

# Teradata University Network: A Resource for Preparing and Teaching Business Intelligence and Data Warehousing Courses

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## Abstract

By (re-)using teaching materials, cases, assignments / solutions, and software resources provided by Teradata University Network (TUN), a free Internet portal for database, data warehousing and business intelligence, lecturers can prepare and teach high-quality courses with less effort, can benefit from their peers' experience and can actively contribute to an active IT education community. In this article, a detailed overview of the contents of TUN is given, information about getting access and integrating new materials is provided, and different forms of using TUN in academic teaching are explained. Advantages and disadvantages of the TUN concept are discussed, and suggestions for future extensions are made.

**Keywords:** Business Intelligence, Data Warehousing, Teaching Resources, Teaching Platform.

## Introduction

Business Intelligence (BI) comprises a broad range of business-oriented topics (e.g. customer relationship management, business performance management) as well as technical topics (e.g. data warehousing, data mining, large databases). Due to its significance for business success, the demand for software in these fields as well as for the underlying information logistics infrastructure has increased during the last years, and the strong demand will continue (Wixom & Watson, 2001). The increasing importance of BI is supported by the forecasted growth rate of the BI market (Graham, Horiuchi, Jethanandani, Contu, & Biscotti, 2005) as well as a Gartner survey which reports that "business intelligence jumped from the No. 10 slot to the second-highest priority on CIOs' agendas" (Graham, 2005). The increasing demand for BI solutions is also linked to an increasing demand for qualified personnel that are able to use BI solutions and develop or manage the underlying information logistics infrastructure, respectively. Thus it is necessary that academia includes these topics in their curricula and impart such knowledge to their students. However it is not sufficient that students master the theoretical fundamentals: From a company's point of view, it is much more important that their future employees can handle real-world problems (in-

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stead of small textbook examples) and master state-of-the-art commercial tools (instead of research prototypes). That is why courses in the field of information logistics should not only comprise theoretical contributions and fundamental concepts, but should also enable students to use and understand current software tools. The Teradata University Network (TUN) initiative addresses this

issue. TUN was developed in cooperation with Teradata, a division of NCR Corp., by a group of scholars in 2001. TUN is a portal which can be used free of charge by lecturers and students in the fields business intelligence / management information systems (MIS), data warehousing (DWH) and database. Academia is supported not only by providing a teaching material exchange, but particular by providing easy and free access to centrally operated, commercial BI software tools. The access to such tools is implemented as an application service providing (ASP) model (H. J. Watson & Hoffer, 2003; Winter, 2004). TUN comprises a total user group of almost 1400 registered faculty members from 817 universities and colleges in 57 countries (71% thereof are located in North America, South America, Central America and the Caribbean, 16% in Europe, the Middle East and Africa, 12% in the Asia Pacific region, and 1% in Japan). Within the first eight months of the year 2006, TUN was actively used by more than 400 faculty members by viewing pages and/or contributing to TUN. In the same period of time, 139 faculty members joined TUN for the very first time (all figures as of 2006-09-04).

In this paper we position TUN within the range of existing online resources for learning / teaching support in the field (chapter “Related Work”). An overview of goals and content of TUN is presented in the following chapter. Chapter “TUN Access and Content Integration” provides information about getting access, and integrating new material to TUN. Different forms of using TUN in academic teaching are explained in chapter “Using TUN Resources to Support Teaching”. A short summary is presented, advantages and disadvantages of the TUN concept are discussed, and suggestions for extensions are made in the final chapter “Summary and Outlook”.

## Related Work

TUN is a portal that provides access to teaching materials and software tools to lecturers and students. However, TUN is not an e-learning platform and can also not be compared to so-called “academy” or “university” programs of software vendors. Therefore it will be explained in the following in which way TUN is different from these concepts. Thereafter TUN will be compared to similar platforms.

E-learning platforms make learning content available over the internet. Furthermore they enable students to support their learning process by presenting the contents already studied, presenting test results, providing communications tools etc. (Baumgartner, Häfele, & Maier-Häfele, 2005). Contrary to an e-learning platform, TUN does not support the learning process directly. Lecturers can use TUN material in order to prepare in-class courses as well as e-learning / distance learning courses.

Next to e-learning platforms, numerous offers from software vendors exist under various labels (e.g. Oracle University – <http://education.oracle.com>; Microsoft IT Academy Program – <http://www.microsoft.com/education/msitacademy>; Red Hat Academy – <https://www.redhat.com/training/academy/>) which provide documents and software tools to students and / or lecturers. Most of these services, however, are not free of charge and comprise only materials from one single software vendor. In addition, software tools are usually not provided in an ASP model so that lecturers and / or students have to install and manage such tools. In contrast, TUN does not only provide tools of several vendors that are partially integrated (e.g. by using the same data set), but also provides such tools in an ASP model and free of charge.

Likewise TUN, there are other portals that provide neither an e-learning support nor a specific sales / support channel for software vendors. The Edna Portal (<http://www.edna.edu.au>), the Gateway to Educational Material (GEM, <http://www.thegateway.org>), and the platform Multimedia Educational Resource for Learning and Online Teaching (Merlot, <http://www.merlot.org>) are solely providing links to teaching material. In contrast to that, platforms like EducaNext (<http://www.educanext.org>), Universal Brokerage Platform (UBP, [730](http://nm.wu-</a></p></div><div data-bbox=)

[wien.ac.at/universal/](http://wien.ac.at/universal/)) or Ariadne (<http://www.ariadne-eu.de>, based on UBP) store their teaching materials in a database – like TUN does. However, these platforms do – contrary to TUN – not concentrate on a specific subject and therefore are neither trying to establish a common understanding in a certain field, nor are they offering a common, keyword based access. Such platforms do not provide any software in an ASP model. Although GEM is offering links to software tools as well, this is only freeware and the tools must be installed on the lecturers / students computer.

## Goals and Content of TUN

TUN (<http://teradatauniversitynetwork.com>) has been created to

- be a premier resource for knowledge about data warehousing, decision support systems (DSS), business intelligence, and databases,
- build an international community whose members share their ideas, experiences, and resources with others, and
- serve as a bridge between academia and the world of practice.

Plans to create TUN were first announced in late 2001. In early 2002, membership of the advisory board was finalized, design was completed, and testing began. After adding content, TUN was promoted at AMCIS and the website of AISWorld (formerly ISWorld) in summer 2002. The formal roll out in fall 2002 was followed by adding the Teradata database software, a dimensional modeling tool (research prototype), and MicroStrategy software through a web based ASP arrangement in 2003. In 2004, TUN moved to a new platform. TUN was migrated to the same platform as [teradata.com](http://teradata.com) in November 2005. In this migration the layout of the platform was optimized, and content was made accessible by multiple indexing.

In the following, the teaching material provided by TUN will be presented, and the available software will be explained. Thereafter further TUN resources are described. TUN structures the content in two different ways: On the one hand, different teaching materials (e.g. articles, research reports, assignments etc.) can be accessed according to their subject area (course type). That means a user can select material that focuses on business intelligence, data warehousing, or database. On the other hand, teaching material can be accessed according to the content type, which means that all available articles, research reports or assignments are presented to the user irrespective of the subject area.

The following teaching materials are available in TUN (structured according to the content type as of late 2006):

- 14 course syllabi – most on graduate level,
- more than 60 articles and book chapters,
- eight research reports,
- eight cases, one software project and 18 assignments - including teaching notes,
- link to a course web sites,
- five PowerPoint presentations – including speaker’s notes,
- 20 web seminars as well as
- descriptions about the integration of different kinds of material (“integrated material”).

Under the category “integrated material”, descriptions are presented that explain how to use different kinds of material in an integrated form to prepare courses. E.g., teaching materials from business intelligence, data warehousing, and database can be integrated to support a “customer relationship management” teaching module.

Besides the valuable range of materials for course preparation, the most important feature of TUN is that business intelligence software, data warehousing software, and database software as well as other tools are made accessible through an ASP model. Colleges and universities do not have to select, obtain, install, and maintain any software. Instead, all included tools can be used free of charge, using just browsers and internet access. Not only is the software made available, but the Teradata database is already loaded with various data sets, including those from popular textbooks. Both with the Teradata database and with the Analytic Modules of MicroStrategy a substantial tutorial basis can be accessed. Currently (as of 2006-08-26), the following software tools and data sets are available on TUN:

- Teradata database: Access to data sets from leading textbooks, including e.g.
  - the “Mountain View Community Hospital” case from the Jeffrey Hoffer et al. textbook “Modern Database Management” (Hoffer, Prescott, & McFadden, 2002/2004),
  - the database used in chapters 7 and 8 of “Modern Database Management” (Hoffer et al., 2002/2004), and
  - the database used in Richard T. Watson textbook “Data Management: Databases and Organizations” (R. T. Watson, 2003).
- Hyperion: At the moment only computer based training courses, product demonstrations, presentations, and white papers can be accessed. The access to Hyperion software is planned for the end of 2006.
- MicroStrategy 7i: TUN makes available the access to the following modules:
  - module for customer analysis: e.g. customer segments analysis, analysis of the value proposition and the loyalty of customers, identification of cross selling possibilities etc.,
  - module for financial reporting analysis: analysis of receivables and payables, drawing the balance and profit and loss account, execution of future prospects etc.,
  - module for sales analysis: analysis of product, distribution and sales figures.
- University of Arkansas Resources: Access to large-scale, real-world datasets:
  - Sam’s Club Database: A sales database provided by Wal-Mart Stores, Inc. containing six tables with more than 55 million rows.
  - Dilliard’s Department Stores Database: A sales database provided by Dilliard’s Inc. containing five tables and more than 128 million rows of retail sales.
- Other easy-to-use, downloadable software like a dimensional modeling tool and a web data analyzer. In contrast to the main software offer, these software tools are research prototypes.
- Various software demonstrations (e.g. for data quality management, dashboards and data integration as well as a shell for expert systems).

TUN also comprises various resources from the field of commercial software training. These resources however have not been peer reviewed:

- Teradata specific materials:
  - Over 80 web based courses (1-2 hours each)
  - 83 white papers
- Access to Teradata certification
- Teradata user group and discussion forum
- Tech Center: Access to technical papers

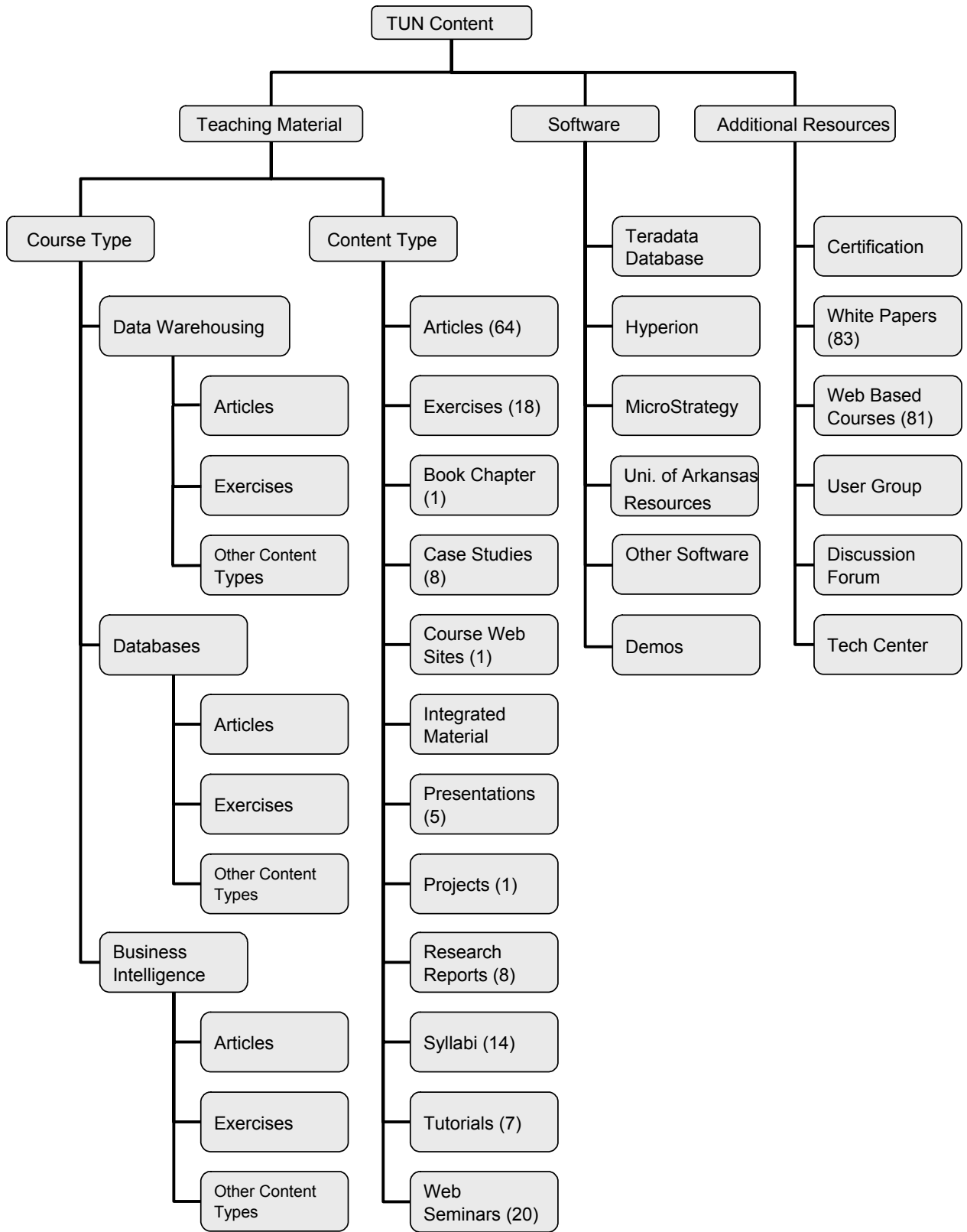


Figure 1: TUN Content Structure

Next to the teaching materials and software tools listed above (see as well Figure 1), the mission of the portal as well as the members of the steering committee are presented. Furthermore there is an easy-to-use content submission form for new content or related web pages, and the latest newsletters as well as contact information are provided. In order to gain fast access to the content of TUN, a search functionality for document's metadata was implemented in November 2005.

A separate portal for students, Teradata Student Network (TSN, <http://www.TeradataStudentNetwork.com>) provides access to a subset of the above mentioned materials. Students are granted access to software tools, book chapters, articles, research reports, cases, projects and assignments - but not to syllabi, teaching notes and assignment solutions. Students can also use the web seminars and the tech center. From the beginning of the year 2006 until the end of August 2006, about 1200 students have been registered and actively using TSN resources (as of 2006-09-04).

## **TUN Access and Content Integration**

To gain access to TUN, faculty must first register at the TUN web site. In addition to providing personal information such as name and university, applicants must provide the URL of a web page as well that proves their teaching faculty status. This procedure is necessary because the material provided by TUN is – on the basis of fair use rules – only available to faculty members. After their application has been authenticated (usually within 24 hours), faculty can access TUN. For Teradata's SQL Assistant software, a separate registration is necessary that is coordinated with the TUN authorization. Registered TUN users can make TSN available to their students. A registration procedure for TSN has been implemented in order to control database access (data sets are available for read-write access) and to collect usage metadata.

What differentiates Teradata's initiative from other software vendor offerings for education is that leading academics are primarily responsible for the TUN vision, the evolution of TUN, and peer reviewing of submitted material. The Senior and Associate Directors work together with Teradata and other Advisory Board members as a management team in order to ensure that TUN meets the needs of the IS academic community. Project teams, led by board members, work closely with Teradata staff to make decisions, test prototypes, obtain beta testers, and make design decisions. A usage survey has recently been conducted in order to gain insights into the needs of lecturers for teaching support.

All TUN / TSN content is reviewed by Senior and Associate Directors of the Board, i.e. by fellow faculty. As the value of TUN increases with any further material, faculty is invited to submit material to the Director of the Board. There is an easy-to-use content submission form that collects metadata about the submitted content and allows the submitting faculty member to attach the content or provide an URL where the content can be accessed. If appropriate, the reviewed content is released to TUN / TSN.

## **Using TUN Resources to Support Teaching**

By using TUN resources, diverse instruction forms in the fields of BI, data warehousing and database can be supported. This applies both to classroom-courses as well as to self-instruction (i.e. independent study) settings or hybrid forms thereof.

As starting point for the planning of a new and / or the adaptation of an existing course, different curricula are available in TUN. Based on these materials, the lecture part of the course as well as associated exercises, assignments, and even exams can be prepared. The numerous articles, book chapters, and research as well as practice reports available in TUN are particularly suitable to this end. Furthermore, some PowerPoint slides as well as web seminars that can be used for self-instruction purposes are provided in TUN, allowing for the immediate adoption in the respective

course. For the preparation of exercises, it is advisable to revert to the case studies available in TUN that can be worked on by the students individually or in groups. In most cases, TUN provides the course instructors with teaching notes, questions, and sample solutions.

Likewise, it is advisable to use the MicroStrategy BI Analytic Modules in connection with the exercises provided in TUN to make the students gain hands-on knowledge and develop a thorough understanding of the lecture materials. In order to become familiar with the MicroStrategy tools, it is advisable for both instructors and students to accomplish the MicroStrategy tutorial and to complete some lessons in the eTrainer. In the context of the tutorial, users have the opportunity to give reporting functionalities and navigation as well as the other features of the tool an unlimited and unrestricted trial (Wixom, 2004). The eTrainer is a web based training environment that allows users to learn about the handling of the MicroStrategy tool and to check the acquired knowledge. Topics covered include basic tool navigation, looking for a report, changing a report (both in form and content), storing and deleting a report, as well as exporting and printing documents (MicroStrategy, n.d.).

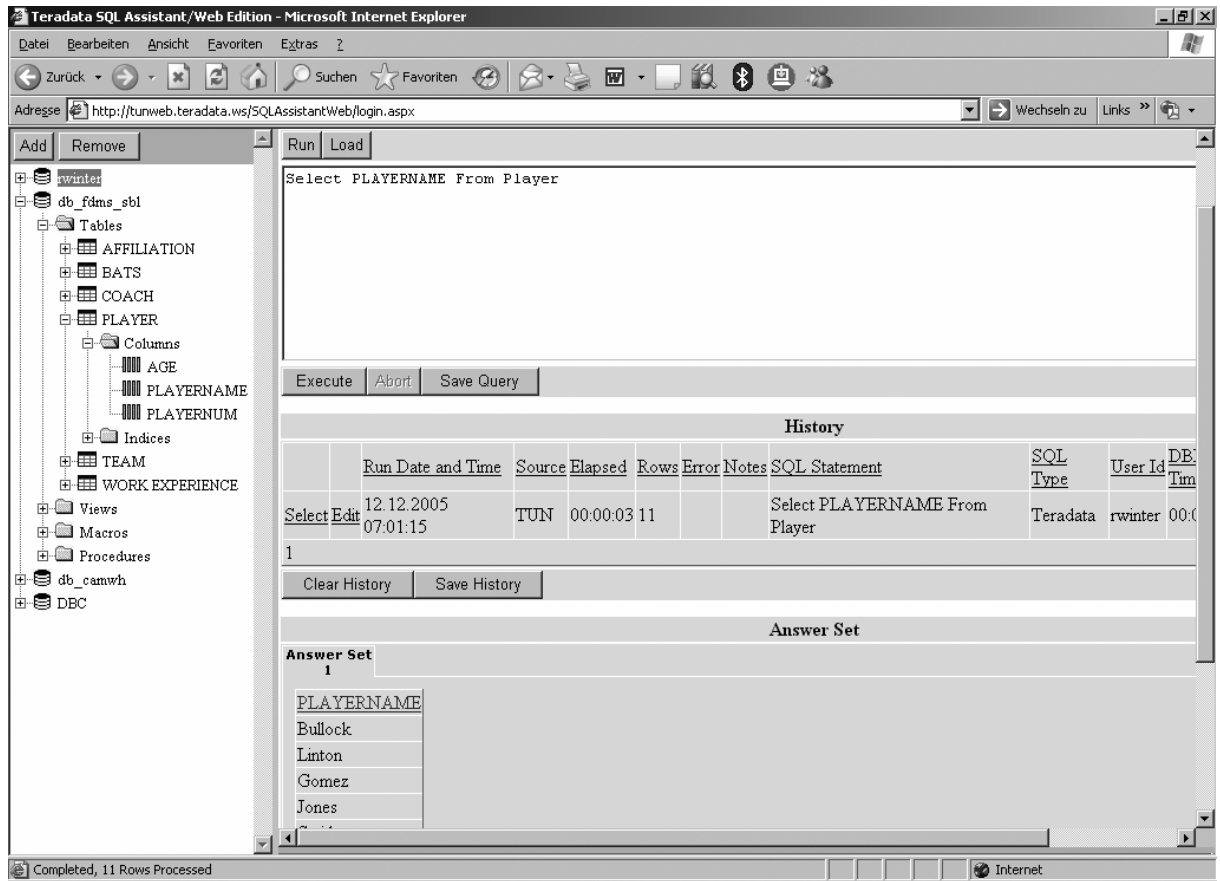


Figure 2: Teradata SQL Assistant Tool

In order to accomplish database exercises, the SQL Assistant tool can be used. With this tool, users are given the possibility to work on the Teradata database with adequate data sets in order to interactively learn how to develop SQL queries (see Figure 2). Besides accessing pre-defined data sets that are taken from popular database text books, it is also possible to upload individual data sets into the Teradata database. For the comfortable use of the SQL Assistant tool, course instruc-

tors have the opportunity to create and administrate dedicated course environments. By means of password protection it is possible to differentiate between databases used for in-lecture demonstrations and exercises, databases needed for assignments, and databases restricted to examinations. As a consequence, TUN and TSN users are granted both read and write access on the databases assigned to the respective course.

In addition, it is worth noting that some of the aforementioned resources (e.g. PowerPoint presentations, case studies, and exercises) contain teaching notes which further simplify the development of a BI or DWH course. In case this assistance should prove insufficient and/or students have questions relating to TUN resources, course instructors may contact the Teradata customer service. Within the scope of TUN support, inquiries are generally answered within a timeframe of no longer than 24 hours.

## Summary and Outlook

TUN is an innovative, effective support instrument for educators in the field of BI / MIS, data warehousing and database – and the application of such information systems for management support.

By supporting the development and execution of state-of-the-art, in-class as well as distance learning courses in these fields, TUN helps to prepare students in a realistic, yet theory-based way. A substantial amount of teaching material is made available by one integrated platform, and an easy, free-of-charge access to commercial software tools is provided. The costs for the development and maintenance of TUN and TSN are covered by software vendors (to a large extent by Teradata, a division of NCR Corp.) because they aim at a marketing impact on future executives – as well as on lecturers. As a consequence, the choice of software tools provided on TUN is a result of Teradata's business and partnership strategy.

As already mentioned, the advantages of TUN can be seen in the easy exchange of teaching materials and in the free-of-charge access to commercial software tools. However, the limitations of this platform have to be taken into consideration as well. Firstly, it has to be recognized that TUN will only stay interesting for academia if the available material is up-to-date. This implies that lecturers as well as companies will remain willing to make their own teaching materials and software tools available free of charge to others. Beyond figures about registered TUN users and aggregate TSN usage statistics, there are no validated findings yet about the actual use of the portal which might allow a focused evolution. However, this information will be available soon.

Useful extensions of TUN can be seen in the allocation of further teaching materials and software tools. With some materials already having been integrated, the full access to Hyperion's business performance management solution will be available shortly. Furthermore the addition of a data mining tool, CRM software, and a tool for data extraction, transformation and load (ETL tool) would complement the portal to provide a complete range of software tools. However, the integration of these tools as well as their evolution into a web-based ASP model take some time.

Thanks to an increased internationalization of curricula and teaching aids, significant demand for non English-language materials has not been articulated so far. The multiple indexing of the content as well as the new search functionality make it easier to reuse whole courses or parts of them, but they especially simplify the identification of certain content components in order to integrate them into existing courses. In order to support the integration of teaching materials into a broad range of courses and programs, however, it is planned to modularize TUN content in a finer way and to provide additional, searchable content metadata.

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## Biographies



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