From Business Models to BI Models

Lawrence Corr
Essentially, all models are wrong, but some are useful.

— George E. P. Box
Business Models

• A business model describes the rationale of how an organization creates, delivers and captures value.

  – Alexander Osterwalder, Business Model Generation

• We define “business model” as the logic by which an enterprise sustains itself financially.

  – Tim Clark, Business Model You
What is so difficult about BI?
DW/BI Challenges (and Opportunities)

- Capturing detailed **BI requirements**
- Responding to **Agile Software Development**
  - Incremental development
  - Proactive design – parallel development
What kind of models could help us?
Entity Relationship Model
Data Vault Model
Dimensional Model

**CALENDAR**
- Date Key
- Date
- Day
- Day in Week
- Day in Month
- Day in Qtr
- Day in Year
- Month
- Qtr
- Year
- Weekday Flag
- Holiday Flag

**PRODUCT**
- Product Key
- Product Code
- Product Description
- Product Type
- Brand
- Subcategory
- Category

**SALES FACT**
- Date Key
- Product Key
- Store Key
- Promotion Key
- Quantity Sold
- Revenue
- Cost
- Basket Count

**STORE**
- Store Key
- Store Code
- Store Name
- URL
- Store Manager
- Region
- Country

**PROMOTION**
- Promotion Key
- Promotion Code
- Promotion Name
- Promotion Type
- Discount Type
- Ad Type
Entity Relationship Modeling – 3NF

Dimensional Modeling – Star Schema

Data Driven (Supply)  Reporting Driven (Demand)

Design

Analysis

1st Generation Data Warehouse

Dimensional Data Warehouse

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Reporting-Driven Analysis

BI Stakeholders

Business Analyst

Interview notes
Report Specifications
Requirement Document

Data Modeler

Data Models
Database Schemas

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Reactive Data Warehouse Design


OLTP Design  OLTP Deployment  DATA  DW Design  DW Deployment
Proactive Data Warehouse Design
Data modeling is the act of exploring data-oriented structures. Evolutionary data modeling is data modeling performed in an iterative and incremental manner. Agile data modeling is evolutionary data modeling done in a collaborative manner.”

— Scott Ambler

www.agiledata.org
Why model collaboratively?
Why Model with BI Stakeholders?

- Identify the significant business events worth measuring
  *Scope and Prioritisation*

- Discover how business events are described
  *Dimensions*

- Determine how they are measured
  *Measures, Hierarchies, Comparisons, KPIs*

- Unearth budgets, forecasts, targets and other user-controlled data sources
  *Extra data, Common summarization levels: Physical Optimization*

- **Creates business ownership and pride in the DW design**
What

Techniques agile could help?
Techniques and Terminology

- **Scrum** – Project Management
  - ScrumMaster, Product Owner, Daily Scrum, Sprint, Product Backlog, Sprint Backlog, Burndown Chart

- **Extreme Programming (XP)** – Software Engineering
  - User Stories, Daily Stand-Up, Iteration, On-Site Customer, Pair Programming, Test-Driven Development (TDD), Continuous Integration
User Stories → Usage Requirements
Data Stories → Data Requirements
What kind of model can represent data stories?
What is a dimensional model, really?
How can you model data with business people?
Modelstorming: Data Modeling + Brainstorming

Quick

Inclusive

Interactive

Fun

Developers
Data Modeler
BI Stakeholders
BEAM

Business Event Analysis & Modeling
Using the 7Ws to tell Data Stories

- **Who**
- **What**
- **When**
- **Where**
- **How Many**
- **Why**
- **How**

• **Who does what?**
Using the 5Ws and 2Hs to tell Data Stories

- **Wie**
- **wat**
- **wanneer**
- **waar**
- **hoeveel**
- **waarom**
- **hoe**

**● Wie doet wat?**
1. Modelstorm a Business Event

**Who does what?**
(that we need to measure next)

Customer buys product

(Responsible) Subject Verb Object
Model it using a BEAM\textsuperscript{*} Table – an Example Data Model

<table>
<thead>
<tr>
<th>Subject Column Name</th>
<th>Verb</th>
<th>Object Column Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUSTOMER</td>
<td>buys</td>
<td>PRODUCT</td>
</tr>
<tr>
<td>[who]</td>
<td></td>
<td>[what]</td>
</tr>
</tbody>
</table>

Event Stories (4-6 rows)

Details

\textsuperscript{*} © Copyright Lawrence Corr 2012
When does a customer buy a product?
What do you call that date/time?
Example Stories

<table>
<thead>
<tr>
<th>CUSTOMER</th>
<th>PRODUCT</th>
<th>SALE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elvis Priestley</td>
<td>iPip Blue Suede</td>
<td>18-May-2011</td>
</tr>
<tr>
<td>Vespa Lynd</td>
<td>Book Air</td>
<td>29-Jun-2011</td>
</tr>
<tr>
<td>Elvis Priestley</td>
<td>iPip Blue Suede</td>
<td>18-May-2011</td>
</tr>
<tr>
<td>Phillip Swallow</td>
<td>iPOM Pro</td>
<td>14-Oct-2011</td>
</tr>
<tr>
<td>Unknown</td>
<td>iPip G1</td>
<td>10 Years Ago</td>
</tr>
<tr>
<td>US Senate</td>
<td>iPOM + Printer</td>
<td>Yesterday</td>
</tr>
<tr>
<td>US Senate</td>
<td>iPip Touch</td>
<td>Yesterday</td>
</tr>
</tbody>
</table>

Group Stories
CUSTOMER can be an organisation. PRODUCT can be a bundle of products

Missing Value Possible

MD: Mandatory Detail

Typical Event Story

Repeat of Typical Story used to discover what makes each story unique

Oldest Event Story
Deleted PRODUCT? Do we need to go back this far?

Most Recent Stories use Yesterday rather than date to show the urgency of the required data

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When

Are there any other dates/times closely associated with these stories?
Durations: Modeling with Timeline

- Fixed Milestone
- Variable Milestone
- Repeating Milestone

Order Date
Ship Date
Delivery Due Date
Delivery Date

Packing Time
Delivery Time
Delivery Delay

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Who

does a customer buy a product from?
Anyone else involved?
Adding a Second Who Detail

CUSTOMER | PRODUCT | SALE DATE
--- | --- | ---
Elvis Priestley | iPip Blue Suede | 18-May-2011
Vespa Lynd | POM Book Air | 29-Jun-2011
Elvis Priestley | iPip Blue Suede | 18-May-2011
Phillip Swallow | iPom Pro | 14-Oct-2011
Unknown | iPip G1 | 10 Years Ago
US Senate | iPom + Printer | Yesterday
US Senate | iPip Touch | Yesterday

SALESPERSON: James Bond, MD
SALESPERSON: N/A
SALESPERSON: James Bond
SALESPERSON: George Smiley
SALESPERSON: Capital Team

Event without a SALESPERSON is possible
SALESPERSON can be a group or team

New and old SALESPERSON

Second who detail

from Preposition
CUSTOMER buys PRODUCT (on SALE DATE) from SALESPERSON

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What else is involved?
Where does a customer buy a product?
Any other locations involved?
How Many?
Why does a customer buy a product on...?
How does a customer buy a product?
How do you know it happened?
How can you tell one story from another?
### Completed Event Table

#### CUSTOMER ORDERS [DE]

<table>
<thead>
<tr>
<th>CUSTOMER</th>
<th>PRODUCT</th>
<th>ORDER DATE</th>
<th>DELIVERY DATE</th>
<th>SALESPERSON</th>
<th>LOCATION</th>
<th>DELIVERY ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elvis Priestley</td>
<td>iPip Blue Suede</td>
<td>18-May-2011</td>
<td>22-May-2011</td>
<td>James Bond</td>
<td>POMStore NYC</td>
<td>Memphis, TN</td>
</tr>
<tr>
<td>Vespa Lynd</td>
<td>POMBook Air</td>
<td>29-Jun-2011</td>
<td>4-Jul-2011</td>
<td>N/A</td>
<td>store.POM.com</td>
<td>London UK</td>
</tr>
<tr>
<td>Elvis Priestley</td>
<td>iPip Blue Suede</td>
<td>18-May-2011</td>
<td>22-May-2011</td>
<td>James Bond</td>
<td>POMStore NYC</td>
<td>Memphis, TN</td>
</tr>
<tr>
<td>Phillip Swallow</td>
<td>iPOM Pro</td>
<td>14-Oct-2011</td>
<td>Not Applicable</td>
<td>George Smiley</td>
<td>POMStore London</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Unknown</td>
<td>iPip G1</td>
<td>10 Years Ago</td>
<td>Not Applicable</td>
<td>Unknown</td>
<td>Amazon.com</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>US Senate</td>
<td>iPOM + Printer</td>
<td>Yesterday</td>
<td>3 Days from now</td>
<td>Capital Team</td>
<td>1-800-MY-POM</td>
<td>Washington, DC</td>
</tr>
<tr>
<td>US Senate</td>
<td>iPip Touch</td>
<td>Yesterday</td>
<td>3 Days from now</td>
<td>Capital Team</td>
<td>1-800-MY-POM</td>
<td>Washington, DC</td>
</tr>
</tbody>
</table>

#### ORDER QUANTITY

<table>
<thead>
<tr>
<th>ORDER QUANTITY</th>
<th>REVENUE</th>
<th>PROMOTION</th>
<th>DISCOUNT</th>
<th>ORDER ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Retail Units]</td>
<td>[$, £, €, ¥]</td>
<td>[why]</td>
<td>[$, £, €, ¥, %]</td>
<td>[how] GD</td>
</tr>
<tr>
<td>1</td>
<td>$249</td>
<td>No Promotion</td>
<td>0</td>
<td>ORD1234</td>
</tr>
<tr>
<td>1</td>
<td>£1,400</td>
<td>Launch Event</td>
<td>10%</td>
<td>ORD007</td>
</tr>
<tr>
<td>1</td>
<td>$249</td>
<td>No Promotion</td>
<td>0</td>
<td>ORD4321</td>
</tr>
<tr>
<td>1</td>
<td>£2,500</td>
<td>Star Coupon</td>
<td>£150</td>
<td>ORD0001</td>
</tr>
<tr>
<td>50</td>
<td>$20,000</td>
<td>Trial Price</td>
<td>$2,500</td>
<td>ORD0012</td>
</tr>
<tr>
<td>100</td>
<td>$150,000</td>
<td>New Deal</td>
<td>$20,000</td>
<td>ORD5466</td>
</tr>
<tr>
<td>100</td>
<td>$25,000</td>
<td>New Deal</td>
<td>$1,000</td>
<td>ORD5466</td>
</tr>
</tbody>
</table>

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### Event Matrix: Data Modeling and Planning

#### Details/Dimensions (BEAM* Sequence)

<table>
<thead>
<tr>
<th>Event</th>
<th>Importance</th>
<th>Estimate</th>
<th>who</th>
<th>what</th>
<th>where</th>
<th>why &amp; how</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUFACTURING PLANS</td>
<td>2</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant builds Product</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BILL OF MATERIALS</td>
<td>2</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product made from Component</td>
<td></td>
<td>30</td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PURCHASE ORDERS</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee purchases Component</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPONENT DELIVERIES</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier delivers Component</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUPPLIER PAYMENTS</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee pays Supplier</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPONENT INVENTORY LEVELS</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant stocks Component</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QA TESTS</td>
<td>6</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee tests Product</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANUFACTURING PROCESSES</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant runs Process</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRODUCT INVENTORY LEVELS</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warehouse stocks Products</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAREHOUSE SHIPMENTS</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier ships Product</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Departments/Groups

- **Marketing**
- **Finance**
- **Product Development**
- **Manufacturing**
- **Sales**

- **Employee**
- **Supervisor**
- **Reseller**
- **Carrier**
- **Component**
- **Product**
- **Process**
- **Test**
- **Warehouse**
- **Store**
- **Contract**
- **Ship Mode**
- **PO**

- **Event Owner**
- **Interested Stakeholder**

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Business Models

- A business model describes the rationale of how an organization creates, delivers and captures value.
  
  – Alexander Osterwalder, Business Model Generation

- We define “business model” as the logic by which an enterprise sustains itself financially.
  
  – Tim Clark, Business Model You
Key Partners

Who are our Key Partners?
Who are our key suppliers?
Which Key Resources are we acquiring from partners?
Which Key Activities do partners perform?

Key Activities

When do we perform Key Activities?
Why do we perform Key Activities?
What are the Key Activities we perform?
Which Key Activities are most expensive?

Value Propositions

What value do we deliver to our customer?
What are the Key Activities inherent in our Value Propositions?
Which one of our Key Activities is most expensive?
Which Key Activities do our Value Propositions require?

Customer Relationships

What type of relationship does each of our Customer Segments seek?
Which one of our Key Relationships are most expensive?
Which ones have we established?
Which ones work best?

Customer Segments

Who are our key suppliers?
Which Key Resources are we acquiring from partners?
Who are our key suppliers?
Star Schema Layout

When
- Date/Month/Period
- Time
- Location/Store/Hospital

How
- Transaction Type/Method
- Event/Fact
- Promotion/Reason

Who
- Customer
- Employee/Organisation

Where
- When
- Where
- Time

What
- How Many
- Why

Why
- When
- Who
- What
### The BI Model Canvas

<table>
<thead>
<tr>
<th><strong>When</strong></th>
<th><strong>How</strong></th>
<th><strong>Who</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>When does it happen?</td>
<td>How does it happen?</td>
<td>Who does what? How do we organize them?</td>
</tr>
<tr>
<td>Date</td>
<td>How do we know it happened?</td>
<td>How do they change? Who else is involved?</td>
</tr>
<tr>
<td>Time</td>
<td>How do we uniquely identify a fact/event?</td>
<td>Customer: Business, Consumer, Segment</td>
</tr>
<tr>
<td>Time Zone</td>
<td>Activity, Process, Event</td>
<td>Employee</td>
</tr>
<tr>
<td>Period</td>
<td>Effect, Outcome</td>
<td>Supplier</td>
</tr>
<tr>
<td>Timeline: Milestones</td>
<td>Transaction Type</td>
<td>Partner</td>
</tr>
<tr>
<td></td>
<td>Transaction # [Degenerate Dimension]</td>
<td>Third Party</td>
</tr>
<tr>
<td></td>
<td>Step #</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Granularity, Event Type: Discrete, Evolving, or Recurring]</td>
<td></td>
</tr>
</tbody>
</table>

### How Many

<table>
<thead>
<tr>
<th><strong>How Many</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>How many/much is involved? How long does it take?</td>
</tr>
<tr>
<td>Revenues</td>
</tr>
<tr>
<td>Costs</td>
</tr>
<tr>
<td>Quantities, Balances</td>
</tr>
<tr>
<td>Activity/Status Counts</td>
</tr>
<tr>
<td>Durations</td>
</tr>
<tr>
<td>[UoM, Fact Type: Fully Additive, Semi-Additive, Non-Additive]</td>
</tr>
</tbody>
</table>

### Where

<table>
<thead>
<tr>
<th><strong>Where</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Where does it happen? Where does it refer to?</td>
</tr>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Branch, Store, Facility, Channel</td>
</tr>
<tr>
<td>URL</td>
</tr>
<tr>
<td>Map: Start, Previous, Current, Next, Last</td>
</tr>
</tbody>
</table>

### What

<table>
<thead>
<tr>
<th><strong>What</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What is involved/used? How are they organized?</td>
</tr>
<tr>
<td>Value Proposition</td>
</tr>
<tr>
<td>Product</td>
</tr>
<tr>
<td>Service</td>
</tr>
<tr>
<td>Resource</td>
</tr>
</tbody>
</table>

### Why

<table>
<thead>
<tr>
<th><strong>Why</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Why does it happen? Can it be different? If so, why?</td>
</tr>
<tr>
<td>Cause, Reason</td>
</tr>
<tr>
<td>Promotion, Deal</td>
</tr>
</tbody>
</table>

---

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<table>
<thead>
<tr>
<th><strong>Key Resources</strong> (location-based)</th>
<th><strong>Key Activities</strong></th>
<th><strong>Key Partnerships</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channels</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cost Structures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Revenue Streams</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Customer Relationships</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Customer Segments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Segments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Channels</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Revenues</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quantities, Balances</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity/Status Counts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Durations</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Customer**                     |                   |                     |
| **Partnerships**                 |                   |                     |
| **Key**                          |                   |                     |
| **Resources**                    |                   |                     |
| **(human)**                      |                   |                     |
| **(other)**                      |                   |                     |

| **Who**                          |                   |                     |
| **When**                         |                   |                     |
| **Where**                        |                   |                     |
| **Why**                          |                   |                     |
| **How**                          |                   |                     |

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If you have been affected by any of the issues raised in this presentation:
Agile Data Warehouse Design
Collaborative Dimensional Modeling, from Whiteboard to Star Schema
Lawrence Corr with Jim Stagnitto

Agile Data Warehouse Design
Lawrence Corr, Jim Stagnitto,
Decision Press, November 2011
Online

- decisionone.co.uk and agiledw.info – Agile data warehouse design resources include BEAM tools, templates, reference card and links to books and articles

- Lawrence Corr: Lcorr@decisionone.co.uk

- @LawrenceCorr

- Connect with me, if you read ADWD (and you like it)
MODELSTORM: Don’t model alone! Model with examples!
Agile Data Warehouse Design Course

with Lawrence Corr

15-17 April, Utrecht