333. Telephone: 404-639-1958; Fax: 404-639-8828; E-mail: aok2@cdc.gov.

Summary

This report is a revision of the General Recommendations on Immunization and updates the 2006 statement by the Advisory Committee on Immunization Practices (ACIP) (CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices [ACIP]. MMWR 2006;55[No. RR-15]). The report also includes revised content from previous ACIP recommendations on the following topics: adult vaccination (CDC. Update on adult immunization recommendations of the immunization practices Advisory Committee [ACIP]. MMWR 1991;40[No. RR-12]); the assessment and feedback strategy to increase vaccination rates (CDC. Recommendations of the Advisory Committee on Immunization Practices: programmatic strategies to increase



Nature of Sources

Poliomyelitis Prevention in the United States

Updated Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Summary

These recommendations of the Advisory Committee on Immunization Practices (ACIP) for poliomyelitis prevention replace those issued in 1997. As of January 1, 2000, ACIP recommends exclusive use of inactivated poliovirus vaccine (IPV) for routine childhood polio vaccination in the United States. All children should receive four doses of IPV at ages 2, 4, and 6–18 months and 4–6 years. Oral poliovirus vaccine (OPV) should be used only in certain circumstances, which are detailed in these recommendations. Since 1979, the only indigenous cases of polio reported in the United States have been associated with the use of the live OPV. Until recently, the benefits of OPV use (i.e., intestinal immunity, secondary spread) outweighed the risk for vaccine-associated paralytic poliomyelitis (VAPP) (i.e., one case among 2.4 million vaccine doses distributed). In 1997, to decrease the risk for VAPP but maintain the benefits of OPV, ACIP recommended replacing the all-OPV schedule with a sequential schedule of IPV followed by OPV. Since 1997, the global polio eradication initiative has progressed rapidly, and the likelihood of poliovirus importation into the United States has decreased substantially. In addition, the sequential schedule has been well accepted. No declines in childhood immunization coverage were observed, despite the need for additional injections. On the basis of these data, ACIP recommended on June 17, 1999, an all-IPV schedule for routine childhood polio vaccination in the United States to eliminate the risk for VAPP. ACIP reaffirms its support for the global polio eradication initiative and the use of OPV as the only vaccine recommended to eradicate polio from the remaining countries where polio is endemic.



imprecise

Nature of Sources

Poliomyelitis Prevention in the United States

Updated Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Summary

These recommendations of the Advisory Committee on Immunization Practices (ACIP) for poliomyelitis prevention replace those issued in 1997. As of January 1, 2000, ACIP recommends exclusive use of inactivated poliovirus vaccine (IPV) for routine childhood polio vaccination in the United States. All children should receive four doses of IPV at ages 2, 4, and 6–18 months and 4–6 years. Oral poliovirus vaccine (OPV) should be used only in certain circumstances, which are detailed in these recommendations. Since 1979, only indigenous cases of polio reported in the United States have been associated with the use of the live OPV. Until recently, the benefits of OPV use (i.e., intestinal immunity, secondary spread) outweighed the risk for vaccine-associated paralytic poliomyelitis (VAPP) (i.e., one case among 2.4 million vaccine doses distributed). In 1997, to decrease the risk for VAPP but maintain the benefits of OPV, ACIP recommended replacing the all-OPV schedule with a sequential schedule of IPV followed by OPV. Since 1997, the global polio eradication initiative has progressed rapidly, and the likelihood of poliovirus importation into the United States has decreased substantially. In addition, the sequential schedule has been modified to allow for additional injections. On January 1, 2000, ACIP recommended that all children receive four doses of IPV as the only vaccine for polio prevention. The use of OPV as the only vaccine for polio prevention is no longer recommended.

All children should receive four doses of IPV at ages 2, 4, and 6–18 months and 4–6 years. Oral poliovirus vaccine (OPV) should be used only in certain circumstances, which are detailed in these recommendations.



- 2 and 4 – months or years?
- up to, or up to and including (through), 18 months and 6 years
- vaccination at 2 or 4 months? what about +/- 1 day? +/- 5 days? +/- 30 days? what is the threshold?



- Increase precision
- Eliminate inconsistency
- Drill down on decision logic
- Fill gaps



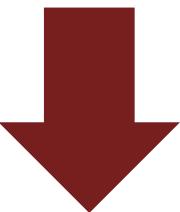
Poliomyelitis Prevention in the United States

Updated Recommendations of the Advisory Committee on Immunization Practices
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All children should receive four doses of IPV at ages 2, 4, and 6–18 months and 4–6 years. Oral poliovirus vaccine (OPV) should be used only in certain circumstances, which are detailed in these recommendations.



interpret to

date ranges of

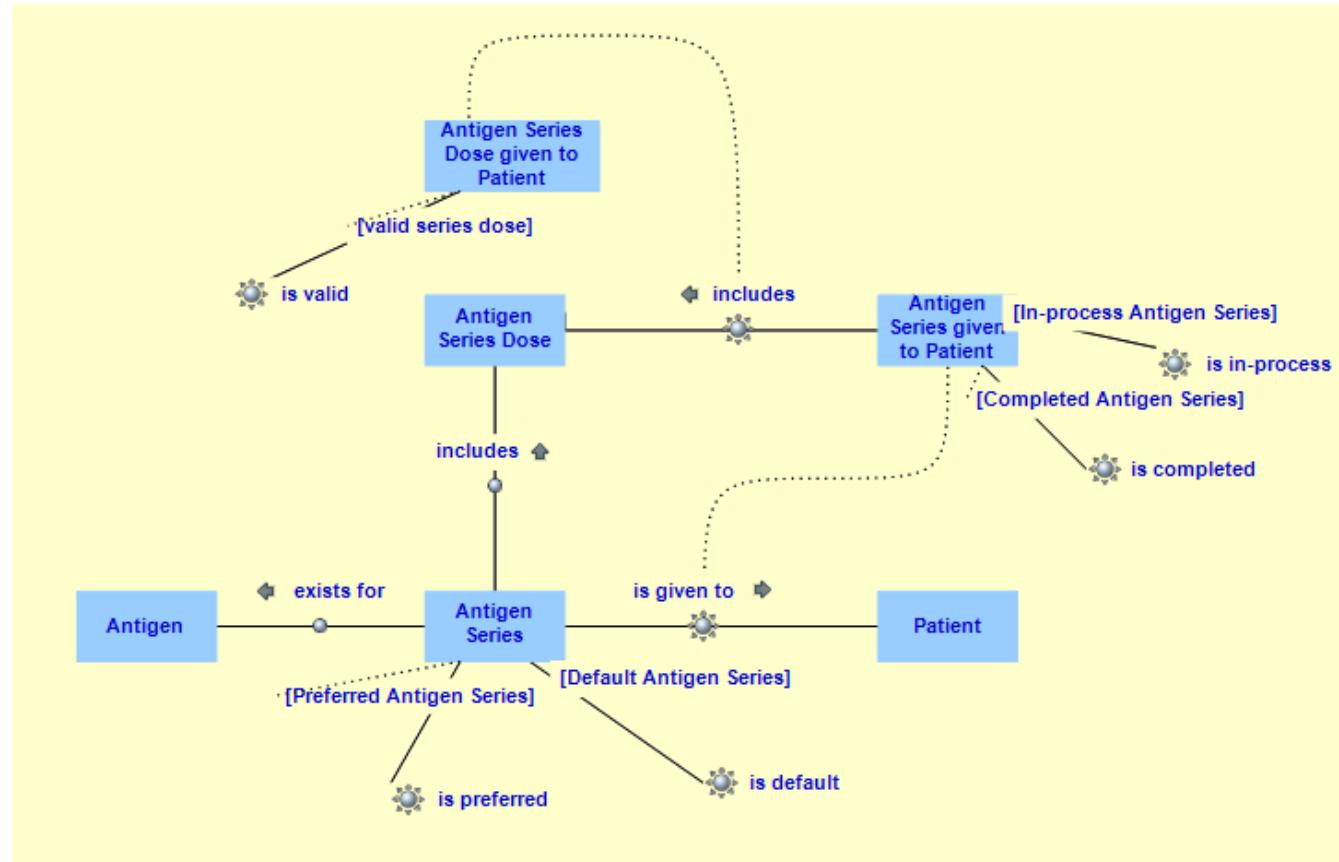
- 0 through 2 months
- 2 months + 1 day through 4 months
- 6 months through 18 months
- 4 years through 6 years



Minimum age
Maximum age

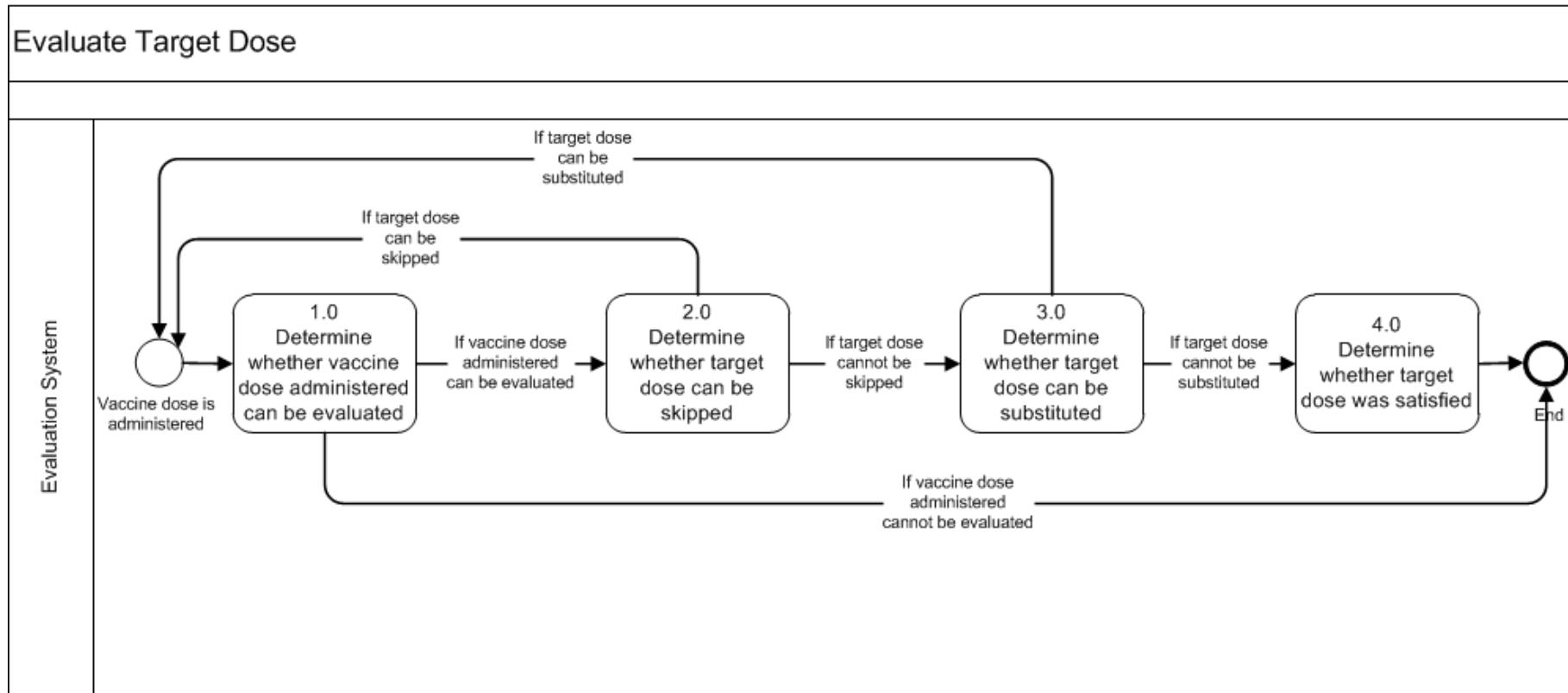


Concept Model (Structured Business Vocabulary)

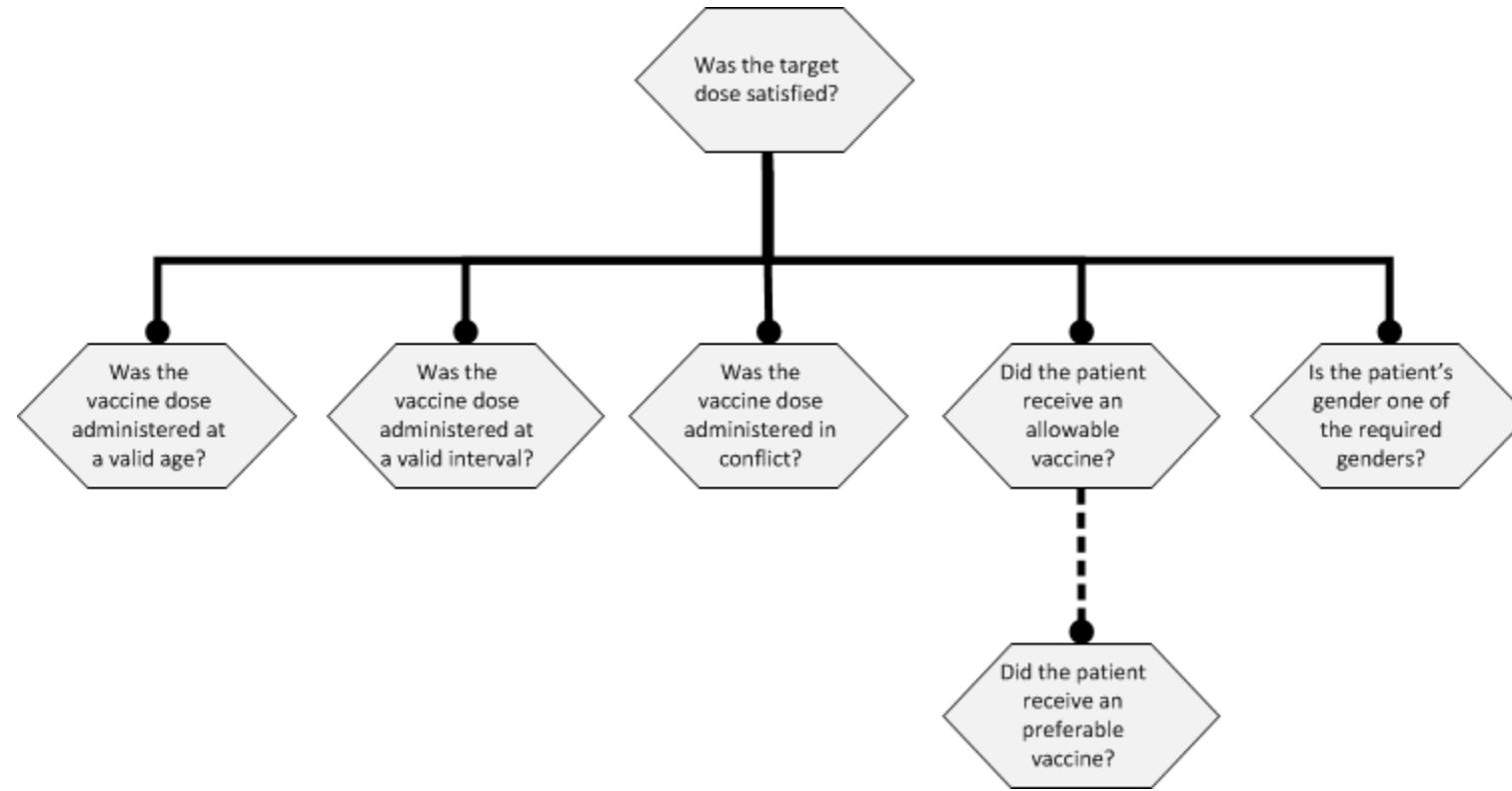


Antigen	a foreign (non-self) substance which can cause an immune response
Antigen Series	one possible path to achieve presumed immunity against a disease
Antigen Series Dose	the measured quantity of a medicine or other therapeutic agent to be taken at one time or in a period of time
Antigen Series Dose given to Patient	an Antigen Series Dose given to a patient
Antigen Series given to Patient	an Antigen Series given to a patient

Process Model



Q-Chart



Q-COE

Was the target dose satisfied?

Question	Considerations	Outcomes
	<p>Was the vaccine dose administered at a valid age?</p> <p>Was the vaccine dose administered at a valid interval?</p> <p>Was the vaccine dose administered in conflict?</p> <p>Did the patient receive a preferable vaccine?</p> <p>Did the patient receive an allowable vaccine?</p> <p>Is the patient's gender one of the required genders?</p>	<ul style="list-style-type: none">the target dose is satisfiedthe target dose is not satisfied

Decision Table

considerations			
Is the vaccine type of the vaccine dose administered one of the allowable vaccine types?	yes	no	yes
Allowable vaccine type begin age date \leq date administered $<$ allowable vaccine type end age date?	yes	-	no
Outcomes	The patient received an allowable vaccine.	The patient did not receive an allowable vaccine.	The patient did not receive an allowable vaccine.

Business Rule Statements

A vaccine dose administered must be considered an allowable vaccine if all the following are true:

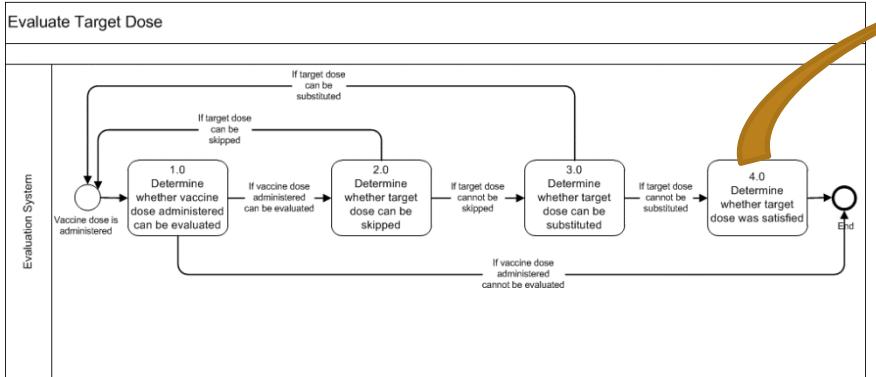
- The vaccine type of the vaccine dose administered is one of the allowable vaccine types.
- The date administered is on or later than the allowable vaccine type begin age date.
- The date administered is earlier than the allowable vaccine type end age date.



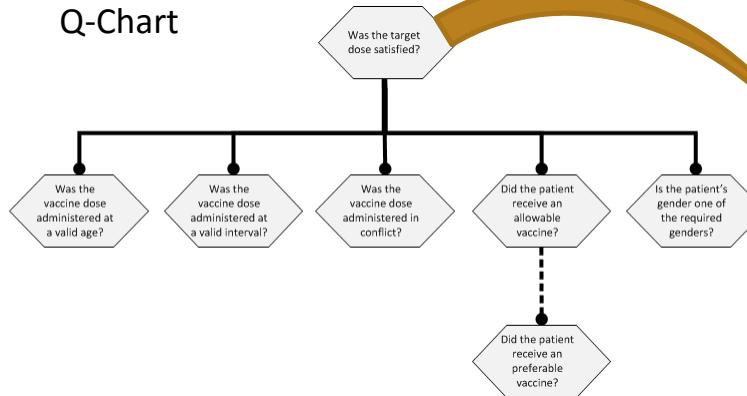
Business Rule Groups

Name: DATE RULES		
	Name	Rule Statement
1	Overarching Date Rules	
2	BR 341	The computed date of adding any number of years to an existing date must be calculated by incrementing the year while holding the month and day constant.
3	BR 342	The computed date of adding any number of months to an existing date must be calculated by incrementing the month (and year, if necessary) while holding the day constant.
4	BR 343	The computed date of adding any number of weeks or days to an existing date must be calculated by adding the total days to the existing date.
5	BR 344	The computed date of subtracting any number of days from an existing date must be calculated by subtracting the total days from the existing date.
6	BR 345	A computed date which is not a real date must be moved forward to first day of the next month.
7	Min/Max Date Rules	
13	Interval Date Rules	
14	BR 361	The patient's Absolute Minimum Interval Date must be calculated as the patient's Reference Dose Date plus the Absolute Minimum Interval.
15	BR 362	The patient's Minimum Interval Date must be calculated as the patient's Reference Dose Date plus the Minimum Interval.
16	BR 363	The patient's earliest recommended interval date must be calculated as the patient's date of birth plus the Earliest Recommended Interval.
17	BR 364	The patient's Latest Recommended Interval date must be calculated as the patient's date of birth plus the Latest Recommended Interval.
18	BR 365	The patient's Latest Minimum Interval Date must be the Latest Date of all calculated Minimum Interval Dates for a given Target Dose.
19	Skip Target Dose Date Rules	
21	Substitute Target Dose Date Rules	
22	BR 352	The patient's First Dose Begin Age Date must be calculated as the patient's Date of Birth plus Substitute Dose First Dose Begin Age.
23	BR 353	The patient's First Dose End Age Date must be calculated as the patient's Date of Birth plus Substitute Dose First Dose End Age.
24	Conflict Date Rules	

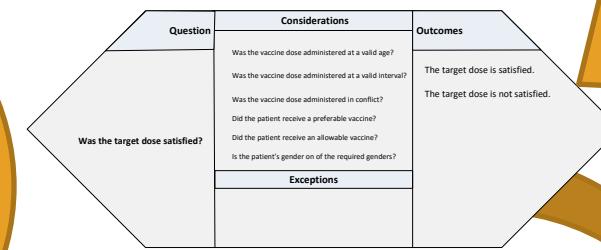
Process Model



Q-Chart



Q-COEs



Decision Tables

DECISION	RULES	OUTCOMES			
		Age is valid	Age is valid	Age is valid	Age is not valid
Info: Is the Vaccine Dose Administered at a Valid Age?	Age is valid	Valid	Valid	Valid	Not Valid
Info: Is the Vaccine Dose Administered at a Valid Interval?	Age is valid	Valid	Valid	Valid	Not Valid
Info: Is the Vaccine Dose Administered in Conflict?	Age is valid	Valid	Valid	Valid	Not Valid
Decision: Did the Patient Receive a Preferable Vaccine?	Preferable	Valid	Valid	Valid	Not Valid
Decision: Did the Patient Receive an Allowable Vaccine?	Allowable	Valid	Valid	Valid	Not Valid
Decision: Is the Patient's Gender One of the Required Genders?	Required	Valid	Valid	Valid	Not Valid
OUTCOMES	Target Dose Administered				
	Target Dose Administered				

The deliverables all fit together; the concept model serves as the 'glue'.

Business Rules

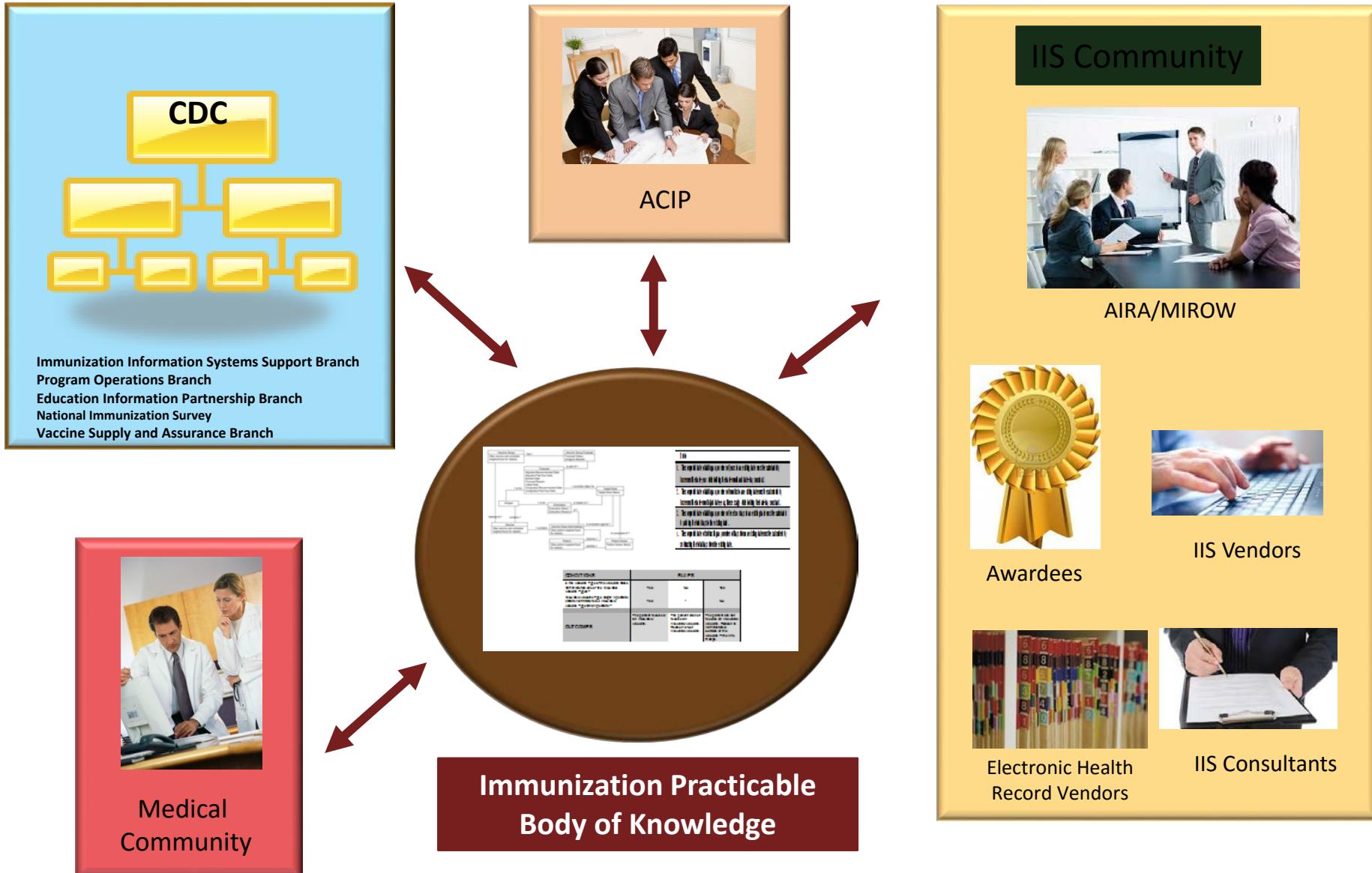
Rule	Statement	Status
BR 341	The computed date of adding any number of years to an existing date must be calculated by incrementing the year while holding the month and day constant.	Operational
BR 342	The computed date of adding any number of months to an existing date must be calculated by incrementing the month (and year, if necessary) while holding the day constant.	Operational
BR 343	The computed date of adding any number of weeks or days to an existing date must be calculated by adding the total days to the existing date.	Operational
BR 344	The computed date of subtracting any number of days from an existing date must be calculated by subtracting the total days from the existing date.	Operational
BR 345	A computed date which is not a real date must be moved forward to first day of the next month.	Operational
BR 351	The patient's Skip Target Dose Trigger Age must be calculated as the patient's Date of Birth plus the Skip Target Dose Trigger Age.	Proposed
BR 352	The patient's First Dose Begin Age must be calculated as the patient's Date of Birth plus Substitute Dose First Dose Begin Age.	Proposed
BR 353	The patient's First Dose End Age must be calculated as the patient's Date of Birth plus Substitute Dose First Dose End Age.	Proposed
BR 354	The patient's Maximum Age Date must be calculated as the patient's Date of Birth plus the Maximum Age.	Proposed



Management



Vision



Business Terms

RuleXpress Business Center - User Copy

Ready Kristen Seer

Manage Vocabulary and Rules

Manage Vocabulary and Rules

Manage Terms

Manage Fact Model

Manage Rules

Manage Decision Table

Manage Rule Groups

Manage Decisions

Community Overview

Community Statistics

Find and Replace

Search Communities

Quality Overview

View Dependencies

View Hierarchies

Produce Reports

Multi-Item Reports

Audit Trail Reports

Re-Usable Filter Editor

Change Management

RuleXpress

291 item, 291 item shown

Lists Hierarchies

Properties Terms Patterns Expression Usage History

Term - Minimum Age

the earliest age a vaccine may be administered

Click once on an underlined term to view its definition here.

A. Representation

Term: **Minimum Age** (highlighted with a red circle)

Topic: Yes No

Derived: Yes No

Concept Type:

B. Management

Status: Published

Responsible Party:

C. Documentation

Example:

double click here to extend the size of this text box; right click to reduce

Assumed Value If Empty:

Supporting Data: Yes No

Comment:

Analyst Comment:

Motivation:

double click here to extend the size of this text box; right click to reduce

D. Sources

Reference Source: Reference Source Name = CDSi Logic Specification v1.0

Reference Source Content:

Reference Source URL:

Reference Source Author:

Reference Source Location:

Reference Source Page:

Reference Source Name: CDSi Logic Specification v1.0

Dictionary Basis:

Dictionary Name:

Dictionary Definition:

Terms are defined in glossary

Search the web and Windows

10:06 AM
3/7/2016

Terms are defined in glossary



Business Rules

RuleXpress Business Center - User Copy

Kristen Seer

Ready

Manage Vocabulary and Rules

Manage Terms
Manage Fact Model
Manage Rules
Manage Decision Tbl
Manage Rule Groups
Manage Decisions

Community Overview
Community Statistics
Find and Replace
Search Communities
Quality Overview
View Dependencies
View Hierarchies

Produce Reports
Multi-Item Reports
Audit Trail Reports
Re-Usable Filter Editor

Change Management

RuleXpress

118 items, 118 items shown

Lists Hierarchies

Properties Expression Patterns Relationships Rule Groups Usage History

1:35 PM 3/7/2016

Allowable-1 The patient has received an a
Allowable-2 The patient has not received a
CALCDT-1 The computed date of adding
CALCDT-2 The computed date of adding
CALCDT-3 The computed date of adding
CALCDT-4 The computed date of subtracting
CALCDT-5 A computed date which is not
CALCDT-6 A computed date must be calculated
CALCDTAGE-1 A patient's maximum age date
CALCDTAGE-2 A patient's latest recommended age date
CALCDTAGE-3 A patient's earliest recommended age date
CALCDTAGE-4 A patient's minimum age date
CALCDTAGE-5 A patient's absolute minimum age date
CALCDTALLOW-1 A patient's allowable vaccine
CALCDTALLOW-2 A patient's allowable vaccine
CALCDTCOND-1 The patient's conditional begin date
CALCDTCOND-2 The patient's conditional end date
CALCDTINT-1 A patient's reference dose date
CALCDTINT-2 A patient's reference dose date
CALCDTINT-3 A patient's absolute minimum age date
CALCDTINT-4 A patient's minimum interval between doses
CALCDTINT-5 A patient's earliest recommended age date
CALCDTINT-6 A patient's latest recommended age date
CALCDTINT-7 A patient's latest minimum age date
CALCDTINT-8 A patient's reference dose date
CALCDTINT-9 A patient's conflict begin interval
CALCDTINT-10 A patient's conflict end interval
CALCDTINT-11 A patient's latest conflict end interval
CALCDTPREF-1 A patient's preferable vaccine
CALCDTPREF-2 A patient's preferable vaccine
CALCDTSKIP-1 The patient's trigger age date
CALCDTSKIP-2 The patient's trigger interval date
CALCDTSKIP-3 A patient's conditional skip begin date
CALCDTSKIP-4 A patient's conditional skip end date
CALCDTSKIP-5 A patient's conditional skip interval date
CALCDTSUB-1 The patient's first dose begin date
CALCDTSUB-2 The patient's first dose end date

Rule - CALCDTAGE-4

A patient's **minimum age date** must be calculated as the patient's **date of birth** plus the **minimum age**.

Click once on an underlined term to view its definition here.

A. Representation

Name: CALCDTAGE-4
Kind of Guidance: Business Rule
Topic:

B. Management

Status: Published
Responsible Party:

C. Documentation

D. Sources

Reference Source Content = January 28, 2011 / 60(RR02):1-60; Reference Source URL = <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm>

Spacing of Multiple Doses of the Same Antigen

General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP)

E. Applicability

F. Enforcement

G. Implementation

Name of Implementation Comp.: CDSi Logic Specification v1.0
Kind of Implementation Comp.: Publication

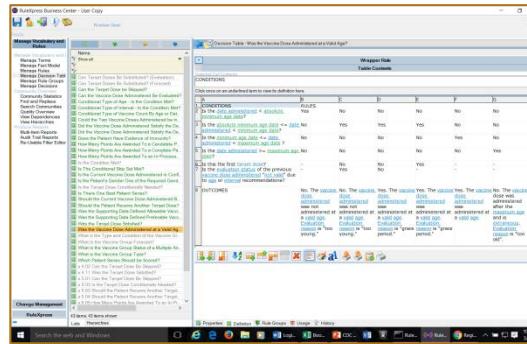
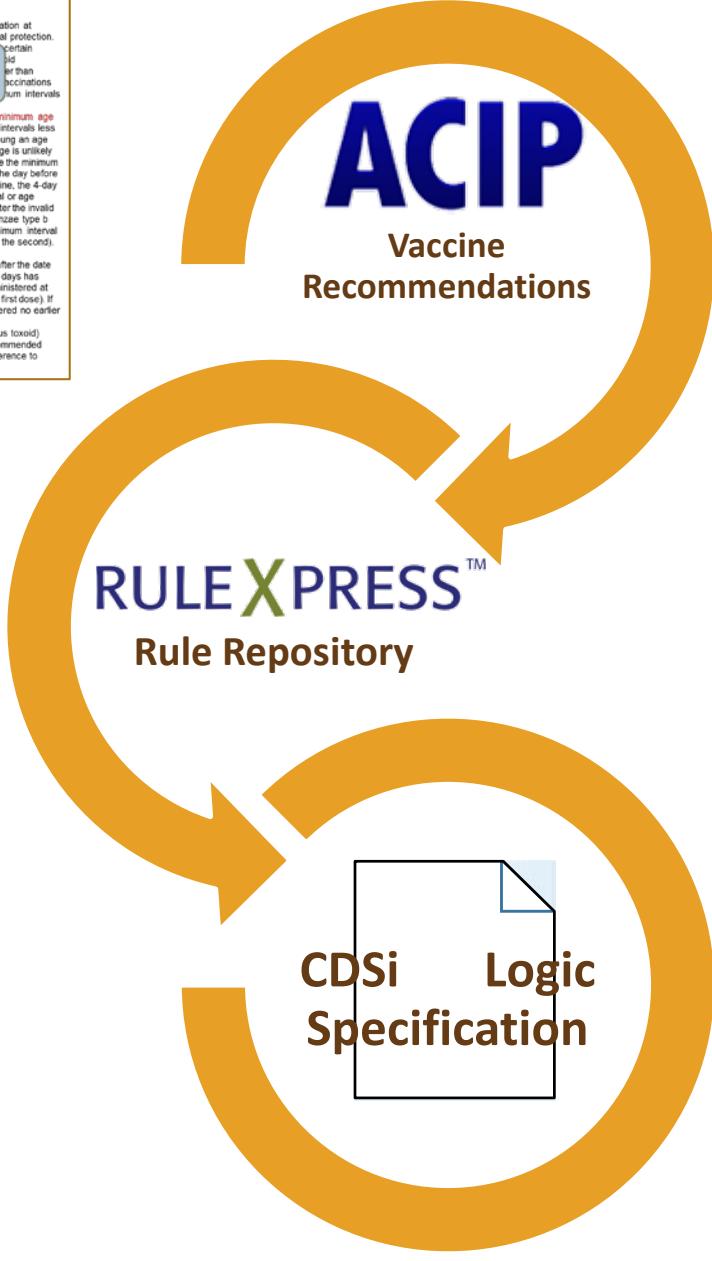
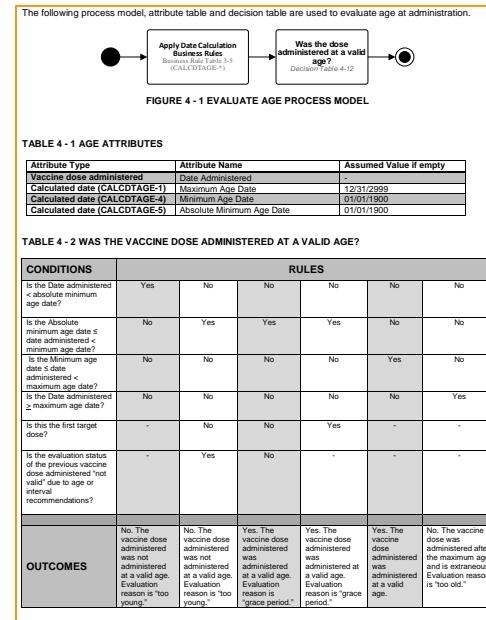
Traceability to reference source



Publication



Spacing of Multiple Doses of the Same Antigen
 Vaccination providers should adhere as closely as possible to recommended vaccination schedules (Table 1). Administration at recommended ages and in accordance with recommended intervals between doses of multidose antigens provide optimal protection. Administration of doses of a multidose vaccine using intervals that are longer than the recommended intervals, such as during an international travel or when a person is not able to receive recommended vaccinations at recommended ages, might result in certain circumstances, in less than optimal protection. In these situations, an alternative schedule with shorter than recommended intervals is recommended for routine vaccination. The accelerated or modified vaccination schedules for certain vaccines are available at <http://www.cdc.gov/vaccines>. Vaccine doses should not be administered at an age that is younger than the minimum age.
 Before administering a vaccine dose, providers might need to verify that all previous doses were administered after the minimum age and in accordance with minimum intervals. (Table 1) In clinical practice, vaccination doses are occasionally administered at intervals less than the minimum age or at ages younger than the minimum age. Doses administered too close together or at too young an age can lead to a suboptimal immune response. However, administering a dose a few days earlier the minimum interval of age is unlikely to have a substantially negative effect on the immune response to that dose. Vaccine doses administered ≤4 days before the minimum interval or age are considered valid; however, local or state mandates might supersede this 4-day guideline. 1 (Day 1 is the day before the day that the previous dose was administered or minimum age for a vaccine.) Because the rule for doses administered ≤4 days before the minimum age does not apply to this vaccine, (5) Doses of any vaccine administered ≤5 days earlier than the minimum interval or age should not be counted as valid doses and should be repeated as age appropriate. The repeat dose should be spaced after the invalid dose by the recommended minimum interval (Table 1). For example, if the first and second doses of Haemophilus influenza type b (Hib) were administered only 14 days apart, the second dose would be invalid and need to be repeated because the minimum interval from dose 1 to dose 2 is 4 weeks. The repeat dose should be administered ≥4 weeks after the invalid dose (in this case, the second). The same logic applies to other vaccines.
 If the first dose in a series is given ≥5 days before the recommended minimum age, the dose should be repeated on or after the date when the child reaches at least the minimum age. If the vaccine is a live vaccine, ensuring that a minimum interval of 28 days has elapsed from the invalid dose is recommended. For example, if the first dose of varicella vaccine were inadvertently administered at age 10 months, the second dose would be administered no later than the child's first birthday (the minimum age for the first dose). If the first dose of varicella vaccine were administered at age 11 months and 2 weeks, the repeat dose should be administered no later than 4 weeks thereafter, which would occur after the first birthday.
 Certain vaccines (e.g., adult tetanus and diphtheria toxoids [Td], pediatric diphtheria and tetanus toxoids [DT], and tetanus toxoid) produce increased rates of local or systemic reactions in certain recipients when administered more frequently than recommended (6,7). Careful record keeping, maintenance of patient histories, use of immunization information systems (IISs), and adherence to recommended schedules can decrease the incidence of such reactions without adversely affecting immunity.



Working Together



Summary: Goal for Knowledge



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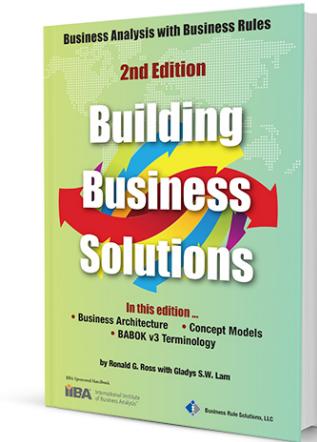
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- Business rules
- Decision structures
- Decision tables
- Subject vocabulary

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each audience

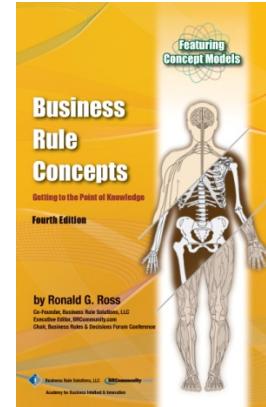




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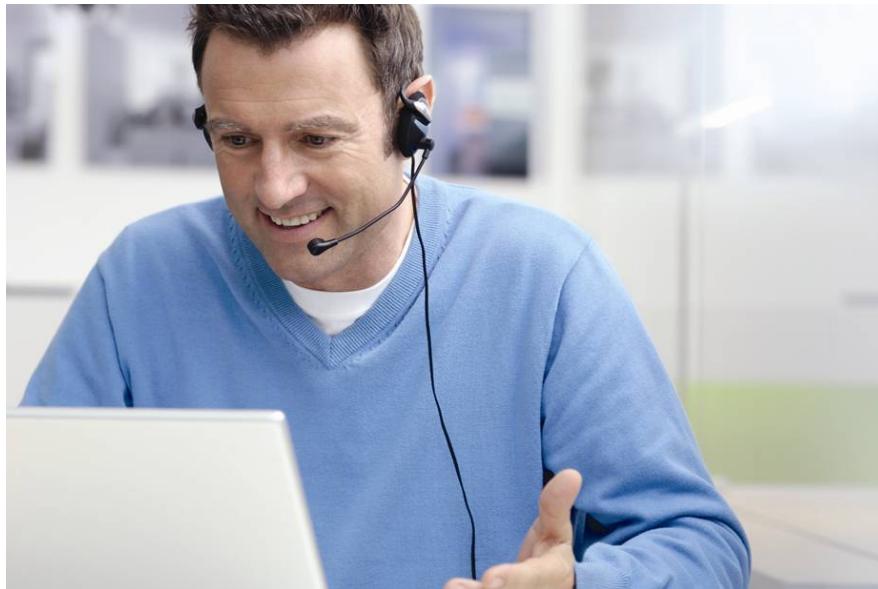
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