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DAMA Foundation Model Curriculum Framework for Post Secondary Education Programs in Data Resource Management

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Abstract: Over the years, many curricula have been developed for various information and computing disciplines. However, the majority of these documents have concentrated on technologies and products – not on the concepts of data and information as a resource to be managed. Emerging international law on acceptable information handling make the case for better basic education in data resource management. The lack of attention to the information asset has been cited as one reason for a lack of understanding of the value of an organization's data to the overall performance of the company. With the development of a curriculum framework for the Data Management professional, the Data Management Association (DAMA) hopes to increase the awareness of the importance of data and information as valuable, manageable resources. Courses and programs developed around this framework may serve as a foundational education for certification as a Data Management Professional (CDMP) and other formal certifications.

Keywords: DAMA, data resource management, model curriculum, data management curriculum, curriculum framework, information resource management, education

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DAMA Foundation
Model Curriculum Framework for
Post Secondary Education Programs in
Data Resource Management

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Abstract

Over the years, many curricula have been developed for various information and computing disciplines. However, the majority of these documents have concentrated on technologies and products – not on the concepts of data and information as a resource to be managed. Emerging international law on acceptable information handling makes the case for better basic education in data resource management. The lack of attention to the information asset has been

cited as one reason for a lack of understanding of the value of an organization's data to the overall performance of the company. With the development of a curriculum framework for the Data Management professional, the Data Management Association (DAMA) hopes to increase the awareness of the importance of data and information as valuable, manageable resources. Courses and programs developed around this framework may serve as a foundational education for certification as a Data Management Professional (CDMP) and other formal certifications. This presentation will explain the recommended Curriculum Model for Post-secondary Institutions that has been developed by a committee of academics and professionals from DAMA. The presentation will also outline the concepts that are essential for developing a competency and certification in DRM, so that attendees will have an understanding of the curriculum's foundations and approach. There will be a discussion period on the curriculum framework, curricula and approaches to its implementation at various institutions. This paper presents: (1) The major academic concepts of a DRM curriculum framework. (2) The various approaches to delivery of those concepts in North American institutions of higher education. (3) The outline of the recommended DRM curriculum. (4) Planned enhancements and implementation strategies of the curriculum framework. (5) The role of the curriculum framework in the CDMP (Certified Data Management Professional) program in the ICCP. (6) Supporting initiatives underway at various North American institutions.

Keywords: data management curriculum, curriculum framework, data management, information resource management, data resource management, education

1. FOREWORD

Curriculum Feedback Encouraged

The DAMA International Foundation welcomes feedback on this Model Curriculum Framework for Data Resource Management, as revisions will occur in the future. We encourage you to let us know how you are using these materials and how they might be improved. Your comments can be sent to the Vice President of Education, VP_Education_Services@DAMA.org.

Executive Summary

Over the years, many curricula have been developed for various information and computing disciplines. However, the majority of these documents have concentrated on technologies and products – not on the concepts of data and information as a resource to be managed. The lack of attention to the information asset has been cited as one reason for a lack of understanding of the value of an organization's data to the overall performance of the company.

With this model curriculum framework for the Information Resource Management/Data Resource Management professional, the DAMAI Foundation hopes to increase the awareness of the importance of data and information as valuable, manageable resources, and to reduce the redundancy of data and it misuse by business and technical professionals.

This curriculum framework can be implemented in any North American educational institution, from certificate programs, through associate degree programs (2-year colleges), bachelor and master's degree programs (colleges and universities). This document presents an outline of the concepts that are essential for developing a competency in DRM, and offers some career and directional advice to students of DRM programs. The content of this curriculum framework is aligned with the ICCP's Data Management examination, and can be used as an educational source for those preparing to take this examination.

Modern organizations recognize the need to maintain and manage data as an organizational asset. They also recognize the need for today's managers to be well versed in information resources management. This document details an international data resources management curriculum framework for various DRM-oriented programs specifically designed to meet the needs of information resource management and data resource management professionals. The curriculum framework provides a model for individual colleges and universities to tailor to their particular structure. This curriculum model prepares students to understand the concepts of data resource management and the technologies, methods, and related pro-

cedures used to collect, analyze and disseminate information throughout organizations. This curriculum model outlines core course concepts, rationales, and objectives. It does not include suggested specific course topics since each institution may want to implement these concepts differently.

This Curriculum Model addresses the needs of two distinct sets of learners:

1) Students currently employed or seeking employment in the DRM field

2) All business students

Although the DRM student needs depth to understand the nuances of DRM, all business students require an understanding of how data and information management affects their job, the jobs of other managers, and the entire organization.

History of this Curriculum Framework

The DAMAI Curriculum Model presented here is a revision of several years of extensive research and efforts by a DAMAI International Task Force on DRM Curriculum framework. This Task Force was transferred to the newly established DAMA International Foundation in 2004.

Initially, this curriculum framework was a joint effort between DAMAI and the Information Resource Management Association (IRMA), begun in October 1994. A second revision began in 1998 when members of the current task force were invited to bring the curriculum model up to date. The curriculum model from the second revision was adopted at the IRMA International Conference in Anchorage, Alaska in 2000. The joint effort was disbanded in January 2004. DAMAI Foundation assumes sole responsibility for this 2005 DAMA Curriculum Framework.

Relationship to Other IS Curricula

The 2004 DAMA Curriculum Framework is a major revision by DAMAI Foundation alone, to address the specific needs of the Data Management profession, and should be considered separately from any prior and jointly issued versions of a DRM curriculum framework.

There are various well known IS model curricula that incorporate some DRM concepts.

In general, the data/information management focus of these curricula is not as broad or deep as DRM students and professionals require or the emphasis is primarily on the development and implementation of databases.

The basis for curricula comparison is the fourteen topic clusters recommended in this DRM curriculum. These topics track the data oriented exams that are part of DAMA International's Certified Data Management Professional (CDMP). DAMA International and the Institute for Certification of Computing Professionals (ICCP) jointly developed the data-oriented exams for the CDMP as both the curriculum and professional certification development efforts were going on concurrently and synergistically:

•   The Environment for Managing Data as a Resource

•   Data Resource Management Overview

•   Planning for Data and Metadata

•   Data Requirements Analysis and Documentation

•   Data Models and Modeling

•   Relational Data Model

•   Data Storage Management

•   Data Access and Database Programming

•   Data Warehousing

•   Data / Metadata Infrastructure Management

•   Information and Data Security

•   Data Quality Management

•   Data Reliability

•   Information Systems Project Management

The selected IS model curricula include the:

•   Database Curriculum by Blesa et al., (1999). A team of Spanish University professors developed this curriculum to define the content of database courses in the University. Six courses were proposed that focus on the creation, development and implementation of databases.

•   Information Systems-Centric Curriculum '99 developed by a collaborative Aca-

deme/Industry Task Force (www.iscc.unomaha.edu) – The task force members developed a "Profile of the Graduate" to describe the skills (technical and personal skills, and personal attributes) and knowledge they wanted in a new IS hire. This became the basis for the curriculum, which has thirteen courses including a comprehensive collaborative project. There is one course devoted to information databases, and one other course that includes the development of data structures topics among other topics.

- Information Systems (IS) 2002 Model Curriculum developed by Gorgone, Davis, Valacich, Topi, Feinstein and Longenecker – This model curriculum is an update of the IS '97 Model Curriculum by Davis, Gorgone, Couger, Feinstein, and Longenecker. Both are available at www.aisnet.org/curriculum/. The individuals involved in both efforts are members of the Association for Information Systems (AIS), Association of Computing Machinery (ACM) and Association of Information Technology Professionals (AITP). The revised IS 2002 curriculum framework is directed toward a broad audience, for all information systems and information technology professionals. There is one course that focuses on the physical design and implementation of information systems applications within a database management system, and a project management course.

- MSIS 2000 developed by Gorgone and Gray, AIS and ACM (www.aisnet.org/curriculum/) - This graduate MS model curriculum has five recommended IS Core courses. There is one course in data management, one course in analysis, modeling and design that could include data and other topics, and one course for project/change management. The focus of this curriculum is more technical than business or management oriented.

The recommended topic clusters are detailed in this report (see Section 10 and Appendix A). This type of detail is not covered in other model curricula, and is based on the input of both DRM industry practitioners and academics. Our hope is that schools designing or revising their curricula for DRM will use

and benefit from this curriculum as well as other complementary curriculum models.
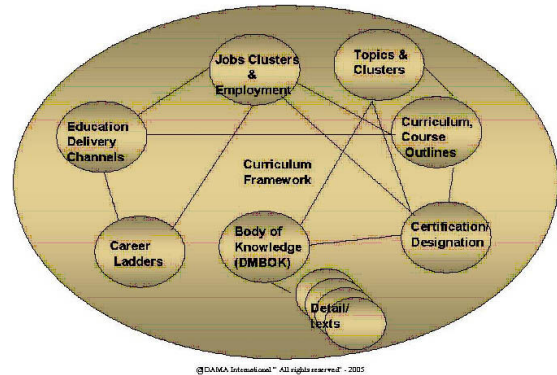
Fig. 1 Diagram of the DAMA International Curriculum Framework

Audience and Scope for this Curriculum Framework

The scope of this project is to publish a document that lists recommended topics, career paths, guidelines and core competencies for DRM academic and professional degree programs. This will involve compilation and revision of work done in this area by various organizations. It is anticipated that guidance counselors, college faculty, employers or other professionals will use this document to advise students and others interested in this field. It must be applicable to the needs of all levels of post-secondary education, from 2-year colleges through graduate school programs in North America. The core topics will also encompass those competency areas included in the certification exams for IRM/DRM professionals given through the Institute for Certification of Computing Professionals (ICCP).

Development and compilation of sample course materials or recommended textbooks are not within the scope of this project. The European/Australian model of post-secondary education is also not within the scope of this project, but we hope to address these needs at some point in the future.

2. INTRODUCTION TO DATA MANAGEMENT

The basic premise of Data Management (DRM) is that information and data is like any other business resource – and should be managed as such. Today enlightened businesses are beginning to see the critical role data plays in their companies. Some are

going as far as to put data as a resource on their balance sheet. There are many companies today that deal solely in data as their product; they sell data banks and associated data analysis services. Unfortunately, the majority of businesses do not currently manage information as they manage other resources, whether human, financial, equipment, material, facilities, or others. This explains, in part, why companies continue to suffer so significantly from information problems involving consistency, timeliness, accessibility, security, cost, etc. Basic principles for managing resources of any type are relatively straightforward and generally recognized by almost all organizations.

These principles include the following:

- Requirements for the resource must be anticipated, and fulfilled in anticipation of future need. Otherwise, by the time the resource is needed, the opportunity to acquire it will have disappeared.

- The business cannot afford an infinite amount of the resource; therefore, the amount must be optimized. In other words, the company should always have enough--but also minimize excess and redundancy.

- The resource should be shared and leveraged in as many ways as possible, in order to maximize its value while diminishing its overall costs.

- The resource must be carefully managed to ensure that its use in the business is prudent, efficient, effective and secure. It must therefore follow a clearly defined life cycle guided by explicit rules.

Whereas most businesses accept the above principles without question and apply them carefully to other resources, this is seldom the case for data. As a result, many companies find their data resource in relative chaos. Yet, information may actually be the company's most important resource because it provides the means through which all other resources are ultimately managed.

Education is an important step toward enabling both business and information professionals to appreciate the significant potential of a well-managed information resource. One way to assure that these professionals have the appropriate skills to build an effective Data Management environment is to create, formalize, disseminate and implement a curriculum that emphasizes managing information as a resource.

The DRM profession also suffers from confusion of terms within its practice. Some refer to the practice as Information Resource Management (IRM) while others call it Data Resource Management (DRM). The professionals who work with data and information may be labeled as data analysts, data administrators, database analysts, database administrators, etc. One of the secondary purposes of this proposed curriculum framework is to illuminate the dark corners of terminology and bring some order to the language that data professionals use.

Generally, the DRM function encompasses the following areas: data administration, data modeling, database administration and management, data warehousing, data and business process analysis, business intelligence, data architecture and knowledge management. This proposed curriculum framework will includes education / training for these positions / functions and may include others as appropriate.

3. THE VALUE OF DATA MANAGEMENT

The value of data management can be viewed from several perspectives, including DM's role in the systems development lifecycle, the uses of data as an organizational resource and the necessity of solid, accurate information upon which to base business decisions.

Some areas that DATA MANAGEMENT can affect an organization include:

1) Development and implementation of common data processes, procedures and tools

2) Implementation of data quality, security and configuration management processes and initiatives

3) Development and implementation of an effective data management infrastructure including the establishment of performance metrics and analytic framework, policy and procedures and determination of the business value of data management activities.

4) Development and management of the Human Resource Services

5) Development and implementation of standard data definitions & stewardship of these

6) Define of system of record for data and control data redundancy

7) Perform data audits (e.g. are all customers getting appropriate billing, etc.? Do asset descriptions match the physical assets they describe on the balance sheet?)

8) Monitor and recommend ethical uses of data within the business

9) Coordination of data management education, training and consultation services

4. EMPLOYMENT

Employment opportunities are varied in the data management field. Job titles such as data administrator, data architect, database administrator, data quality analyst, data analyst, business (systems) analyst, data warehouse manager, and other variations on these terms exist. The significant growth in data retained in organizations has led to greater specialization and diversification of data management roles. Because of experience requirements, and the need to understand organizations and technologies, many data management positions are not entry-level (i.e., positions held by someone immediately after completing a post-secondary degree). Business systems analysts and especially programmer analysts, which have been typical entry level jobs leading to more senior data management positions, are currently in a state of flux due to trends for organizations to outsource and sometimes off-shore entry-level, more technical development positions. There are reports of some more senior positions, such as database administrators, being outsourced, although recent evidence points to potential problems with outsourcing these more mission critical roles. Given this changing playing field, it is still true that data management positions are available in a wide variety of organizations from all private and public sectors, and in service firms such as information systems consulting practices. Gaining practical experience and certifications, along with formal education, provide greater entry-level opportunities in the data management field.

Data management positions which deal more with the business meaning, policies, planning, and use of data as opposed to those that concentrate more on operational, technical matters, require close contact with organizational management, and hence are difficult to outsource. Those holding these roles (e.g., data analyst, data administrator, or data architect) also require more organization domain knowledge, and may over time switch between data management and organization management roles. Degrees from the domain (e.g., business, public management) with an emphasis on data management are typically required for these positions. Those individuals holding more technical data management positions (e.g., database administrator or database programmer) may over time switch between data management and other more technical roles, such as lead programmer, system architect, and various computer system network and operations jobs. Degree requirements for these more technical jobs tend to favor technical degrees (e.g., masters in information systems, technical concentration in an MIS or CIS program, or computer science).

According to the U.S. Department of Labor, there were 110,000 database administrators in 2002. Some data management jobs are temporary (e.g., under contract for the life of a project), but most data management jobs are part of the permanent infrastructure of an organization. The U.S. Department of Labor also predicts that job opportunities for data management professionals (as well as several other IT fields including the related position of business systems analyst) will grow much faster than the average for all occupations. For data management, this is driven by the explosive growth in data, fueled in no small way by the vast increase in data caused by Internet commerce (resulting in the ability to capture more detailed transactional data). Also, newer technologies such data warehouse and business intelligence software, has caused a surge in re-architecting data systems in many organizations.

Pay for a data management position is strong, even among all IT jobs. For example, the median salary in the Chicago area in June 2004 for a database administrator was $86,600, for a data warehouse specialist $74,000, and a database analyst I $50,500

(source: Salary.com). These salaries compare favorably with similar computer networking positions (e.g. Robert Half International, a leading human resources consulting firm, reports for 2003 that database administrators tended to be paid twenty to thirty percent more than similar LAN and network administrators; Computerworld annual salary survey results typical show a similar comparison).

5. DATA MANAGEMENT EDUCATION

Education in data management is increasingly important as users and information systems staffs attempt to address the information needs of their communities and organizations. Education in data management has been lacking to date, with more emphasis placed upon pure "technical" training in tools and products, and less education in the concepts and rationale of a data-centric approach to data management.

Where do data management programs currently reside?

- Business schools

- Library Schools

- Computer Departments

- Engineering Schools

- Community Colleges

This curriculum framework, created by DAMAI – the premier international organization of data and information management specialists – is an attempt to codify the essential concepts of data and information, to present a comprehensive approach to educating users and information systems personnel at all levels of instruction:

- 2 or 3-year community college

- Traditional 3-4-year business and information systems program,

- Advanced studies at the graduate level in either business or information systems.

6. APPROACH

The approach taken by this DAMAI Data Management curriculum framework consists of the following items that progressively build a picture of topics that form courses, mapped to delivery channels and careers:

- A model for data management in the real world

- List of concepts in data management

- List of topics from the ICCP Data Management exam as input

- Data Management Comprehensive Body of Knowledge (CBOK) for data management, as input

- List of careers and job clusters from the NWET (National Workforce Center for Emerging Technologies)

- List of education delivery channels based on the North American model

- Clustering of topics for courses

- Cross Reference Matrices for the reader to study in the development of a curriculum framework.

7. MODEL FOR DATA MANAGEMENT IN THE REAL WORLD

Using a tool of the data management discipline: the data model; Figure 2 below shows the interrelations and dependencies in the real world for the delivery of data management education. The yellow entities signify key 'hub' pieces in the model.

8. PRIMARY DATA MANAGEMENT EDUCATION CONCEPTS

Primarily, education in data management should focus on the concepts that are common within the practice of DRM. These concepts should reinforce the idea of data and information as organizational assets, with a need to be managed and protected as any other organizational asset (funds, building, personnel, etc.) Once the core foundation has been laid, education into various aspects of data management can lead the student across and down several paths, based on the student's staff role, the organization's specific approach to DRM and the current implementation of products and tasks within the DRM function.

- Well rounded approach, encompassing human aspects, Project Management, soft / interpersonal skills, practices (capstone)

- Team activities

- Hands on use of activity
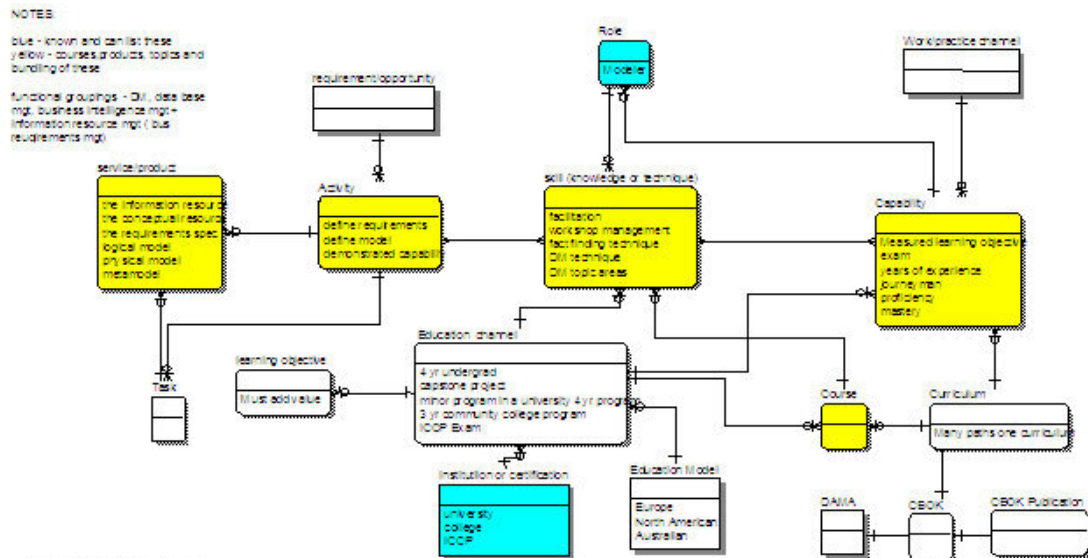
Fig. 2. Data Model

- Writing skills, oral skills, presentation
- Field activities and internships / practice sessions

9. CERTIFICATION

Institute for Certification of Computing Professionals (ICCP) Data Exams

DAMA International along with the ICCP worked on three new data-oriented exams in 2002 - 2004: Data Management, Database Administration and Data Warehousing. DAMA provided the subject matter expertise and the ICCP provided expertise in exam development, maintenance and administration.

The ICCP was established to credential the highest level of professional for the computing professions. It is the world's leading certification body for information and communications technology (ICT) professionals. Many universities and colleges use the ICCP examinations to test their students' exiting knowledge and competency as validation of their curriculum framework, faculty and educational processes. The new data examination are designed to test the knowledge of the IRM/DRM professional, and the outlines of these exams can serve as a method of validation for the proposed DAMA International Foundation Curriculum Framework for Data Management.

The ICCP Data Management Exam Subject Outline is summarized below:

1.0   Data Management Function

2.0   Data & Metadata Infrastructures Creation / Maintenance

3.0   Data Analysis and Modeling

4.0   Data / Metadata Infrastructure Management

5.0   Information Quality Management

The ICCP Database Administration Exam Subject Outline is summarized below:

1.0   Database Administration Function

2.0   DBMS Concepts and Usage

3.0   Database Design

4.0   Database Operation

5.0   SQL Considerations

The ICCP Data Warehousing Exam Subject Outline is summarized below:

1.0   Data Warehousing Function

2.0   Data Warehouse Infrastructure Creation / Maintenance

3.0   Data Warehousing Analysis and Design

4.0   Data Acquisition and Cleansing

5.0   Data Warehouse Implementation and Operation

Certified Data Management Professional (CDMP) Certification

The Certified Data Management Professional (CDMP) credential is awarded to those who qualify based on a combination of criteria including education, experience and test-based examination of professional level knowledge. This credential is offered at the Mastery or Practitioner level. To maintain certified status and continued use of the credential, an annual re-certification fee along with a 3-year cycle of continuing education and professional activity is required.

The Data Management Association International (DAMA) (www.dama.org) authorizes the Certified Data Management Professional certification program and granting of the CDMP designation in partnership with the Institute for Certification of Computing Professionals (ICCP) (www.iccp.org), which administers testing and re-certification.

This section identifies to the IRM/DRM Curriculum framework builders what requirements are expected for experienced data personnel in testing for the CDMP. The CDMP requirements and the associated ICCP exams can validate the IRM/DRM Curricula being proposed in higher educational institutions through outcome assessment.

CDMP Exam Criteria

Three ICCP exams must be passed with the following scores:

Score	Credential Earned
Pass all exams at 50% or higher	CDMP Practitioner Certificate
Pass all exams at 70% or higher	CDMP Mastery Certificate

The **CDMP Practitioner** certification is awarded to professionals who scored above 50% on all three exams. These individuals can contribute as a team member on assigned tasks for they have a working knowledge of concepts, skills and techniques in a particular data specialization.

The **CDMP Mastery** certification is awarded to professionals who scored 70% or higher on all three exams. These individuals have the ability to lead and mentor a team of professionals as they have mastered the concepts, skills and practices of their data specialization.

Exams may be retaken to improve your score and go from the Practitioner to the Mastery certificate level. You may be able to substitute select vendor certifications for up to one specialty exam.

Additional CDMP Certification Criteria

The following criteria must also be met in order to qualify for the CDMP:

	CDMP Practitioner Certificate	CDMP Mastery Certificate
Years of Data Professional Work Experience	2	4+
Substitute Up to 2 Years – Bachelor or Master Degree in an appropriate discipline for Work Experience	2	2
Recertification Required	Yes	Yes
Continuing Professional Education / Activity Required	120 hours every 3-year cycle	120 hours every 3-year cycle
ICCP Code of Ethics	Yes	Yes

Example Qualifications - CDMP

Other qualifications may be accepted. Check with the DAMA contacts or ICCP office

Education

The following types of degrees are examples of what degrees could be accepted for the CDMP.

Bachelor of Science Degree

Major in:

- Computer Science
- Information Systems
- Management Information Systems
- Information and Communications Technology
- Major in another discipline with minor in any of the above

Masters Degree

- Computer Science
- Information Systems

- Information Resource Management
- Information and Communications Technology
- MBA with concentration in one of the above

Work Experience

Example qualifying position/role titles:

- VP, Director, or Manager of Data Management
- Data Architect, Data Administrator, Data Analyst, Data Modeler
- Data Specialist, Database Administrator, Data Warehousing Analyst
- Systems Architect, Systems Analyst, Project Manager, Project Leader
- Business Analyst, Repository Analyst, Repository Architect

Professional Examinations

The CDMP requires three ICCP exams: IT Core, one specified data oriented exam, and one other exam. Please note that Data Management (May 2004) and Database Administration (August 2004) exams will eventually replace the Data Resource Management (DRM) exam. A candidate can take the DRM exam in the interim period to count as a data specialty exam.

If you already passed one or more ICCP exams, these exams can be used toward a CDMP if considered current by ICCP standards, and the exams are listed within your CDMP area of specialization. For information on your status, contact the ICCP at office@iccp.org.

If you wish to demonstrate expertise in exam specialty areas specifically, the ICCP will issue Proficiency Certificate-Mastery Level for each specialty exam passed at 70% or higher or Proficiency Certificate-Practitioner Level for each specialty exam passed at 50% or higher.

Suggested Exams Based on Candidate's Work Experience

See Appendix B for a table that shows the Data Management areas by which ICCP exam is required (R) or by which exam is the candidate's choice (C) for a total of three exams. The Data Resource Management

exam is being phased out and replaced with the Data Management and Database Administration exams. The Data Management exam has been released in 2004. The Database Administration exam has been released in 2004.

10. TOPICS AND TOPIC CLUSTERS

Overview

The prior sections, especially "Outline of Courses/Concepts for a DRM Curriculum", have identified the unique topics that are covered within a data resource management (DRM) curriculum. These topics will be supplemented with other, more general topics as appropriate for the educational program. Thus, the DRM curriculum framework topics do not address such topics as team building, communication skills, project management, budgeting, and other more general topics that may be combined with DRM topics to form courses or may be taught in courses taken by all students in the academic institution.

Each DRM topic should be considered a learning unit. Each learning unit may be covered in different depth or with different learning objectives in different courses within a curriculum. That is, a given topic may be covered in several courses, each in a different depth or combined with topics from this or other areas. Thus, DRM topics do not naturally group into mutually exclusive courses. However, related topics do naturally segregate into topic clusters. A topic cluster is a highly related set of topics that are typically taught together. A course is developed by assembling a set of topic clusters (possibly combined with topics outside the range of this curriculum framework) to accomplish some objective for the curriculum framework.

Alternatively, if the topics within a cluster are not all taught within the same course, then the sequencing between courses must be carefully managed. For example, the normalization topic within the relational data model topic cluster cannot be effectively learned without learning the other topics within this cluster. However, if a predecessor course has already covered the relational data model topic without formally addressing normalization, then a subsequent course that covers normalization (probably with a

brief review of the relational data model) will work.

The DRM curriculum framework guidelines are developed recognizing that not every school will create the same courses because of the unique objectives and overall curriculum at that school. For example, some schools will emphasize more technical aspects, a particular technology orientation, or a business focus, for example. Hence, these DRM curriculum framework guidelines do not recommend a specific set of courses. An implementation of a DRM curriculum framework will typically be a subset of some degree program or equivalent (e.g., various certifications or specialty programs). Thus, for example, a DRM curriculum within an information systems curriculum in a business or applied computing degree program (see IS 2002) will combine topic clusters to form courses in a different pattern than will be done in an accounting or a software engineering curriculum.

We do not imply that topic clusters are of equal length in terms of number of classroom or study hours required. At a shorter length, a topic cluster might be a chapter in a textbook because of the natural linkages between topics in a cluster. At a longer length, a topic cluster might encompass a whole textbook, and hence it would be a complete course. Thus, a topic cluster may be covered in as little as one college class meeting or may require several weeks of class meetings or a whole term, depending on the needs of the academic program.

Topic Clusters

Clustering of topics facilitate the formation of courses in the curriculum framework. The suggested clusters and their associated topics as outlined in Appendix A, are meant to serve as a guideline for developing appropriate courses and materials. The depth to which an implemented curriculum addresses a topic within a cluster or to a cluster as a whole is dependent upon many factors, including the level of instruction (junior college, baccalaureate, master or certification), the position that topic holds in the university's implemented DRM curriculum, the decisions made on clusters and their relationships within that curriculum, and other factors pertinent to the particular approach and curriculum of that institution.

Some topic clusters may constitute an entire course in itself while others can serve as foundations for courses or seminars.

11. CAREERS IN DATA MANAGEMENT

Career Paths /Roles

The backgrounds of successful data management professionals are varied. Many people with information systems, business, liberal arts and a wide range of other experiences have found their way into data management roles. Individuals may develop an interest or experience in data management by working with data in an organization as a data steward, knowledge worker, business applications specialist or developer. With additional training or experience, these roles may progress into more responsible analyst, administrator or management positions. Because of the nature of these career paths and roles, it is important to provide continuing education in basic data resource management concepts, using multiple delivery channels to begin to lay an educational foundation and build career paths for future workers entering this profession.

In addition to technical skills, data management professionals need very strong interpersonal communication, analytical, project management and writing skills. The ability to work in teams and the understanding of the business domain are also very important skills, and should not be overlooked in a well-rounded curriculum.

Job Clusters

Careers that require an understanding of data resource management principles can be grouped into eight job clusters that share similar skills and responsibilities. These are: Business Analysts, Systems Analysts, Data Analyst or Data Modeler, Database Administration and Development, Project Manager, Quality Assurance Analyst/Testing, Technical Trainer or Technical Writer, and Data Architect. Each of these clusters is described in this section.

Business and Systems Analysts:

Description of Responsibilities

Business Analysts work with management and users to analyze, design, implement and/or support business applications and

systems. They develop detailed, functional system and program specifications using structured design methodologies and CASE tools. Strengths usually revolve around oral and written communication, organization and cross-functional business knowledge. Many business analysts also have some exposure to systems development methodologies and appropriate tools and techniques.

Systems Analysts may perform some or all of the responsibilities of business analysts, but may also specify computer system requirements for the solution of moderate to difficult business problems, or for portions of more complex problems and formulates procedures for their solutions. They are responsible for "owning" certain business systems and applications. Usually requires a background in programming and / or systems operations

Sample Job Titles

> Business Analyst
>
> Systems Analyst
>
> Business Systems Analyst
>
> Sr. Systems Analyst
>
> Information Systems Analyst
>
> I.T. Analyst / Infrastructure Analyst

Data Warehouse Specialist:

Description of Responsibilities

The *Data Warehouse Specialist* focuses upon designing and developing enterprise-widen (or departmental) repositories for all corporate data. They use tools, e.g. Oracle, Sybase, other database systems or other specialized decision support or expert systems and knowledge of decision support systems to accomplish this goal. Interfaces all current and legacy data and uses queries and reporting tools to support corporate business units or external customers

Sample Job Titles

> Data Warehouse Consultant
>
> Data Warehousing Specialist
>
> Data Warehouse Analyst
>
> Data Warehouse Project Manager
>
> DSS (Decision Support Services) Analyst

> Data Warehouse Administrator
>
> Business Intelligence Consultant
>
> Enterprise Systems Analyst

Data Analysis or Data Modeling Positions:

Description of Responsibilities

Data Analysts or *Data Modelers* use data modeling techniques and tools in analyzing and specifying data usage within an application area and creates queries and reports for specific business areas. They may be responsible for an enterprise view of corporate data, and would create and maintain an enterprise data model. Data modeling skills are used by other roles as well, including data warehousing specialists, database administrators, and business analysts.

Sample Job Titles

> Data Analyst
>
> Data Modeler
>
> Data Modeling Specialist
>
> Database Modeler
>
> Database Analyst

Database Administration and Development:

Description of Responsibilities

Database administrators or *developers* have responsibility for the physical data resource. They must identify user requirements to design reports and forms so users can create data queries and interpret the results. They must determine needed changes either to new systems or existing systems as they grow, and test everything before it's put into operation. They may write procedures and scripts to access data from applications and to maintain data update integrity. To keep data secure and protected from catastrophic events, database administrators must create security procedures and implement backup and recovery processes. They must be creative in their approach to problems and willing to help everyone get the data they need while maintaining system security and reliability.

Sample Job Titles

- Database Administration Associate
- Database Administrator
- Senior Database Administrator
- Database Developer
- Database Programmer
- Database Manager
- Database Security Expert
- Manager, Database Administration

Project Management:

Description of Responsibilities

Responsible for achieving the goals and milestones associated with all applications or systems projects. Oversees the analysis, design, execution and support of all assigned projects, including resource planning, team selection, performance appraisals and budgets. Is skilled in project management concepts, tools, and techniques. Requires high level of analytical skills, oral and written communication skills, negotiation and team building / team-leading skills.

Sample Job Titles

- I.S. Project Manager
- I.S. Project Leader
- Senior Project Leader
- Project Coordinator

Quality Assurance/Test Analyst:

Description of Responsibilities

Ensures all software development processes and procedures are in place, standardized and fully utilized. Involved in the final portion of the software development life cycle to ensure development efforts are acceptable prior to implementation. Develops test plans and test scripts in conjunction with system users, creates and maintains appropriate test data sets and executes testing activities. Involved in assuring the quality of all modifications for existing applications prior to implementation. Requires experience with SEI software development maturity modeling, ISO9000, design review, test plan preparation, and execution and automated testing.

Sample Job Titles

- Quality Assurance Analyst
- Quality Assurance Coordinator
- Data Quality Analyst
- Software Tester
- Testing Coordinator
- Tester

Technical Trainer or Technical Writer:

Description of Responsibilities

Works with users, systems analysts and programmers to create and edit application and systems documentation, user manuals, training courses and procedures. Prepares proposals and technical reports, works with project managers to develop appropriate documentation. Works with word processing, presentation and Web authoring applications for documentation on the Internet/Intranet and in paper.

Sample Job Titles

- Technical Writer
- Technical Training Specialist
- Technical Trainer
- Documentation Specialist

Data Architect or Administrator:

Description of Responsibilities

A *Data Architect* works to attain the optimal design of the data location / currency / quality by establishing a governance program for data in the business units / enterprise.

A *Data Administrator's* role is to assist business analysts and end-users across all functional areas in identifying long-term, strategic data needs for the enterprise, defining how the data is related to the business processes, and developing a conceptual and functional model of the data. This effort is essential to the development of integrated, shared databases within the enterprise. (Excerpt from DAMA Guidelines for Implementing DRM – Third Edition, page 30)

University Programs

	Course Definition	Course Profile
Masters - A - course makeup	MIS (in schools of Bus Administration) MASTER ARTS, MASTER SC, MASTER BUS AD (MBA)	13-14 courses, (extra if accounting major) basically same structure, but bus oriented not co-op oriented
Masters – B- course makeup	MIS (in Bus Admin, in a humanities university), M. SC. (Library or Information Science)	42 credits, = 7 in foundation, 5 in core, 4 in specialty, 1 free elective, capstone course (6 credits). 1 course - 3 credits
Undergraduate - A - course makeup	Comp sc (sc) undergrad hum core, comp core, then IRM BACHELOR OF ARTS OR SC< OR BACH BUS ADMIN	20 courses in the core, 12 common comp sc courses (comp sc core), 6 courses in track chosen, 4 elective
Undergraduate – B - Course makeup	Comp sc (arts& sc) 30% humanities & 70% comp sc	In business school - 40 courses - 20 - foundation, bus core 13, professional studies (major) 6 if MIS major or bus major, elective 4 (can be the minor)
Undergraduate - C	"E" could be in engineering school, most common to have co-op	
Doctorate	PHD COMP SC, PHD BUS ADMIN	

Sample Job Titles

    Data Administrator

    Data Architect

    Information Architect

    Information Planning Consultant

    Data Management Associate

    Manager, Data Administration

    Data Administration Consultant

    Data Administration Analyst (Senior)

    Repository Administrator

Community College - Tech Programs

Program	Courses Profile
Community and technical colleges (2-year or 3-year programs)	**ASSOCIATE TRANSFER Degrees:** Intended to transfer to a 4-year degree program with an articulation agreement. This degree requires a higher number of general humanities and general education credits but may include specialized courses, dependent upon individual agreements with 4-year colleges. **ASSOCIATE PROFESSIONAL/TECHNICAL** Degrees: Intended as a two-year specialized program. This degree is primarily skill-based and requires less humanities and general education credit. Transfer to a 4-year program not contemplated. **PROFESSIONAL CERTIFICATION PROGRAMS:** Typically 1 year or less. Focuses on preparing for certification, usually administered by a third party (vendor, accrediting organization).
Educational consortium/ tech program	1-3 year program. Focus may be similar to 2-year community college except higher-level degrees may be awarded (e.g. DeVry, ITT Tech)

Europe and Australia Education Delivery Model

Europe and Australia - 3 year	3 year reading on topic - No core academic model

Enterprise Data Architect Knowledge Architect

12. EDUCATION DELIVERY CHANNELS

Data management curriculum may be delivered in a variety of ways to serve the different needs of professionals. Education is an ongoing lifelong process, and the following are some of the types of programs that might deliver courses in DRM topics.

University Programs

These are raditional four year/North American institutions. A possible co-op or internship is strongly recommended for data management. Co-op or internships often depend on GPA, and opportunities in the community.

Community College - Tech Programs

Community and technical colleges provide programs and certificates for continuing education as well as transfer to 4-year insti-

ICCP Certification and the Delivery Channels

Certificate Issuing Organization	Course / Certification Profile
DAMA International (administered through the ICCP)	Certified Data Management Professional - ICCP Exam Review Course - A course where the students become familiar with the process of taking ICCP exams. This course is given at the 2004 DAMA Symposium, at DAMA Chapter meetings and upon request. Tests for the CDMP include: 1) IT Core, 2) Data Management / Data Resource Management, 3) Database Administration (August 2004), 4) Data Warehousing, 5) Integrated Project Management, 6) IT Management, and 7) Systems Development.
IBM	Certified Database Administrator - DB2 Universal Database *
IBM	Certified Advanced Database Administrator - DB2 Universal Database *
IBM	Certified Solutions Expert - DB2 Universal Database *
IBM	Certified Solutions Expert - DB2 Content Manager *
Information Engineering Services Pty Ltd	Certified Business Data Modeler *
Insurance Data Management Association (IDMA)	Certified Insurance Data Manager *
Microsoft	Certified Database Administrator *
NCR (Teradata)	Teradata Certified Professional *
Oracle	Oracle (xx) Certified Professional *
Oracle	Oracle 9i Database Administrator Certified Professional (can be applied toward Practitioner Level of the CDMP) *
Oracle	Oracle 9i Database Administrator Certified Master (can be applied toward Mastery Level of the CDMP) *

tutions. The following describes some of the types of program that may deliver data management content or courses.

Europe and Australia Education Delivery Model

This curriculum framework does not address the European and Australian post secondary education model and delivery channels for data management curriculum. This is due to the concentration on 'in-depth' reading on single topic or small group of related topics that these models use. This Curriculum framework will address these models in future releases as possible and practical based on input from these regions and educators.

ICCP Certification and the Delivery Channels

The following lists certifying organizations that may be also deliver courses.

MATRICES FOR DELIVERY

A set of four cross reference matrices are included in Appendix C. These matrices depict the relationships between the types of data management roles, responsibilities, qualifications and competencies.

The Generic Roles show how different types of responsibilities relate to four functional roles: Management, Architecture, Analysis and Design, and Engineering. Recommended Qualifications list the typical education and experience levels required for each functional role, and the Recommended Competencies matrix shows the set of increasing skill levels needed to perform these functional roles.

APPENDICES

Appendix A - Topic Clusters Details

Many of these topics come from the jointly developed DAMA-ICCP data exam outlines. These topics are used in this curriculum with ICCP permission.

I. The Environment for Managing Data as a Resource

This cluster includes core, foundational, and contextual topics that may review or slightly extend general information systems topics covered in courses outside of the DRM area or as part of a general overview course for the DRM curriculum framework. Topics in this cluster include:

> Data, information, knowledge, wisdom; metadata
> Types of data and information
> General file and database processing principles
> Uses of data and information (by discipline and within DRM)
> Evolution of database technologies
> Risks and rewards of data resource management

II. Data Resource Management Overview

This cluster includes topics that outline the processes involved in data resource management, from strategic to operational. Topics in this cluster include:

> Information Systems Planning (ISP) concepts *(more detailed for MS)*
> Data / Metadata Management Plans   *(more detailed for MS)*
>> Strategic data plan (linked to business plan)
>> Enterprise data / information framework
>> Data portfolio management
>> Relationship management (vendor, customer, employee)
>> Data quality management
>> Metadata management plan
> Policies / Standards / Legal requirements/ Processes / Procedures *(more detailed for MS)*
>> Internal to DRM
>> External to DRM
>> External to organization (e.g. Legislated privacy acts, ISO, OMG/CWM)
> Data Resource Development Management
>> Data planning, policy development
>> Data architecture
>> Data requirements modeling
>> Data modeling / database design
>> Data model management
>> Data model implementation and maintenance
>> Data resource control and quality
>> Standards management, setting, communication and enforcement
>> Liaison with Database Administrators, Business Analysts, Management, Users
> Metadata Management *(more detailed for MS)*
>> Metadata planning, policy development
>> Metadata requirements gathering
>> Meta-modeling
>> Metadata content management and standards
>> Metadata repository tool management
> Database Administration *(basic in BS, more detailed in MS)*
>> Definition and organization of physical database

        Protection and recovery of physical database
        Optimization and documentation of physical databases
        Liaison with Data Administrators, Business Analysts, Management, Users
        Data Warehouse Management and Warehouse modeling
        Data access administration
    Data Stewardship
        Data ownership
        Data custodianship (physical)
        Data creator/originator of business rules
        Data quality accountability
        Business metadata creation
        Data usage by business areas

III. Planning for Data & Metadata

This topic cluster emphasizes that proper data management begins with a comprehensive, organizational plan. An infrastructure must be created in which to properly manage data and metadata. Topics in this cluster include:

    Architectures
        Enterprise Data
        Data Sourcing
        Data Distribution
        Data Integration
        Change Authorization
        Zachman Framework
        Data Processing Architectures (i.e. client-server, distributed data, etc.)
        Metadata Architectures
        Reporting Strategy
        Integration of Structured and Unstructured data
    Data Architecture Methodologies
        Information Engineering
        Enterprise Architecture Planning
        Data Life Cycle
        Data Reengineering
        Prototyping
    Data Systems Foundations - Tools
        Database Management Systems (DBMS & ODBMS)
        Data modeling tools
        Extract, transform, and load (ETL) tools
    Metadata & Descriptive Information
        Data dictionaries
        Metadata stores
        Metadata repositories
        Metadata management tools
        CASE tools
    Data and Business Systems *(more detailed for MS)*
        Business intelligence technologies (OLAP, Data Mining, etc.)
        Data management and the Internet / Intranet
        Data management and unstructured data

IV. Data Requirements Analysis and Documentation

This topic cluster includes topics about processes and techniques to elicit and document the data resource needs of an organization. These topics are similar to those in any information systems analysis curriculum, but focused on the data requirements. Topics in the cluster include:

Fact Finding Techniques
    Interviewing
    Surveys, questionnaires
    JAD sessions
    Legacy systems analysis
    Report analysis
    Business document analysis
Requirements Definition
    Evaluation of current environment and documentation
    Future state
    Gap analysis
    Data / process matrices
    Prototyping
    Business rules (discovery, validation, and documentation)
    Tools for requirements documentation

V. Data Models and Modeling

Data Diagrams
    Entity types
    Relationship types
    Attribute
    Key
    Degree
    Cardinality
    Optionality
    Supertypes and subtypes
    Entity clustering
    Metadata type
    Business rule
Data Structure Design
    Relational tables
    Normalization (this is relational theory related to structures, not ERD)
    Relational operation
    Data integrity
Pre-packaged data models
    Functional area data models
    Industry data models
    Party-role structures
Dimensional Warehouse
    Fact
    Dimension
    Usage of dimensions
    Cubes
Object Oriented / UML
    Object
    Class type
    Attribute type
    Object identifier
    Relationship type
    Class diagramming
    Relationships with other OO models
    Challenges of OO
Data Representations in Process Models (more detailed for MS)
    Business views / presentation level
    Triggers
    Stored procedures
    Object method representation

Types of Models *(more detailed for MS)*
  Enterprise
  Conceptual
  Logical
  Physical
  Data warehouse
  Metamodels
  Object class
  Data life cycle
Scope of Model and Metadata
  Enterprise wide
  Project oriented
  Subject area
Data Model Support
  Creation
  Maintenance
  Version control
  Comparison
  Merging
  Importing / exporting (Linkages and mappings between enterprise, logical, physical data models, and process models)

VI. Relational Data Model

Topics in this cluster relate to the dominant form used by database management systems: the relational data model. Topics in this cluster include:

Properties of relations
  Multi-valued attributes
  Referential integrity
  Anomalies
Transforming entity models to relational
  Mapping entities and relationships
  Mapping supertypes and subtypes
Normalization
  Justification for normalization
  Normal forms
  Process of normalization
Merging relations
  Issues that arise during merging

VII. Data Storage Management

Topics in this cluster address the physical structures and media used to store and access data. Issues of efficiency of physical assets are addressed. Topics in this cluster include:

Data volume and usage analysis
Data representation
  Data coding
  Data compression
  Handling missing data
Denormalization
  Justification of denormalization
  Forms of denormalization
File organizations
  Sequential
  Indexed
  Types of indexes

        Selecting indexes
        Managing indexes
        Hashed
    Files storage systems
        RAID
        SAN

VIII. Data Access and Database Programming

Topics in this cluster address the computer programming languages used to define, store, maintain, and access data. Topics in this cluster include:

    History of relational languages
        Relational algebra
        Relational calculus
    SQL
        Standards
        DDL
        DCL
        DML
        SQL scripts
        SQL in a multi-tier computing environment (e.g., Internet)
    QBE

IX. Data Warehousing

This topic area addresses the specialized area of data management for decision support—data warehousing. Topics in this cluster include:

    Need for data warehousing
    Data warehousing architectures
        Operational databases
        Operational data stores
        Enterprise data warehouse
        Real-time data warehouse
    Characteristics of data warehouse data
        Status versus event
        Transient versus periodic
        Time
    Loading the data warehouse
        ETL process
        Data cleansing and quality
        Data transformation
        Data loading
    Data warehouse data models
        Star schema and variations
        Slowing changing dimensions
        Normalized relations
        Comparison of data warehouse data models
    Business intelligence
        BI applications
        Analytic queries
        SQL OLAP extensions
        Drill-down, drill-through, dimensional processing
        Data mining

X. Data / Metadata Infrastructure Management   *(more detailed for MS)*

The topics in this cluster deal with standards for managing data and metadata. Topics in this cluster include:

        Standards Management Process
            Creation of standards (reasons and methods)
            Enforcement
            Maintenance
        Data Models Standards
            Naming conventions for entities, relationships, attributes, etc.
            Business and integrity rules
        Data Elements Standards
            Element types
            Naming conventions
            Definition principles
            Legacy element linkages
            Data element audit
            Metadata

XI. Information and Data Security

The topics in this cluster
        Data Security Principles
            Concepts of information security, ethics, privacy and usage: Accountability,
                Authorization, Availability
        Data Security Policy Types
            Data ownership
            Data and value sensitive access
            Trans-border data flow
            Data content
            Data privacy and protection within and external to enterprise

XII. Data Quality Management   *(more detailed for MS)*

Topics in this cluster
        Data Quality Principles
            Data and quality
            Business drivers
        Data Quality Dimensions
            Data Accuracy
            Believability
            Relevancy
            Resolution
            Completeness
            Consistency
            Timeliness
        Quality Assessment Characteristics
            Data definition quality characteristics
            Data model / requirements quality characteristics
        Quality Assessment Dimension Measurements
            Baseline data cost calculation
            Cost of non quality data
            Value chain relationship between quality data and business parameters
        Data Quality Improvement
            Data clean-up of legacy data
            Mapping, transforming, cleansing legacy data
        Continuous Data Quality
            Data defect prevention

Data quality employee motivation
Information quality maturity assessment
Gap analysis

XIII. Data Reliability

Topics in this cluster:
Types of database failures
Data backup procedures
Data recovery procedures
Controlling concurrent access
Locking
Versioning

XIV. Information Systems Project Management

Project Management principles and concepts (usual MIS course in MIS)
Information systems-specific PM concepts, issues, challenges
DRM issues in IS PM
Management of IS and other consultants, use of DRM standards
Project Management and Ethics

Appendix B – Suggested ICCP Exams Based on Candidate's Work Experience

The following table shows the Data Management areas by which ICCP exam is required (R) or by which exam is the candidate's choice (C) for a total of three exams.

ICCP Exams	Management	Architecture	Data Analysis & Design	Database Administration	Data Warehousing	Meta Data / Repository Management	Data / Information Quality (Future)
IT Core	R	R	R	R	R	R	R
Specialty Exams							
Data Resource Management [1] / Data Management [2]	R	R	R	C	C	R	R
Data Resource Management / Database Administration [3]		C	C	R	C	C	C
Data Warehousing		C	C	C	R	C	C
Integrated Project Mgmt	C				C	C	C
IT Management	C				C	C	
Systems Development		C	C	C		C	
Object Oriented Analysis & Design			C				
Systems Security				C			
Future ICCP Exams							
Information Quality			C	C	C	C	R (future)
Architecture		R (future)	C	C	C	C	
Acceptable Exam Substitutes (Third Party)	Information Not Available	C	C	C	C	C	C (future: e.g. MIT or Berkeley – DQ programs)

[1] The Data Resource Management exam is being phased out and replaced with the Data Management and Database Administration exams.
[2] The Data Management exam has been released in 2004.
[3] The Database Administration exam has been released in 2004.

Appendix C – Matrices for Delivery

Generic Roles

Functional Area Function	Data Resource Management	Database Administration	Data Warehousing / Business Intelligence	Meta Data / Repository Management
Management	VP/Director			
	Manager	Manager	Manager	Manager
Architecture	Enterprise Architect			
	Portfolio Manager	Database Architect	DW Architect	Meta Data Architect
Analysis & Design	Enterprise Data Administrator			
	Data Analyst	Database Administrator	Data Warehousing Administrator	Data Administrator
Engineering	Enterprise Database Administrator			
	Performance Analyst	Database Administrator	Data Warehousing Developer	Data Administrator

Recommended Qualifications

Functional Area / Function	Data Resource Management	Database Administration	Data Warehousing / Business Intelligence	Meta Data / Repository Management
Management	<u>Min:</u> Undergraduate Degree – Information Systems, Computer Science &/or Business <u>Recommended:</u> MBA/ MS-Information Systems and CDMP/CCP	<u>Min:</u> Undergraduate Degree – Computer Science &/or Business <u>Recommended:</u> CDMP/CCP	<u>Min:</u> 3 years in two or more related roles <u>Recommended:</u> 5 years in more than two related roles and CBIP/CDMP/CCP	<u>Min:</u> Undergraduate Degree – Computer Science &/or Business <u>Recommended:</u> MBA/ MS-Information Systems and CDMP/CCP
Architecture	Undergraduate Degree – Information Systems, Computer Science <u>Recommended:</u> MS-Computer Science/MS-Information Systems and CDMP	<u>Min:</u> Vendor Certification Program <u>Recommended:</u> CDMP	<u>Min:</u> 3 years in one or more related roles <u>Recommended:</u> 5 years in two or more related roles and CBIP/CDMP	<u>Min:</u> UG – CS/MIS <u>Recommended:</u> MS-Computer Science/ MS-Information Systems and CDMP
Analysis & Design	<u>Min:</u> Undergraduate Degree – Information Systems, &/or Business <u>Recommended:</u> Undergraduate Degree – Computer Science and CDMP	<u>Min:</u> Vendor Certification Program/ACP <u>Recommended:</u> Undergraduate Degree – Computer Science and CDMP	<u>Min:</u> 2 years in one or more related roles <u>Recommended:</u> 4 years in one or more related roles and CBIP/CDMP	<u>Min:</u> Undergraduate Degree – Information Systems, &/or Business <u>Recommended:</u> Undergraduate Degree – Computer Science and CDMP/CBIP
Engineering	<u>Min:</u> Undergraduate Degree – Computer Science, Math, Engineering <u>Recommended:</u> Post Graduate studies and CDMP	<u>Min:</u> Vendor Certification Program/ACP <u>Recommended:</u> CDMP	<u>Min:</u> 1 years in one or more related roles <u>Recommended:</u> 3 years in one or more related roles	<u>Min:</u> Undergraduate Degree – Computer Science, Math, Engineering <u>Recommended:</u> Post Graduate studies and CDMP

Recommended Competencies

Function	Competent	Advanced	Distinguished
Management **Architecture** **Analysis & Design** **Engineering**	Minimum education and experience levels A professional certification at the Practitioner Level, CDMP, CCP, or CBIP ICCP Proficiency Exam(s) One or more One or more Specialty / Vendor exams Specialty / Vendor training programs in Data Management Active membership in domain related professional association or user group	Competent plus: Recommended education and experience levels A professional certification at the Mastery Level, CDMP, CCP, or CBIP Regular continuing professional education program / recertification Active professional network of peers Presentations at local professional association / user group Leadership role in local professional association / user group	Advanced plus at least 3 of the following: Advanced experience in at least one other professional role Additional ICCP / other proficiency exams Presentations at national or international conferences Leadership role at the national or international level in professional organization / user group Teaching at institution of higher education Publication of articles in trade magazines, academic journals Published author of professional text

APPENDIX D - SUPPORTING RESOURCES

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Appendix E - Websites

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http://www.iccp.org - Institute for Certification of Computing Professionals (ICCP)

http://www.tdan.com – The Data Administration Newsletter

http://www.dw-institute.com – The Data Warehousing Institute

http://www.ewsolutions.com – Real World Decision Support

http://www.pmi.org – The Project Management Institute

Appendix F - Task Force Members

DAMAI 2003-5 Task Force Members

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Appendix G – Glossary

Terminology/Acronyms

Term	Acronym	Definition
Data Management / Data Resource Management	DM / DRM	Data Management / Data Resource Management is the practice of managing data as a resource of the organization, managing data by the same principles by which other resources are managed, ensuring that all stakeholders have responsibility for cooperatively managing the data resource, and integrating management of the data resource with business planning.
Data		Data are the individual facts that are out of context and have little meaning. They are often referred to as raw data. Data in context are the individual facts that have meaning. They are the raw data that are supported with comprehensive definitions.
Information		Information is a set of data in context that has relevance to one or more people at a point in time or for a period of time. Information must have relevance and a time component.
Knowledge		Knowledge is information that is combined with experience and retained by individuals.
Information Resource Management Association	IRMA	The Information Resources Management Association (IRMA) is an international professional organization dedicated to advancing the concepts and practices of information resources management in modern organizations.
Institute for Certification of Computing Professionals	ICCP	Established in 1973, the Institute for Certification of Computing Professionals (ICCP) has dedicated itself to the establishment of high professional standards for the computer industry through its product and vendor neutral IT certification programs.