


Integrating Sustainability Plan (FC-301)

Instructor: Mary Sweeney – Adjunct faculty
Course: BusIT 202 Dimensional Modeling (4658B233)

Contents

Overview	2
Personal Sustainability Teaching Mission Statement	2
Sustainability Incorporation into IBIT curricula	2
Teaching Portfolio	2
Sustainability Outcomes Map	3
Impacted Modules: Modules 1, 8, 9	3
Module 1 modification: Teaching plan:	4
Assignment for Module 1 excerpt (highlights added for clarity)	4
Module 8 modification; Teaching plan:	5
Assignment for Module 8: Research paper	5
Module 9 Modification; Teaching plan	6
Assignment for Module 9 Take Home Quiz	6
Course Sample databases modification: Teaching plan	6
Appendix A – Resource Sharing	8
Appendix B Interview with Professor Vedat Diker, University of Maryland.....	10
Interview with Vedat Diker, Professor, University of Maryland	10
Appendix C – Updated course syllabus.....	12
Course Syllabus	12
BusIT 202 Dimensional Modeling 	12
Students will learn to:	13

Overview

In January 2013, I participated in a Sustainability Workshop in which I agreed to learn about the importance of integrating sustainability awareness into multi-discipline curriculums, and to incorporate this awareness in multiple ways into a single course. The course I chose was the one I was teaching that specific quarter, BUSIT 202, Dimensional Modeling. The journey has been fascinating and during the course of the time allowed for this project, I have learned a lot and believe I have successfully and smoothly integrated some very important topics into this course. I encourage other professors in my discipline to consider it their responsibility and goal to incorporate these important concepts in some way into their own courses. I truly hope my experience helps light the way for others in this effort, as I was also helped by others including the capable workshop facilitators, Deric Gruen, Marika, and Lisa Harris, the speakers that participated in the workshop, and most especially by Professor Vedat Diker, University of Maryland.

Personal Sustainability Teaching Mission Statement

Given that:

- Sustainability in the information systems and IT industry is critical as part of the global fabric in which we all live,
- The college students we teach today are the stewards of our systems and planet today and tomorrow,

I pledge to incorporate applicable sustainability whenever and wherever possible into the courses I teach, and to constantly be on the lookout and open to more teaching opportunities for these important concepts.

Sustainability Incorporation into IBIT curricula

While at first glance it may seem a challenge to incorporate Sustainability concepts into a technical curriculum, I have found through research, study, interviews and a great deal of thought, that there are many ways to incorporate these concepts. In fact, I believe it is our duty and responsibility as technical faculty to understand and promote the sustainability agenda in all applicable areas. Particularly in design courses, such as BUSIT 202, Dimensional Modeling, where we can influence the efficient and effective use of many kinds of resources, including personnel and hardware usage, through promotion of good, thoughtful design technique. I encourage all IBIT and computer-related discipline faculty members to peruse the resources I have listed in the [Appendix](#). Following those resources leads to many other related resources and surely there technical faculty will find ones that will be specific and helpful to any course taught.

Teaching Portfolio

The following teaching portfolio outlines how I have updated the course to be sustainability-related. It includes:

- a [mapping of sustainability outcomes](#) to the course learning outcomes,
- a short explanation of teaching strategies for the [impacted modules](#)
- the [assignments](#) that I have updated with the outcome, description and assessment
- copy of the updated syllabus in [Appendix C](#)

Sustainability Outcomes Map

#	Sustainability Outcome	Current Outcome	New or Modified outcome for sustainability	Modules directly Impacted
1	Demonstrate connections between a student's chosen course of study and sustainability.	Describe the <u>components</u> of a data warehouse	Describe multiple resources that a solid, robust, efficient design for a data warehouse impacts or saves	8
2	Demonstrate technical skills and expertise necessary to implement sustainable solutions in solving problems related to the course.	Describe the <u>goals</u> of a data warehouse	Identify techniques for designing sustainable data warehouses, i.e., the benefits and cost trade-offs for reuse of structures (such as conformed dimensions)	1, 9
3	Explain how sustainable thinking and decision-making contribute to solutions for current and emerging social, environmental and economic crises.	Apply design principles to new situations	Identify multiple ways that dimensional modeling principles design for growth and how this will impact long term resource usage	8
4	Apply practical solutions to real-world sustainability challenges	Develop design principles based on the problems identified in the case studies	Identify the benefits (cost and otherwise) of designing reusable structures for data warehouses	9

These concepts are now covered throughout the course, i.e., integrated into the ideas of good design that we already promote. During lecture and discussion, I will draw specific lines to the long term benefits of good design showing how it promotes efficient use of resources and systems design to last which saves redoing and unnecessary update projects.

Impacted Modules: Modules 1, 8, 9, and course example database

The following table shows the modules directly impacted in **red**. Other modules are less directly impacted but will use the updated course example and these are Modules 2-5 and are highlighted in **blue** below.

Assignment Week	Topics	Reading
1	Introduction to Dimensional Modeling – Reach for the Stars	Chapter 1
2	The Design Process – Watch out for Snowflakes	Chapter 2
3	Snapshots – Inventory Application	Chapter 3
4	Changing Dimensions – Procurement Application	Chapter 4
5	More on Dimensions: Junk Dimensions, Degenerate Dimensions ... - Order Management Application	Chapter 5
6	Changing Monster Dimensions - Customer Relationship Management	Chapter 6
7	Factless Fact Tables - Education	Chapter 12
8	Multi-valued Dimensions - Health Care Application	Chapter 13
9,10	Data Warehouse Architecture/ Wrapping it Up	

Module 1 modification: Teaching plan:

Updated the module's "Goals of the data warehouse" to incorporate sustainability related goals. The assignment asks students to evaluate an existing data warehouse that has been updated with new sustainability related structures. This opens up good discussion on what the goals of a data warehouse should be and the opportunity to infuse this lesson with the importance of creating sustainable, efficient data warehouses that consider resource usage at all stages within the design.

Module update:

What are the goals of a data warehouse? These goals are taken from Kimball with some addition for considerations of sustainability in our design considerations:

- The data warehouse must make an organization's information easily accessible.
- The data warehouse must present the organization's information consistently.
- **The data warehouse must be adaptive and resilient to change.**
- The data warehouse must be a secure bastion that protects our information assets.
- The data warehouse must serve as the foundation for improved decision making.
- The business community must accept the data warehouse if it is to be deemed successful.
- **The data warehouse must be designed with sustainability in mind – systems should be designed for efficiency, designed to last, and to consider conservation of resources. This should be from the stand point of cost efficiency for the business as well as efficiency industry-wide.**

Assignment for Module 1 excerpt (highlights added for clarity)

- Recall that an operational database has different goals than the data warehouse. What are the goals Kimball specifies for operational databases? Recall the goals written in our module introduction (repeated here):

What are the goals of a data warehouse? These goals are taken from Kimball with some addition for considerations of sustainability in our design considerations:

- The data warehouse must make an organization's information easily accessible.
- The data warehouse must present the organization's information consistently.
- **The data warehouse must be adaptive and resilient to change.**

- The data warehouse must be a secure bastion that protects our information assets.
 - The data warehouse must serve as the foundation for improved decision making.
 - The business community must accept the data warehouse if it is to be deemed successful.
 - The data warehouse must be designed with sustainability in mind – systems should be designed for efficiency, designed to last, and to consider conservation of resources. This should be from the stand point of cost efficiency for the business as well as efficiency industry-wide.
- Write a short paragraph describing what you believe are the goals of the operational Northwind database and how this design in the above diagram meets (or attempts to meet) these goals.
- Imagine that you are a data warehouse designer and are interested in helping transform the data into a state that will allow analytics of the Northwind data. Review the goals of a Data Warehouse listed above and from the first chapter of our text. **Please list 3 transformations of this data that you believe would be useful in a Northwind Datawarehouse.** For example: flatten Products and Categories into a single dimension table.
- **Post your work in the Module 1 Intro to Dimensional Modeling discussion.**

Outcome mapping(s):

- [Sustainability Outcome #2](#)

Assessment

By graded discussion

Module 8 modification; Teaching plan:

This module explores actual data warehousing by presenting health care systems and some specific design and modeling techniques for this type of data warehouse. Within this module the instructor presents and discusses case studies of both poor and robust designs during the lecture. Case study examples are presented in document format as well (I can provide two of these upon request). Students are then asked to write a research paper on an existing or recent health care system. They will review the design in light of Kimball's design techniques and provide an analysis of how the system performs with sustainability in mind as well.

Assignment for Module 8: Research paper

- 1) **Research the importance of dimensional modeling in promoting sustainable, efficient data warehouse systems.** It can be argued that sustainable systems can be built by using thoughtful efficient design. This topic is important in our industry: how can we build systems that last? Our dimensional modeling course has provided some great design basics. How do these help design cost efficient, sustainable data warehouses that grow with an organization and promote resource stability?

Details

- Write a 4-5 page paper on relationship between good dimensional modeling practices and effective, efficient sustainable data warehouse systems. Your paper should include:
 - A listing of multiple and specific techniques learned in this course and how each of those you choose supports sustainable, efficient, effective systems built to last
 - An in-depth discussion of how poor design (lack of dimensional modeling) adversely impacts organizations
 - Examples of systems that are poorly designed and examples of systems that are well-designed. If you can find detailed examples, that's great, but high level descriptions are also acceptable as long as they are real and you must provide references.

Outcome mapping(s):

- [Sustainability outcome #1](#)
- [Sustainability outcome #3](#)

Assessment

Instructor grades assignment via rubric on key required elements.

Module 9 Modification; Teaching plan

The final module is a comprehensive module in which the instructor reviews key points from the course in preparation for the course take home quiz. During the review, the instructor includes the sustainability discussions that have been presented throughout the course. The assignment includes a question that all students must address (see Assignment for Module 9 below).

Assignment for Module 9 Take Home Quiz

Take home quiz question (excerpted from the full take home quiz):

1. *Describe ways in which dimensional modeling techniques support resource and cost efficiency in an organization.*

Outcome mapping(s):

- [Sustainability outcome 2](#)
- [Sustainability outcome 4](#)

Assessment

Instructor grades assignment via rubric on key required elements.

Course Sample databases modification: Teaching plan

The course sample databases are updated to include a structure tracking reuse and recycling within a retail organization. Most course modules are impacted by this change to the existing sample databases

since these are used in most of the exercises – all of them up to module 5 use these same sample databases. This update to the sample database provides:

1. Opportunities to discuss key sustainability concepts to prepare students for the take-home quiz and research paper options
2. Present students with a database that includes thought for sustainability, unlike any other databases that are used in standard technology courses.

Outcome mapping(s):

- [Sustainability outcome #1](#)
- [Sustainability outcome #3](#)
- [Sustainability outcome 2](#)
- [Sustainability outcome 4](#)

Assessment

Assessment by graded discussion and also from Take Home quiz and Research paper (see assignments discussed above).

Appendix A – Resource Sharing

Resources key:

1. Title
2. Type
3. Related disciplines
4. Description
5. Location

First Resource:

1. Sustainable Computing Journal/website
2. Webpage
3. Computer Science, Information Systems, Technical disciplines
4. Excellent clearing house for new books and articles on this emerging topic in the industry
5. <http://www.journals.elsevier.com/sustainable-computing/>

2nd Resource:

1. Earthcare website: “building a smaller technology footprint”
2. Webpage
3. Computer Science, Information Systems, Technical disciplines
4. Information on Sustainable Green Computing - statistics and facts; lots of links to other green computing links
5. <http://www.earthcaretech.com.au/>

3rd Resource:

1. Green computing information
2. Article
3. Computer Science, Information Systems, Technical disciplines
4. Great basic article on Green computing that includes good information plus many great leads for teaching in the reference section
5. http://en.wikipedia.org/wiki/Green_computing

4th Resource

1. Developing a Sustainable IT Capability: Lessons from Intel’s journey
2. Article
3. Computer Science, Information Systems, Technical disciplines
4. Recent article by Intel on their experiences setting and obtaining a goal to reduce its global greenhouse gas footprint by 20% from 2007 to 2012. Inspiring.
5. http://www.edwardcurry.org/publications/MISQE_SustainableIT_Intel_2012.pdf

5th Resource

1. Student blog from MBA Candidates from IE Business School in Madrid. Others are welcome to join. Encourage students to blog on continuing experiences in Green computing, design, etc.
2. **Blog**
3. Computer Science, Information Systems, Technical disciplines
4. This is an area where students can read and share with others and that provides great insight by fellow students
5. <http://ygreenit.wordpress.com/>

Appendix B Interview with Professor Vedat Diker, University of Maryland

Special thanks to Professor Vedat Diker, University of Maryland, for my enlightening interview and for his mentoring on this project.

Friday, April 12, 2013

Interview with Vedat Diker, Professor, University of Maryland

Discipline: Information management

Course: [INFM 718 Organizational and Business Process Modeling](#)

This morning I had a very informative and enlightening interview with Professor Vedat Diker from the University of Maryland.

The following are some of the key points from my discussion with Professor Diker.

Professor Diker teaches Information Management courses. The course he updated with sustainability concepts is his “Organizational and Business Modeling” course, one that is not far in concept from the one I am updating! The history of his involvement started with the [Chesapeake Project](#) from the Sustainability Institute, which was begun in 2009. In May of 2010, faculty members from both the tenured and non-tenured tracks at the University of Maryland gathered for a two-day workshop. Faculty members from many disciplines were involved: philosophy, economics, life sciences, etc. They were asked to revise at least one of their courses to include sustainability concepts as a result. (This sounds very much like what we’re doing!)

Professor Diker modified his course as a result and first taught it in the fall of 2010. He has taught it three times since. Professor Diker decided first to modify his course for sustainability by incorporating sustainability-related examples of systems to model instead of the standard business systems used for most modeling courses. The first example he chose was to ask students to consider the study done in the National Parks regarding the growth and decline of deer within the National Parks. In this study the desire was to increase the deer population in National Parks so the approach taken was to kill all predators and thus the expected result was an increase in deer population. This approach had catastrophic effects: over-population of deer resulting in starvation and the decimation of vegetation. Overall the deer populations suffered as a result instead of increasing. Students were given this example and other sustainability related examples. They were asked to use this as a way to look at the history of systems and try to learn over time then build models with test scenarios prior to building systems.

Professor Diker also encouraged students to pick course projects that were sustainability-related. One recent student project that Professor Diker coached involved how Cloud computing may or may not help with energy consumption within business systems, i.e., does Cloud technology help or hurt energy consumption? An excellent thought, in my opinion, and something we don’t often look at in our field:

how our new technology ideas impact sustainability and resource consumption issues prior to our actually incorporating them!

There were some concerns Professor Diker had that mirrored my own initial concerns. First, was wondering how to incorporate sustainability concepts into such a non-traditional discipline as our. He answered this by taking a wider lens than perhaps some of the more directly related disciplines, such as within the Life Sciences, may have taken. He talked to them about financial sustainability, for example, within families, within economies (used housing bubble and collapse as one example). He emphasized to students that sustainability is not just about the environment and that all these systems are connected.

Professor Diker's second concern was that students in our technology fields sometimes have a narrow focus. He wondered if students would be able to relate to these concepts and whether they might feel alienated to these discussions since they may be somewhat controversial. Instead he found that students accepted this well and are in fact used to having these discussions. He felt that overall students accepted these course modifications quite easily.

Professor Diker left me with some final thoughts that I found very helpful and relevant. He said that it is not just the students that we need to "sell" these concepts too but also colleagues within our field. Our colleagues, just like us initially, will not necessarily consider their field to be connected. They are often stuck on thinking that sustainability is only a concept that is relevant to ecology related disciplines. Finally, even our non-technology colleagues need to be encouraged to take a wider lens, and realize that these concepts can be related at many different levels of the students lives and not just recycling and reuse. They must also promote this wider view to their students as well, as we have had to, in order to see the interconnectedness of these concepts to all disciplines.

As good as his word, Professor Diker was more than willing to help a colleague here in the Pacific Northwest by this interview, to see how we can stretch to include these important ideas in more courses within our related disciplines. I was honored to speak with him on his experiences, he is a trail-blazer within our discipline for these efforts: his, in fact, was the only course I found remotely related to what I am trying to do! This interview has given me many more ideas for the final push to update my Dimensional Modeling course.

Thank you to Professor Diker for his help!

Appendix C – Updated course syllabus

Course Syllabus

BELLEVUE COLLEGE

[BusIT 202 Dimensional Modeling](#)

- INSTRUCTOR: Mary Sweeney
- E-MAIL: mary.sweeney@bellevuecollege.edu

TEXTBOOKS:

Required:

The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling, Second Edition

Ralph Kimball and Margy Ross, Wiley, ISBN 0-471-20024-7

Available on books

24x7:<http://library.books24x7.com.ezproxy.bellevuecollege.edu/toc.aspx?bookid=6694>

Recommended, optional reading (not available on books 24x7):

Pro SQL Server 2012 BI Solutions

Randal Root and Caryn, **September 12, 2012** | ISBN-10: **1430234881** | ISBN-13: **978-1430234883** | Edition: **1**

http://www.amazon.com/Server-2012-Solutions-Professional-Apress/dp/1430234881/ref=sr_1_1?s=books&ie=UTF8&qid=1356238104&sr=1-1&keywords=Pro+SQL+Server+2012+BI+Solutions

REQUIRED SOFTWARE:

Microsoft SQL Server 2012 (recommended edition: Developer)

- our course Module 0 contains all the instructions for obtaining and installing this software.

PURPOSE OF COURSE:

Dimensional modeling has been broadly accepted as one of the principle techniques for effective design of data warehouses and data marts. This course focuses, not on design of operational databases, but rather on effective design of databases used for analytic purposes. When a database is used for analysis rather than data collection, the principles for effective design change significantly. No longer are we concerned with data normalization. Rather, we are concerned with the ease of extracting information. A poorly designed data warehouse leaves an organization without the core foundation for its business intelligence efforts. A well-designed data warehouse provides the basis for strong analytic applications to support the mission and strategy of the organization. In this course, students learn how to design effective and efficient data warehouses using the principles of dimensional design.

Note: Since this is a design/modeling course we will focus on planning, analysis and development of a robust dimensional model for our clients. In data warehouse development in the real world there are frequently tight deadlines and time for thorough modeling often gets lost as developers move too quickly to implementation. This course will intentionally focus

less on implementation of a data warehouse in a specific software system and more on the design and analysis phases. However, we will still find that being able to see the implementation makes the design become more concrete so we will try to strike a good balance between focusing on the design without becoming too bogged down in the technical details of specific systems.

Students will learn to:

- Describe the goals of a data warehouse
 - Identify techniques for designing sustainable data warehouses, ie., the benefits and cost trade-offs for reuse of structures
- Describe the components of a data warehouse
 - Describe multiple resources that a solid, robust, efficient design for a data warehouse impacts or saves
- Explain the importance of dimensional modeling for a data warehouse
- Design Fact and Dimension tables
- Using a series of Case Studies, identify the probable set of dimensional modeling problems that occur in organizations
- Develop design principles based on the problems identified in the case studies
 - Identify the benefits of designing reusable structures for data warehouses
- Apply design principles to new situations
 - Identify multiple ways that dimensional modeling principles design for growth and how this will impact long term resource usage

ASSIGNMENTS:

- There will be 7-10 assignments during the course of the quarter. Each assignment will be worth 10 - 100 points depending upon complexity. Instructor reserves the right to modify/remove and, rarely, add additional assignments as the course progresses up to the maximum of 10. This will be done with sufficient notice to students, ie., at least a week.
- **Assignments are due as indicated on the course calendar. Unless you make arrangements with the instructor prior to the assignment due date, late assignments will receive a 5-point per day deduction for each day late up to 2 days. Projects will not be accepted more than 2 days after the due date.**
- It is essential to begin each course module as soon as it is posted so that you have ample time to complete each assignment and to get any questions you may have answered. Please note that the instructor may not be available to help with assignments at the last minute so please try to plan ahead.
- Each course module and assignment will be posted the morning after the prior assignment is due.
- All assignments must be completed prior to the final review assignment.

TECHNICAL HELP

- The Computer Lab on campus is in building N Room 250 (N250). You can find hours, location and updates about the computer lab, as well as links and the phone number for the Help Desk at the following link: <http://depts.bellevuecollege.edu/helpdesk/kb/n250-open-lab-hours/>
- All the required software for the course is located on multiple computers in N250, so if you have trouble getting software installed in a timely fashion and you can get to campus you can use these computers to do assignments

EXAMINATIONS:

There will be no official examinations in this course. Grades will be based upon assignments. Note: The last assignment is a quiz that does include examination-style review questions requiring study of the course materials. This quiz will be "take home" and you will have ample time to work on it.

CLASS PARTICIPATION:

Students are expected to participate actively in class discussions and projects.

GRADING:

Grades will be calculated as follows:

- 96% - 100% = A (4.0)
- 92% - 95.9% = A- (3.7)
- 88% - 91.9% = B+ (3.3)
- 84% - 87.9% = B (3.0)
- 80% - 83.9% = B- (2.7)
- 76% - 79.9% = C+ (2.3)
- 72% - 75.9% = C (2.0)
- 70% - 71.9% = C- (1.7)
- 66% - 69.9% = D+ (1.3)
- 60% - 65.9% = D (1.0)
- BELOW 60% = F (0.0)

Note: There are no "Z" grades anymore so students who do not complete the course will receive an "F".

WITHDRAWAL:

Each student is to be familiar with the college withdrawal schedule. Students who do not officially withdraw will receive a grade calculated on the work they had completed.

Be mindful of enrollment calendar deadlines: <http://bellevuecollege.edu/enrollment/calendar/deadlines/>

Required reading Assignments in the course text "*The Data Warehouse Toolkit*":

Assignment Week	Topics	Reading
1	Introduction to Dimensional Modeling – Reach for the Stars	Chapter 1
2	The Design Process – Watch out for Snowflakes	Chapter 2
3	Snapshots – Inventory Application	Chapter 3
4	Changing Dimensions – Procurement Application	Chapter 4
5	More on Dimensions: Junk Dimensions, Degenerate Dimensions ... - Order Management Application	Chapter 5
6	Changing Monster Dimensions - Customer Relationship Management	Chapter 6
7	Factless Fact Tables - Education	Chapter 12
8	Multi-valued Dimensions - Health Care Application	Chapter 13
9,10	Data Warehouse Architecture/ Wrapping it Up	

Students are responsible for understanding the material covered in the reading assignments and to be able to use the knowledge gained within the module assignments and in participation in course discussion.

NOTE: In addition the instructor will assign websites and other resources to complement the required text reading.