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Developing an online database of experts for the Worcester Regional Chamber of Commerce

Zikan Chen

Clark University, zikchen@clarku.edu


Douglas Grey

Clark University, dgrey@clarku.edu

Pranjal Shah

Clark University, prshah@clarku.edu

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CHALLENGE CONVENTION. CHANGE OUR WORLD.

Worcester Regional Chamber of Commerce MSIT Capstone Project

Worcester Chamber of Commerce

Karen Pelletier

MSIT 3999 Professor

Richard Cehon

Project Members

Zikan Chen

Douglas Grey

Pranjal Shah

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Executive Summary

The Worcester Regional Chamber of Commerce as part of their mission to attract business to the Worcester area, want to create an online searchable database of industry experts made up of faculty members of the Colleges and Universities in the Worcester area. This online database will be placed on the Worcester Regional Chamber of Commerce Higher Education – Business Partnership page on their website. The limitations placed on this request are that the Regional Chamber as of this moment have no monetary or Information Technologies resources to provide for the realization of this request.

The proliferation of as A Service Information technology offerings provide a number of options for satisfying the request for an online searchable database of individuals, and some services are geared more specifically for this type of need and are intended for the nonprofit sector as well. The recommendation of this report is for the Worcester regional Chamber of Commerce to consider these options even if it requires a small investment of funds on their part.

Chapter One Introduction

The client in this case, the Worcester Regional Chamber of Commerce would like to create an online database of subject matter experts. These experts will be drawn from the colleges and universities in the greater Worcester area. They have generously offered to participate in a Clark University MSIT Capstone project to create this searchable online database of experts in the Worcester area with our assistance. The Chamber has in mind to create a searchable online database of faculty members of the higher learning institutions in the greater Worcester area. Their vision for this database is for it to help facilitate their mission of attracting businesses to locate themselves in Worcester Massachusetts.

The primary goal of the Worcester Regional Chamber of Commerce is to attract businesses to the City of Worcester. The Chamber strives to market the city of Worcester as a lower cost alternative to other metro areas, and one that contains significant numbers of academics and industry experts as a result of the concentration of university faculty in the area. The purpose of the online expert database is to continue to entice businesses to the area with the prospect of having access to the wealth of knowledge offered by the various higher education institutions, and the experts found within their faculties.

The Worcester Regional Chamber of Commerce describes itself as "The lead organization for economic development serving the region's business community." One of their many programs is their Higher Education – Business Partnership, this project will be part of this partnership, and will augment this program through the creation of the online expert database.

Precedents

This project is an idea for a way to enhance the Worcester regional Chamber of Commerce's Higher education – Business Partnership program. The idea is based on the fact that no such online expert database exists today, there had been such a thing in the past, however, it was not able to sustain its existence. The idea for the database is to collect data on subject matter experts in the Worcester area and house them in a searchable database. Chamber members would have access to this database and would presumably be able to tap into the expertise offered by this database of experts. The database would serve as a means of connecting colleges and business

experts to their mutual advantage, and contribute to the goal of the Regional Chamber of attracting businesses to the city of Worcester.

This project's idea was inspired by an organization no longer in existence, Choose Worcester Inc., was a non-profit marketing organization created in 2005 to recruit companies to Worcester. Choose Worcester went out of business in 2010, but during its five-year existence it was able to maintain an online expert database and is the model for what the regional Chamber would like to build with this capstone project. Choose Worcester has not existed for six years, and there is no online presence to study, so this project can only consider what Choose Worcester had from an anecdotal perspective, it is however the precedent for the idea of this project.

A review of other Chambers of Commerce was undertaken in an effort to find like examples of online expert databases, and to get a sense of the trends in the "industry" of Chambers of Commerce. The two Chambers investigated were ones with similarities to the Worcester Chamber. The common characteristics include an urban setting, and a local concentration of Institutions of higher learning. These qualities are not unique to Worcester, but largely define the setting conducive to the Worcester Chamber's expert database concept. Two local Chambers of commerce in a similar setting are the Greater Providence Chamber of Commerce, and the Greater Boston Chamber of Commerce. Both are in mid to large urban areas, and both boast a concentration of colleges and universities.

Neither Chamber's web presence contained an expert list or database of academic faculty that is accessible to a typical user of their web sites. The Greater Boston Chamber's site makes mention of a group for members to network in but it does not appear to be anything like what the Worcester Chamber wishes to implement, and only members are allowed access, according to their site their "Chamber Networking Group" is described as, "The Chamber Networking Group is designed specifically for our small- to medium-size member companies, who want to expand their network of business contacts, generate new business leads, and learn the most effective strategies for networking. Held every other month, these events are free and are open to Chamber members only."(Greater Boston Chamber of Commerce)

Similarly, the Greater Providence Chamber of Commerce's web site does not contain an online expert database of local university faculty. Their site does acknowledge the concentration of academia in Providence stating "Rhode Island, essentially, is one big college town. With deep concentrations in academia, we have a remarkably large, well-educated talent pool for a state of

our size. The problem for most businesses, however, is finding and tapping into that workforce. The GPCC understands the conundrum."(Greater Providence Chamber of Commerce) They however have not apparently made the effort that the Worcester Chamber is undertaking with this Capstone project.

This hardly represents an exhaustive search of regional Chambers of commerce, but if they did in fact maintain an online expert database it could have served as a data point and an avenue for further research.

There are other such online databases in existence, one example being the site <http://experts.news.wisc.edu/>, and this site is hosted by the University of Wisconsin – Madison, and is a list of experts' guide for local media to search. This site and others found through research will help to define what is possible for this type of project.

The specific characteristic of this project being that the Worcester Regional Chamber is a non-profit organization, and its intent is to maintain an online database of contacts. A non-profit organization maintaining an online list of names is not uncommon, Other non-profits whose mission is to more altruistic and attempts to benefit underserved populations may often maintain an online list of donors, this is similar in concept to the Worcester Chamber's idea, and in practice would be implemented in a similar way.

Worcester Regional Chamber of Commerce High Level Request

As part of the capstone process the Regional Chamber submitted a Capstone Client Project Request (see Appendix 1), in their request they outlined their vision as follows:

The Worcester Regional Chamber of Commerce Higher Education - Business Partnership wants to establish this searchable expert database in an effort to connect new and existing businesses with industry-specific experts in the region. This database will also be designed to assist in showcasing faculty expertise and help promote interdisciplinary collaborations and research partnerships with area businesses and other institutions. To identify a faculty expert, simply search for a topic, a name, etc.

Worcester, with its population just over 182,000 and more than 35,000 students, is home to 12 colleges and universities. From the founding of the College of the Holy Cross in 1843 to the most recently opened Massachusetts College of Pharmacy and Health Sciences, Worcester offers

students a wealth of learning opportunities - including a first-rate teaching hospital, and a top-notch veterinary, pharmacy and bioengineering school.

Worcester area colleges and universities have hundreds of faculty members with a variety of expertise in almost every discipline. Some of their areas include robotics, gaming development, big data, and franchise development.

The new system must include the following:

- Ability to allow both internal and external users to access the application without downloading any software.
- Database needs to be searchable by keyword, name, and institution.
- “Live” database that can be added to as experts change and update their info:
- **Example:** Faculty members and administrators are invited to submit information about themselves to the database via an online form. The questionnaire includes options for submitting new entries, as well as updating existing entries. Please note that only Worcester area faculty and administrators are included in the database and all submissions are reviewed before they are posted online.

Problem Statement

Implementation Issues

This project is a new initiative within the Regional Chamber, the Overview, Scope and Goals are briefly defined in the Capstone Project Client Request (Appendix 2). The idea for this online database has not been attempted, nor has requirements gathering been done previously at the Regional Chamber. There are no previous strategies within the Regional Chamber to evaluate in this project, this represents a new initiative for them and might qualify as a "nice to have" level of criticality. The previously existing Choose Worcester economic development office's site did contain an online searchable expert database, however Choose Worcester has been defunct since 2010 so no actual example of its implementation exists, and therefore we cannot use it as a research resource for this project.

The Regional Chamber has this idea for a project, but their resources for the implementation of it are extremely limited. The resources the Regional Chamber can devote to their initiative are constrained by two major resource limitations.

1. The Regional Chamber has indicated they no budget for their project, at this time there are no funds earmarked for this project. This does not preclude the possibility of them making a modest investment in a solution, they have expressed that a cloud solution, for example, with a nominal cost is not out of the question. However, the constraint of no budget for this project is considered a firm constraint.
2. The regional Chamber has no in-house Information Technology department, and no Information Technology professional on their staff. This represents a minor constraint. The Regional Chamber does ha an online presence with their website which is maintained by a third party vendor. They are able to maintain their operation without a technology professional on staff, and adopting a third party solution for this online database initiative is consistent with their situation and common contemporary practice.

The expectation on the part of the Regional Chamber is that resources for the development of this project can be sourced exclusively from local colleges and universities to develop the project requirements, and to perform all coding and development of the collected requirements. Leveraging local students to create the systems requirements documentation and to also perform the coding of the requirements would provide an opportunity for the Regional Chamber, and local college departments needing "real world" projects for students to work on. This utilization of purely college student resources to complete the project at no cost to the Regional Chamber is their vision for the project since they have no monetary or personnel resources available to commit to the effort.

Despite the indication from the Regional Chamber that there are no monetary or IT resources available for this project, the scope of the deliverable will still be considered as a project that has IT and budgetary resources. In a typical such project, a systems requirements document would be used to gather implementation options that would be recommended to the client. Typical options include in-house development versus an out sourced solution, this is of course commonly known as the question of "make or buy".

A vendor would be found that's qualified to code the requirements as collected, an "off the shelf" solution would be identified, as well as a cloud solution would all be presented and contrasted to allow the client to choose the solution they feel best suits their requirements.

A best solution or all the solutions in order of recommendation would be presented to the client to choose the implementation they prefer. Having established that the client in this case has no budget for any such solution, it is still incumbent on us the Capstone facilitators to fully go through the exercise of finding and recommending these various options to the client. This Capstone project is still fundamentally an effort in requirements gather, the translation of user requirements into system requirements, and the recommendation of a vendor and or solution as the project deliverable. A search of solutions that the client may not take advantage of would serve to benefit them in that they have options to choose from should their resources availability change.

Project Purpose

The purpose of this project to take is to collect requirements, and research vendors/solutions. The project will also attempt to identify potential Computer Science departments in need of student projects. There are hopefully Computer Science departments at local Worcester institutions that seek opportunities for student projects, much in the way Clark University solicits projects for the MSIT Capstone project. The concept of having this online database built by students is what the Regional Chamber is hoping for, to make their online expert database a reality. We will create the systems requirements documentation and search for and present multiple solutions recommendations including a suitable college program that is in need of such a development project.

Project Significance

The significance of this Capstone Project can be viewed from two perspectives. The Capstone project serves as the final project in the Clark University MSIT program, and the significance the project deliverable will play in the Worcester Regional Chamber of Commerce realization of their purpose. The Capstone Project is intended to serve as the culmination of the MSIT students successful completion of the program, and the opportunity to put the skills learned in the various classes to work in a project for real client. In terms of the significance of the Capstone Project deliverable to the client, this request qualifies as a "nice to have" solution. The

online expert database is not a legal or otherwise mandatory requirement, nor does it qualify as a business critical requirement. It is not a requirement without which the Worcester Regional Chamber cannot function, and they are currently functioning well without it. The Worcester Regional Chamber feels this online expert database will be another helpful resource to use in their effort to attract and retain businesses to the Worcester area.

In the Subsequent Chapter two subjects will be discussed. Research on trends in the industry of non-profits, and specifically non-profit organizations use of online databases will be considered. The topic of Data as a service will also be covered in some depth. As the current trend in most organizations is towards an outsourcing model for IT functions, and data services in particular this subject merits some explanation. This is particularly relevant given the nature of this project request, and the limited resources the Worcester Regional Chamber has allocated for it.

Chapter Two Literature Review and Trends in the Industry

The Two Industries to Consider

Two industries converge in this project, the non-profit organization and the IT outsourcing Industry. Organizations continue to move towards outsourcing of non-core competencies in order to achieve the efficiencies realized from said outsourcing. A not for profit organization is not different from an enterprise organization in its need for more efficient operations, and in many real-world instances are less well funded and equipped to manage the necessary technology assets they require to operate effectively.

New Information outsourcing products and services continue to be developed and become available to organizations as A Service. Countless offerings are being developed and offered at extremely moderate costs to potential customers. The evolving array of AS A Service offerings are at this point too numerous to consider in their entirety, and exist in a range of highly specialized areas of focus.

Non Profit Organizational Trends

In order to review trends in nonprofit organizations use of online databases one has to examine non-profit industry trends a little more broadly. Non-profits are largely funded by donors, so maintaining an accurate donor database is a common requirement at non-profit organizations. Obviously technology is needed to facilitate this, and nonprofits particularly seek to accomplish as much as possible with the budget constraints they have. This immediately points to the trend of Information Technology outsourcing that is utilizing low cost hosted solutions to satisfy database requirements. Also the requirement that databases be accurate is an imperative, particularly where donor relations are concerned.

There are multitudes of donor management applications available to nonprofits, complete of course with mobile applications that run on ubiquitous smart phones. These applications are broadly known as donor management applications, and they are necessarily coded for mobile platforms. The online donor database provides the nonprofit the ability to identify donors more likely to give and those that are less likely to make a contribution. This enables the nonprofit to spend its capital on donors more likely to contribute new donations.

Technology and Database Trends

Nonprofits are wise to invest in simple tools that do not require an investment in hardware or software applications, and solutions that do not require in-house Information Technology experts. A typical recommendation is one from Nonprofit Hub Magazine as follows "...technology can be liberating. You don't have to be tech-savvy in order to benefit from technology. Just focus on three areas: simple apps and web tools; your website CMS; and donor database and/or member management tools."(Wilkinson, Jay). A trend or recommendation such as this is consistent with typical Information Technology trends for all organizations. Databases like outsourcing are trending in a direction specific to the technology itself, but the literature reveals some recommendations written specifically for nonprofits.

Recommendations for non-profit databases fall into six major requirements (Tech Impact), and these recommendations all are consistent with the concept of Information Technology being tightly aligned with the organization's strategy, as well as redundancy and data security concerns. Non-profits like everyone else cannot hire Information Technology specialists such as a database administrator, nor do they probably need to have a sql guru on their staff given the outsourcing options available today. Advice on the subject suggests six qualities the non-profit should consider in their database solution.

Workflow

The database system should integrate with the organization's workflow. Again the literature views the database through the lens of donor management, but none the less the information should be accessible when and where it is needed in the organization's processes. It is also desirable that it can be polled or otherwise integrated to facilitate updates and reminders as needed by the organization.

Trust

The nonprofit organization needs to be able to trust the data in their database. This means it must be accurate and be accessible easily to get updated, and scale well as the organization grows. This is not strictly dependent on the technology itself, the dreaded "garbage in garbage out" or worse, "garbage in gospel out" is a result of procedural and administrative failures in the management of the data. This naturally leads to the next quality Authorization.

Authorization

Authorization and administration of the database is important to ensure the validity of the data, and that it can be trusted. The database must be accurate and available to staff who need the information to perform their daily functions. This speaks to how data is updated and is there a database manager or more than one, and how do they keep the data clean and available.

Value

Quality four according to Tech Impact is value, "Does your CRM help you build and maintain relationships?"(Tech Impact) This is the obvious must or why have it in the first place? A database/donor management application should automate mundane tasks freeing staff up for more important organizationally critical work. The system should also not require an inordinate amount of maintenance, again it should be as simple as possible and easily updated.

Security

The database must be secure and redundant, is the data protected from intentional and unintentional damage, and is it backed up so that it is protected from loss in the event of a system failure? Weather the nonprofit hosts their database onsite on a server or outsources it to a cloud provider the requirement is the same. The organization "should ensure that all data is backed up, recoverable, and protected from outside interference and security breaches."(Tech Impact).

Support

The last consideration is support; this relates to all the previous qualities. Who is responsible for the technology aspect of the system? Again the database solution is either going to be in house or outsourced. The advantages are many, with relatively little risk in an outsourced cloud solution. The various as a Service offerings provide opportunities for database management that at one time would have required an investment in in house technology and support. The absolutely critical consideration is to back up the outsourcing agreement with a clearly defined Service Level Agreement that is negotiated with the vendor that protects the nonprofit's interests in all the six areas covered here. A service-level agreement (SLA) is a negotiated "Agreement" between the two parties: the "Client" and the "Service Provider". The SLA represents a common

understanding about services, priorities, responsibilities, guarantees and warranties. In some cases, predetermined and agreed-upon penalties may be applied if one of the parties does not comply with the agreement, and the SLA can be a legally binding Contract. (Cloudaccess) As organizations continue to move towards outsourced cloud solutions, and cloud solutions continue to evolve and provide more specific services that satisfy particular needs, a review of as a service offering, particularly data as a service will also be reviewed as background information for this project.

Data As A Service as part of the As A Service Information Technology Industry Trends

Today organizations are trying to maximize the benefit of the Information technology part of their operation in many evolving ways. The need to have IT strategy tightly aligned with the business strategy is now an imperative. Very little of anything business or otherwise is done without the aid of computing power, data networks, the internet or increasingly data, and data analytics. The discipline of Business Intelligence seeks to transform data to information, to enable fact based decision making, to direct the course of the organization at a strategic and operational level. Organizations also continue to attempt to minimize the cost of doing business, while continuing to lean more heavily on IT to meet the business's need for the highly prized competitive advantage. Contemporary Wide Area Networks and the throughput they offer as well as other advances have made it possible for IT functions to be abstracted and offered as a service. These "As a Service" offerings are commonly categorized as Infrastructure as a Service, Platform as a Service, and Software as a Service. These outsourcing models offer the opportunity to resolve the conflicting need for better and cheaper IT as it aligns with the business strategy. The latest and natural evolution of As Service offerings is Data as a Service (Pringle pg. 2) which provides data and data analytics as a service to the organization.

Rationale for Data As A Service

First and foremost, it is imperative that businesses employ a sound business intelligence methodology to improve management's decision making. (Sharda et al. pg. 9) This is accomplished through the implementation of data driven fact based decision making. Informed fact based decisions need to be based on accurate information. Finding or creating accurate information is the culmination of morphing raw data into information, then into Intelligence that

objectively informs decision makers, so they then can (hopefully) make the correct decision. This decision making is most importantly manifested by action within the organization, information that is not acted upon, and actions resulting from bad decisions, both serve to imperil the business. This information sourced action is taken at all levels of the enterprise from the strategic to the operational level. The root and raw material of this hierarchy of informed action is data. It is well known that data is growing rapidly in terms of volume and type, and data is more urgently needed for businesses to better understand themselves, their customers, and their industry. Evolving technology is permitting individuals within an organization to discover or generate information through easy to use user interfaces. Enabling less technical people with analytic power allows someone who is not a data scientist or statistician with an advanced degree and experience, to produce results that once required such skills.

Again the motivation for data analytics is to improve management's decision making capacity by utilizing factual and predictive data as evidence to qualify the direction taken by the organization.

Data mining is a popular term at the moment, but it is a bit of a misnomer, information mining, or knowledge mining; that is digging information out of the data, is the object no matter how it is termed. (Sharda et al. pg. 149) The typical outsourcing motivators are in play for a business to investigate the opportunities associated with Data as a Service.

A Definition of Data as a Service

Data as a service encompasses several methodologies with variations depending on the intended audience and business objective. At the core Data as a Service is defined as "the sourcing, management, and provisioning of data delivered in an immediately consumable format to organization's business users as a service"(Pringle pg. 3) DaaS again is another as a service model in which the expertise, the investment in the technology, the investment in the skilled professionals is made by the service provider. The consumer or customer does not have to build a data analytics department, or a data warehouse, or even collect and store data to use large data sets for information analytics. There is a move towards a revenue model that utilizes a subscription for services to generate a recurring income stream by software vendors such as Adobe. This revenue model fits coherently with the as a service model. (BrightPlanet pg.3) The "pay as you go" billing as perceived by the buyer conveniently and affordably replaces the businesses/customer/users

costs associated with an in house development of an information mining operation. An organization's make or buy decision weighs initial investment in new technology, personnel, and support expenses against the outsourcing cost, and allows the business to maintain focus on its core competencies. With today's well publicized explosion of data from clickstream activities, social media, POS, CRM, RFID, and the insights gained from the analysis of these data, Data as a Service seems a natural evolution of the as a service model. As a vendor, Data as a Service offers a business model that should be well received by customers, and as an organization needing information analytics, DaaS offers a cost effective solution.

Implementation Models

There are multiple ways in which the provider of DaaS can offer their service, and the corollary to this is the ways in which the consumer takes advantage of these services. The spectrum of customers may range from those who want results produced from analytics, to those who wish to run their in house analytics on a cloud based platform. Data as a service has to be viewed with in the context of the as a service stack. The generally accepted as a service stack consists of from bottom to top: Infrastructure as a service -> Platform as a service -> Software as a Service with Data as a service residing on the top layer alongside SaaS. (Pringle pg. 4) Data as a Service can be broken down into its own stack to more clearly define unique services available at each level, and the technology required to provide the services at each level of the DaaS stack.

From the perspective of the service provider there are essentially four methods of offering Data as a Service and these four can be defined as the level of abstraction of the system from infrastructure to analytics software. (EMC Solutions Group pg. 8) The four layers of abstraction from bottom to top can be defined as Cloud Infrastructure, Data Fabric, Data Platform as a Service, and Analytics Software as a Service. (EMC Solutions Group pg. 8)

Analytics Software As A Service (Analytics Applications)
Data Platform As A Service (Analytics Programming Environment)
Data Fabric (Data Management and Aggregation)
Cloud Infrastructure Service

Four levels of Data as a Service Abstraction (EMC Solutions pg.8)

Cloud Infrastructure Service

The bottom layer, Cloud Infrastructure Service is the typical cloud service model in which hardware, data storage and infrastructure management are hosted at the service provider's location, and provided as a fee for service product. A benefit that the large service provider can take advantage is the big data that their hosted applications generate. This big data generation is a source of data that can be offered as raw data or can be cleansed and further processed in the service provider's infrastructure creating an asset the provider can utilize to their advantage.

Data Fabric

Data Fabric service can be fundamentally described as aggregation and management of a particular data set and allowing controlled access to it via an Application Programming Interface. (EMC Solutions Group pg. 8) The Data Fabric layer of the model can be categorized as Data Management Service in a broader context of a Platform as a Service offering, or a standalone Database as a Service, or a data aggregation and availability service. An example of a data aggregation and availability service is Google Public Data Service, or Bing Public Data Sources. These services are web based and provide user access to multiple public data sources that can be

queried instantly. For example, on Google Public Data one can access the CAIT 2.0 International Emissions database. Selecting it launches a page that has predefined options for querying the data and produces a line chart of the results. This is not a link to the actual database or the CAIT site (<http://cait.wri.org/>) but a user interface that queries the data that is external to Google allowing the user to run instant queries with pre-defined x and y axis variables (http://www.google.com/publicdata/explore?ds=cjsdgb406s3np_). This could be considered almost an application layer service (without delving into the seven layer OSI stack); however, it is really managing the underlying data fabric.

Another form of Data management and Aggregation at the Data Fabric layer is making database services available to applications along the lines of a PaaS offering. (EMC Solutions Group pg. 9) This involves making database services available to applications deployed within the PaaS environment. The data itself can be any type of data store such as scale-out unstructured data, online transactional data stores, analytics databases or a relational database. This also includes stream processing or real-time data as it is known, at this level the data is made available as it is collected. Users of the service tap into the data stream to perform their desired analytics as the data is streaming from its sources. The business value to the consumer is that they need not invest in a Data Warehouse, nor do they need an infrastructure that generates masses of real-time data such as a large scale Online Transaction Processing System. An organization can engage in analytics on any scale with little financial investment.

Data Platform As A Service

The Data Platform As A Service layer is characterized by providing the tools to analyze and manipulate the data that is aggregated and managed by the previous level of Data Fabric. This level offers to provide applications and scripts for the analysis of data, and the data to the customer. The customer can upload their own data sets to the Data As A Platform service, or utilize the data and the tools provided by the DaaS vendor to run their information mining efforts. This level of DaaS is appreciated and used by a more technical level of customer such as data scientists or organizations offering information products to their customers. At this level the service provider bears the responsibility for the infrastructure management, data, and applications, and the customer has access to the resource for a fraction of the investment required to build and manage such an infrastructure. As an example Oracle offers a Database as a Service offering they

term DBaaS. According to Oracle it "defines different "tiers" or classes of database service based on standard templates. An online catalog defines varying sizes, service levels and appropriate levels of chargeback for each tier. Authorized users can select the databases they need from this catalog, consume those services for the duration of a project, and then automatically de-provision the databases and return them to the resource pool". (Oracle pg. 5)

Analytics Software As A Service

This level represents the highest level of abstraction of the actual computing, database, datacenter infrastructure assets to a level approachable by less technical users. The Analytics Software as a Service provides applications, queries and reporting tools that an organization would need in house data scientists, developers and database administrators to facilitate. Users of this level of Analytics SaaS might be familiar with setting up dashboards, generating reports, or running queries that were developed for them by more technical individuals. This level also tends to be focused on more vertical markets, being less horizontal than the lower levels in this four-layer exercise. (EMC pg.9) This level of Data as a Service can be accessed online or acquired through interactions with a vendor's consultants. The CAIT website offers Online tools to view collected data on emissions related subjects presented as map and other visualizations, It has the added benefit of being free and open source. An example of a vendor offering Software Analytics as a Service layer offering is Splunk. Splunk's offers such things as tutorials for users to learn to run their own Hadoop searches and analytics. Another of Splunk's offerings is integration with Amazon which allows the customer to "Leverage automatically configured Hunk instances provisioned by AWS, priced hourly, for data in Amazon EMR and S3, directly from the Amazon EMR console". (http://www.splunk.com/en_us/products/hunk.html)

Pricing Models

Data As A Service pricing generally falls into two categories, data priced by volume and data type, with the consumer/businesses access being through an Application Programming Interface call to the remote hosted database. A billable unit is considered a "call" which "is a single request/response interaction with the API for data."(Soderling) With volume pricing, access to the data may be billed by calls per day or a flat rate for an unlimited number of calls known as the "fire hose" approach. Data priced by data type, may have a base rate for a certain level of

detail of data and additional drill down or supporting data points incur an additional charge. In 2010 Soderling suggested that an API call might incur a charge of "a few cents, for each call to the API", It's not hard to quantify the economic advantage at such a price.

Data Privacy and Security

The decision to utilize data as a service has the incumbent data privacy and security dangers inherent in the cloud computing model. Recent and evolving regulatory requirements such as Sarbanes Oxley and HIPPA impose strict requirements on information handling and validation backed up by penalties. A business who uploads and stores its data in cloud, and the data center that hosts it, enter into the agreement to do so based ideally on appropriate Service Level Agreements, and responsibly negotiated contracts. The small business or nonprofit that accesses cloud based data stores for purposes of intelligence mining must be prepared for any privacy or security eventuality that results from this outsourcing arrangement. The fact is that information mining is now an area businesses are scrambling to exploit for a competitive advantage; or perhaps more correctly to be on par with their competitors. This means cloud housed Data as a Service is an imperative, and vendors and consumers alike are responsible for the ethical handling of data security and privacy.

Data as a Service as a Business Asset

Data as a Service is well positioned to offer cost effective outsourcing option especially given the fact that businesses are moving towards focusing on core competencies and outsourcing non-core functions. A business can upload its data to the DaaS vendor and use the service for analytics, and smaller businesses in particular can run analytics on someone else's data! For business it offers the benefits of scalability, no internal development and infrastructure costs, and most importantly cost effective access to large databases (Big Data) for their analytics efforts. (Linthicum) Businesses are also enjoying an expanding array of DaaS services they can take advantage of. This is true particularly as vendors offer single purpose databases aligned with a vertical focus such as CRM or analytics, and many feature try before you buy offerings. (Linthicum) Many vendors providing all the layers of abstraction of DaaS offer case studies highlighting the benefits their offerings have brought to their customers. These case studies focus on the drivers one would expect, cost savings, increased profits, increased customer satisfaction,

quick return on their investment; the reader may easily find such case studies on the vendors' web sites. As stated earlier there is no upfront cost to the consumer of DaaS, businesses can purchase the service typically on some sort of tiered or usage based pricing model.

Conclusion

The discussion of typical nonprofit organizations database requirements and outsourcing with as a service offering is presented as a backdrop of information relevant to this project. The small nonprofit such as the Worcester Regional Chamber of commerce is not going to invest in in house Information Technology assets, and given the outsourcing options currently available it wouldn't make sense for them to do so. The salient point is that ideally Information Technology is tightly coupled with the organization's strategic implementation of their vision. IT is not an exercise for its own sake it must enable the organization to achieve their objectives as efficiently as possible.

A fine example of an online database of individuals similar to that which The Worcester Regional is requesting is currently maintained by The Greater Worcester Community Foundation. They maintain an online Consultant directory at <http://www.greaterworcester.org/Nonprofit-Support-Center/Consultant-Directory> , which according to their website "The directory is a searchable database that provides nonprofit organizations with information about the skills, specializations, and interests of individual consultants who serve our region." The database is accessible through a link on their page, once accessed there are additional links for anyone to search the database, a hiring link, and a link for members of the database to update their profiles. A user can search the database with a keyword search, by geographic region, there is an advanced search option or one can simply view the whole list.

Chapter Three Methods

Design:

Database Design is the process of producing a detailed data model of a database. This data model all the needed logical and physical design choices and physical storage parameters needed to generate a design in a data definition language, which can then be used to create a database. A fully attributed data model contains detailed attributes for each entity.

The term database design can be used to describe many different parts of the design of an overall database system. Principally, and most correctly, it can be thought of as the logical design of the base data structures used to store the data. In the relational model these are the tables and views. In an object database the entities and relationships map directly to object classes and named relationships. However, the term database design could also be used to apply to the overall process of designing, not just the base data structures, but also the forms and queries used as part of the overall database application within the Database Management System(DBMS)

The process of doing database design generally consists of a number of steps which will be carried out by the database designer. Usually, the designer must:

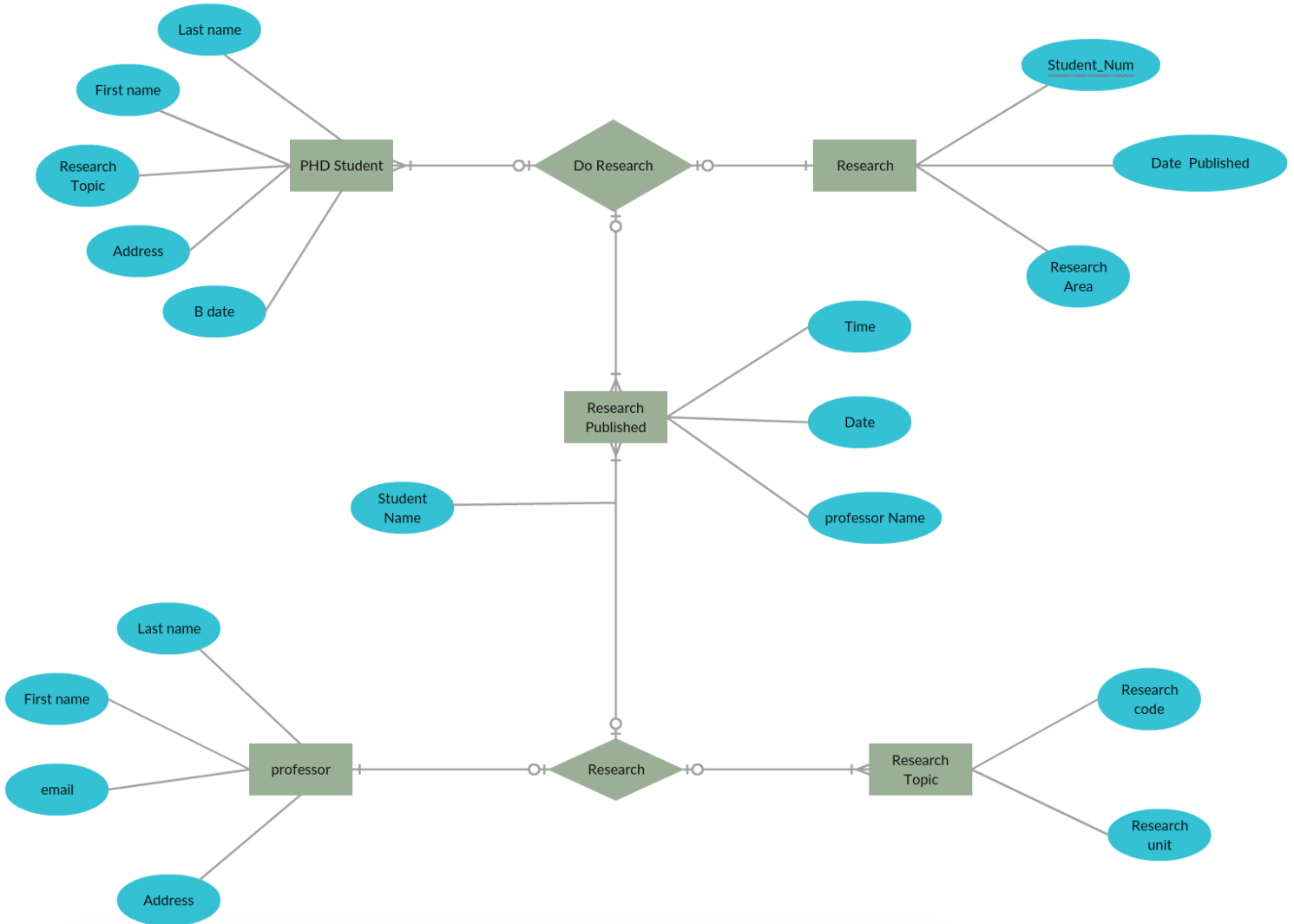
- Determine the data to be stored in the database.
- Determine the relationships between the different data elements.
- Superimpose a logical structure upon the data on the basis of these relationships.

Within the relational model the final step above can generally be broken down into two further steps, that of determining the grouping of information within the system, generally determining what are the basic objects about which information is being stored, and then determining the relationships between these groups of information, or objects. This step is not necessary with an Object database.

ER diagram (entity-relationship model)

Database designs include ER (entity-relationship model) diagrams. An ER diagram is a diagram that helps to design databases in an efficient way.

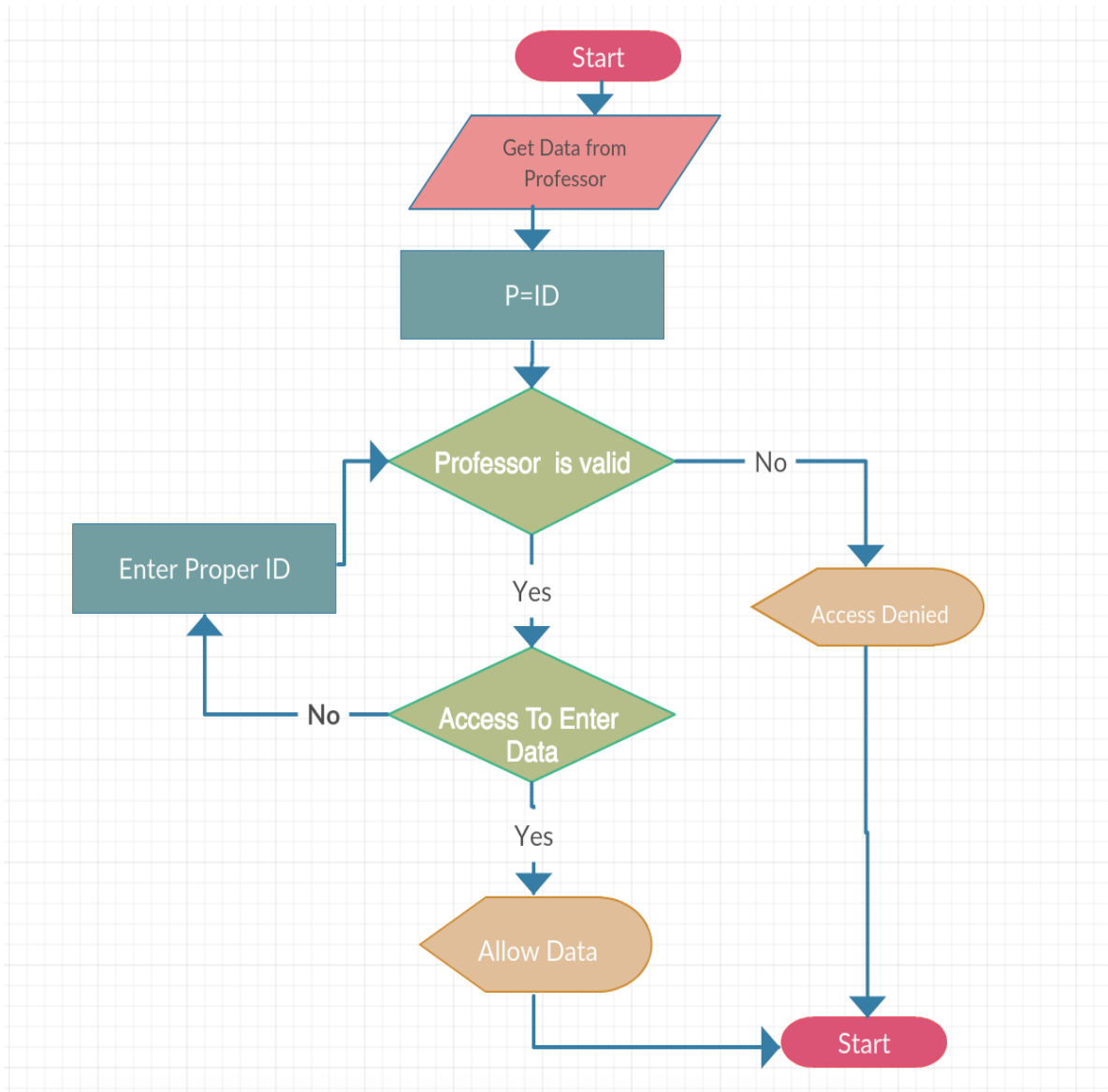
Attributes in ER diagrams are usually modeled as an oval with the name of the attribute, linked to the entity or relationship that contains the attribute.



ER Diagram for Research Management System for Professor and PHD Student

Flowchart Diagram

A flow chart is a type of diagram that represents an algorithm, workflow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.



Flow Chart For Validating Professor Id To Enter Data

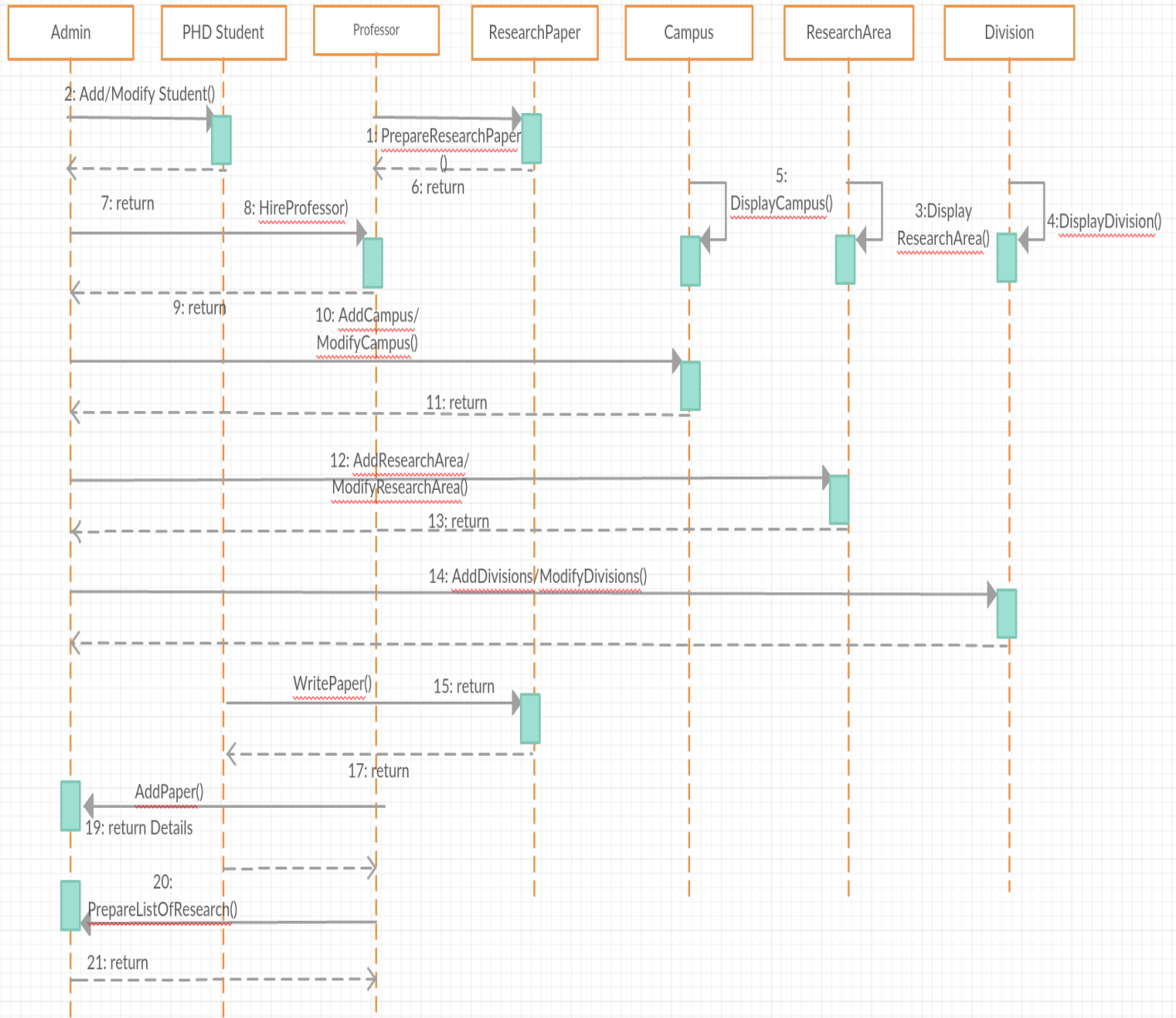
Sequence Diagram:

A Sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations

in the Logical View of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.

A sequence diagram shows, as parallel vertical lines, different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner.

Messages, written with horizontal arrows with the message name written above them, display interaction. Solid arrowheads represent synchronous calls, open arrowheads represent asynchronous messages, and dashed lines represent reply messages. If a caller sends a synchronous message, it must wait until the message is done, such as invoking a subroutine. If a caller sends an asynchronous message, it can continue processing and doesn't have to wait for a response. Asynchronous calls are present in multithreaded applications and in message-oriented middleware. Activation boxes, or method-call boxes, are opaque rectangles drawn on top of lifelines to represent that processes are being performed in response to the message.



Sequence Diagram for Admin, Professor and Student

Class Diagram:

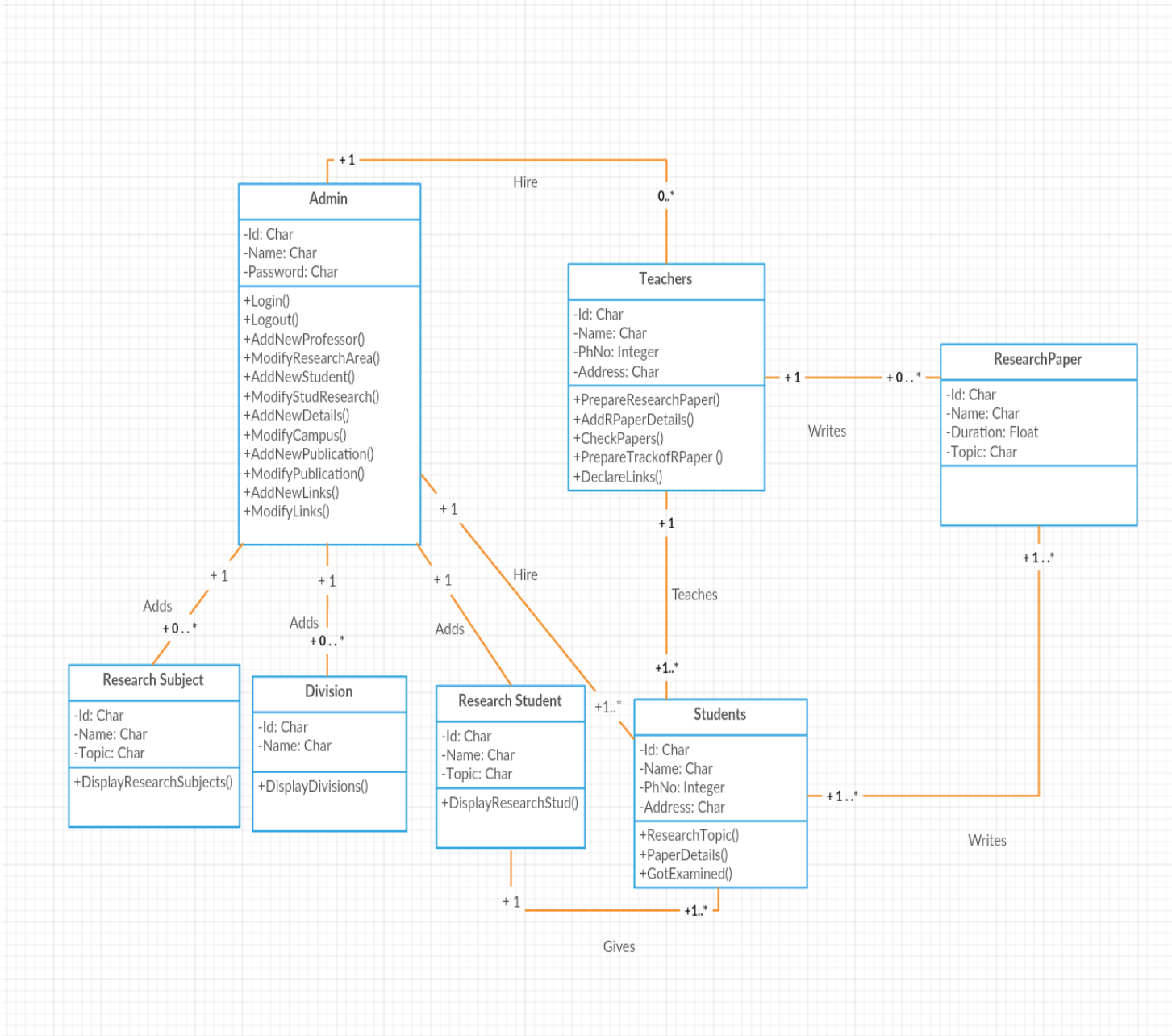
A Class Diagram in Unified Modeling Language(UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations or methods, and the relationships among objects.

The class diagram is the main building block of Object-Oriented modeling. It is used both for general conceptual modeling of the systematics of the application, and for detailed modeling translating the models into programming code. Class diagrams can also be used for data modeling. The classes in a class diagram represent both the main elements, interactions in the application, and the classes to be programmed.

In the diagram, classes are represented with boxes that contain three compartments:

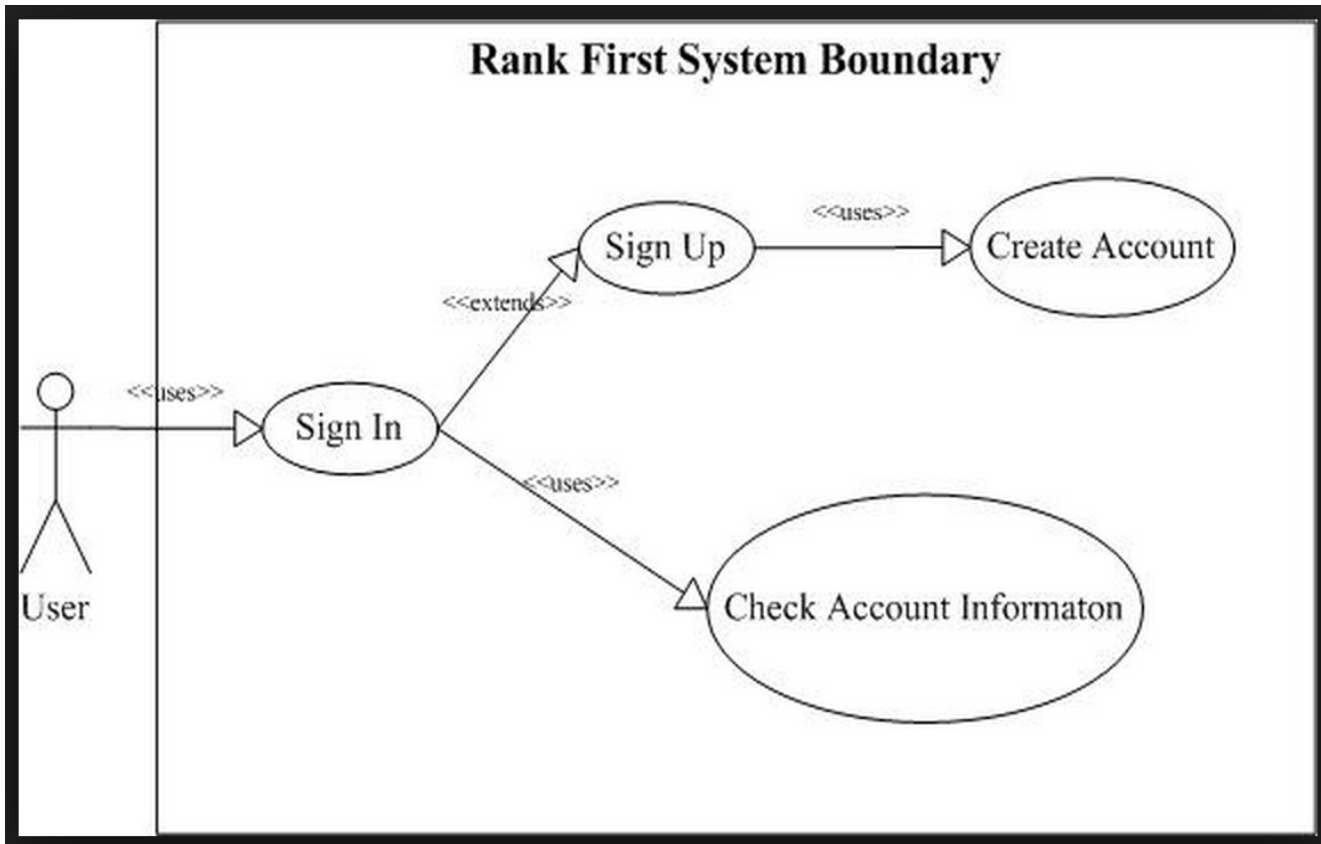
- The top compartment contains the name of the class. It is printed in bold and centered, and the first letter is capitalized.
- The middle compartment contains the attributes of the class. They are left-aligned and the first letter is lowercase.
- The bottom compartment contains the operations the class can execute. They are also left-aligned and the first letter is lowercase.

In the design of a system, a number of classes are identified and grouped together in a class diagram that helps to determine the static relations between them. With detailed modeling, the classes of the conceptual design are often split into a number of subclasses.

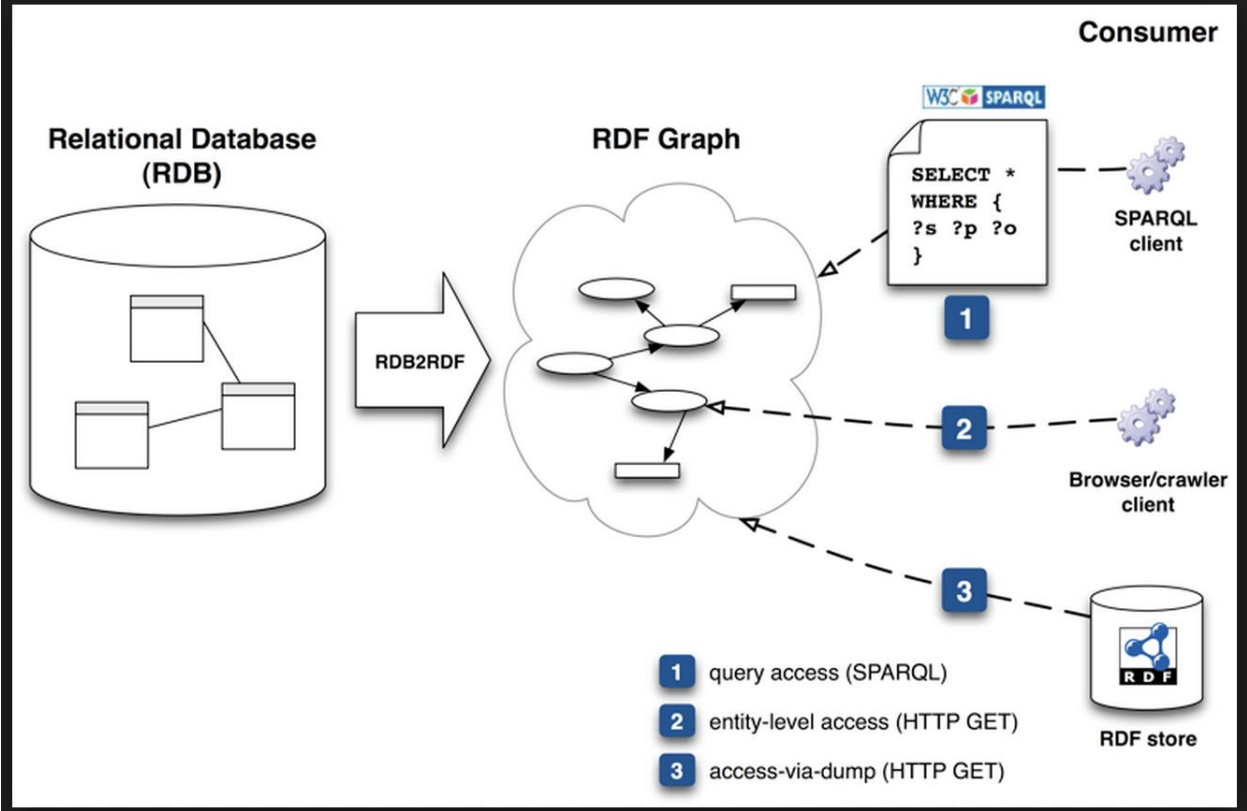


Class Diagram

Login Page For User:



System Diagram:



Budget Chart

Milestone	Start Date	End Date	Budget	Manager	Duration
Database Development	05/20/2016	11/12/2016	\$ 2000.00	All	6 month
Creating Tables	5/30	6/20	\$ 700.00	Pranjal	20 days
Hosting	6/21	12/30	\$750.00	Doug	6 month
Apply query	6/8	6/16	\$ 350.00	Zikan	1/7
Interior Design	7/3	7/15	\$ 3500.00	Doug/Zikan	1/11
Technology Design	7/18	8/1	\$ 2,090.00	Pranjal	1/13
Testing	8/12	9/16	\$ 5,050.00	Pranjal	2/3
Implementation	9/29	10/23	\$ 28,000.00	All	1/23
Maintenance	10/22	12/30	\$ 6,000.00	Zikan	2/3
Contact Utility Company	11/27	11/30	\$ 2,250.00	Doug	1/2
Hire Staffs	11/1	12/5	\$ 10,000.00	Pranjal/Doug	2/2
Train Staff	12/7	12/20	\$ 4,600.00	All	12/30
Total			\$65,840		

This Budget Chart represents the eternity of the project, how and what exactly will be needed once project development is under work. Even it shows how much funding will be needed for the formation of the database and is the cheapest option that we could figure out.

As we see in chart this is a process of Database Development where value is evaluated:

- Table Creation
- Design
- Testing
- Implementation
- Hosting
- Maintenance
- Utility
- Staff

Materials:

The development of this database includes various techniques like developing prototype and design for the project as recommended different types of software will be used and UML diagrammatic representation will be done.

Bulk Upload of data for clients with customized requirements, Extract Data from various Client based and cloud based systems, by using different database like Oracle, MYSQL server, etc. Create specification document which includes detailed data information. Responsibility of analyzing and querying large data sets. Perform data cleansing, manipulation, transformation and loading of processed information into databases.

Whether to use more art or more information, it offers a new way to look at the world at a time when almost everything generates huge swathes of data that are hard to understand. But with the help of all these UML diagram it gets easier to understand the data and help to fetch understand exact required information which is further the use in formation of new database with all professor and student research area and with their campus details.

One way of depicting them is to count them and present them in clusters cloud which help to save memory and keep them into a safe mode without any of memory loss and by providing accesses whenever needed.

Options are available to choose whether to go with manual database formation or with already existing database which will require only hosting fees where-as manual database development will require lot of development and maintenance charges which will supposable will raise budget. We are working on to provide best solution and the cheapest one with all requirement fulfilled.

The project requirement expands from the proposal of the project and its identities. There are some requirements needed for the project to function that way it should, a validation that will determine if the project succeeded is supposed to do. Prototypes and sketches of the project will be needed and last a detail project plan. Project design phase of the project will determine what will actually be needed for the construction of the project. This phase should also show detail structure-breakdown that identifies who will do what and by when. Project Implementation the goal is to build the system, whichever way possible. Just build the system. Validation is the testing of system by the designer, and the customer testing will be required. Documentation Not every system will have documentation. The documentation will help assist developer, and the users.

Ethical Concerns:

Data is measured, collected and reported, and analyzed, whereupon it can be visualized using graphs or images.

Data in a general term that describes any effort to help people understand the significance of data and relevant information by placing it in a particular context. Patterns, trends and correlations that might go undetected in text-based data can be exposed and recognized easier with formation of proper database software to control and uniform data into meaningful information.

The data in various databases and Microsoft Excel files. At the end of every fiscal year all of the data is analyzed and processed, which is then transformed into simple Microsoft Excel graphs for easy interpretation. However, this manual process is very labor intensive. The developer will develop new methods of generating these reports and interactive graphs.

Ethical criteria and scientific standards governing research are universal and should be adopted everywhere, to ensure data protection and data reliability, avoiding all the wrong unethical approach. It should be transferred into simple and effective processes and procedures, which ensure quality of data about professor and PHD student research work or area. Which will ensure quality of their work and progress.

Without putting unnecessary obstacles to all data and required information the process of development should flow smooth and as clean as possible to be a strong work bench.

To satisfy the requirements we will need to demonstrate it, even if it is not as per the bars set we will try best of it to provide and par the expectations at the time of the delivery. Written documents that is a few page abstract that describes what project is to an uninformed group of people. That we would post on the website for customers.

Data Analysis:

Analyze data from various source database management systems like MYSQL Server, Oracle, to evaluate data for keeping record.

At our work of progress, we recognize that following best practices for database design, data access, and integration is critical to the success of our custom software application and database solution. Big data now forms an important part of many business plans. We help develop and execute a database strategy to solve how custom web or mobile software application supports present-day and future business data needs.

we understand that a well-designed database makes it easier to derive value from enterprise data. As a business they need to be fast tracked and, it is more important than ever to gain a competitive advantage while using a database application.

The functions and features will grow and change over the life cycle of development of software project. Understanding the business objectives of the application and the future vision will influence the current development of database design. Taking database design and developing it in future could make it tough. The chosen data model or the recommended models will support the application features as well as the performance and will meet data security requirements.

we work hard to understand business goals and requirements for the entire development of database design. Then, we select the best development technology stack to meet the needs, including the database tools and platform to support those goals.

Chapter Four Results and Reflection

Introduction

The requirements as expressed by the Worcester Regional Chamber of Commerce are as follows. The new system must include the following:

- Ability to allow both internal and external users to access the application without downloading any software
- Database needs to be searchable by keyword, name, and institution.
- “Live” database that can be added to as experts change and update their info:
- **Example:** Faculty members and administrators are invited to submit information about themselves to the database via an online form. The questionnaire includes options for submitting new entries, as well as updating existing entries. Please note that only Worcester area faculty and administrators are included in the database and all submissions are reviewed before they are posted online.

The solutions found and described in this chapter will in addition to technology specific information be compared against these requirements. Information regarding the capabilities of each solution, particularly Data As A Service outsourced solutions is sourced from the individual vendors websites. Vendor web sites and case studies tend to be driven by marketing priorities and may not be overtly technical. It is beyond the scope of this project to report on the underlying technologies employed by vendors offering cloud based outsourced products and services. This Capstone report also cannot independently verify the claims made by vendors on their web sites. We cannot confirm the claims made by any vendors regarding the usability and viability of their products and services.

Additional information from the vendor web sites is included in the appendix section of this report. This provides more information and could serve as a reference for researching the actual implementation of said solution by an administrator. The Worcester Regional Chamber of Commerce may be interested in enlisting the assistance of an intern to implement their choice of a solution, and hopefully this section and the information in the appendix will help with their effort.

Solutions Matrix

1. Knack* <https://www.knackhq.com/>

Brief Description

Knack is a hosted online database product that allows its customers to build their own online databases. All the Knack* services are hosted in the Amazon Web Services Data Centers so Knack is leveraging all the features, compliance and security inherent in Amazon's web Service. Obviously Knack's customers are never investing in IT hardware, and realizing the benefits of Amazon's scaled out data center architecture. Data is transported using encryption and is stored using encryption as well, regular backups are performed, and restores are possible if the database were to get accidentally damaged or deleted by the user. Users can build their own online database applications on the Knack* platform and access them remotely, the access can be accomplished by embedding the link to the Knack* hosted database on an organization's existing web site.

Users of the Knack solution can create custom databases and views or use pre-existing templates the application provides. The Knack* site claims their customers create their database application through a three step process with the assistance of Knack support personnel. See Appendix 2 for a more extensive view of the Knack application builder. The following information is taken directly from the vendor's site and is included to show their claims of the product's capabilities, this information is their explanation of their product, and cannot be confirmed or denied with any authority.

Information From The Vendor:

From the Knack* Web Site

<http://helpdesk.knackhq.com/support/solutions/articles/5000125798-what-is-knack.html>

Knack is an online database, which gives you simple tools to take your own data and build it transform it into an online database. These simple tools make it easy for anyone to build online databases applications with no coding.

So what's an online database application?

- **Databases** are organized collections of related information, or data, which you define.
- **Online** means the database is hosted on the Internet and is accessible through web browsers.
- **Applications**, or “Apps”, are built to access the database and display the data with visual elements in the web browser, like forms and tables.

The Knack Builder

The Knack Builder is the interface used to build and manage your online database applications. There are two main sections to the Knack Builder, which you will use when building your app, the Database and Interface sections.

Building your app has two main steps:

1. **Defining your Database:** In the Database section of the Knack Builder, you will define the types of data your app will use. Think of this like creating a spreadsheet.
2. **Building your Interface:** In the Interface Section of the Knack Builder, you will add visual elements like tables and forms that work with the data in your database. What you build in this section is the interface your users will use to interact with the records in your database.

The Knack Builder can be accessed at <https://builder.knackhq.com>.

Knack Apps

Each app you build in your Knack Builder will have a link allowing your users to access and interact the app. If you already have a website, apps can also be published and embedded directly into your own website.

You can check out examples of online database applications built with Knack here:

<http://knackhq.com/examples>.

From the Knack web site: <https://www.knackhq.com/tour/custom/>

1. Define your database

Knack gives you easy to tools to define the data your app will store and use.

Structure your data with fields that make sense, from numbers and images to names and addresses. Connect related data together, like linking employees to companies.

2. Build your interface

Design how your users will view and update the records in your database, using forms, searches and more. Include tabs, links, menus, and popups so using your app will feel as natural as a web-page. Customize your interface with your logo, colors, and icons.

3. Deploy your app

Embed your Knack app directly into your website for a seamless app experience.

Use your app on any device - Knack is optimized for mobile and will work great at any size.

Show different pages to different users - you have complete control over what each user sees.

The comparison of the Worcester Regional Chamber of Commerce requirements vs. the Knack* hosted database application:

1. Ability to allow both internal and external users to access the application without downloading any software. No downloads are required to access or manage the Knack* solution. Knack* offers their customers the option to download a copy of their database if they so choose for retention or backup purposes, but the database is hosted in Knack's Amazon Cloud Service infrastructure.
2. Database needs to be searchable by keyword, name, and institution. This search functionality is supported.
3. "Live" database that can be added to as experts change and update their info: This is an online "Real Time" database solution that can be added to and changed at any time by its users, and those granted access.

Data security, Redundancy, Privacy, System Maintenance Considerations and Pricing:

Security: According to the Knack* web site their service is hosted in the Amazon Web Services infrastructure and because of this enjoys all the compliance and security features included in their

service. Knack* customer data is encrypted in transport from their servers to the customer's web site which houses the link. Data stored on the Knack* servers is also encrypted using both SHA-256 and AES-256 encryption. Amazon Web Services utilizes firewall and other security protections to try to limit the potential impact of a Denial of Service or other attack vector.

Redundancy: Knack* claims that multiple copies of their customer's databases are stored and encrypted. The active database is stored in multiple locations, and older versions are also archived with multiple copies in multiple locations. If a user of the database were to delete or otherwise compromise the database, an undamaged copy can be restored. Customers have the option of backing up their database in a csv file format to a local computer, this can be done manually or it can be scheduled.

Data Privacy: According to Knack*'s web page <https://www.knackhq.com/safeharbor/>, "Knack complies with the U.S.-EU Safe Harbor Framework and the U.S.-Swiss Safe Harbor Framework as set forth by the U.S. Department of Commerce regarding the collection, use, and retention of personal information from European Union member countries and Switzerland. Knack has certified that it adheres to the Safe Harbor Privacy Principles of notice, choice, onward transfer, security, data integrity, access, and enforcement."

System Maintenance Considerations: As a Hosted solution the vendor assumes all responsibility for system maintenance, availability, patching, and all hardware and application upgrade and maintenance activity. In the case of the Knack solution, they rely on Amazon Web services for these system maintenance considerations because they themselves are not physically hosting the computing infrastructure. Knack* guarantees 99.9% uptime, Knack* customers can engage support by opening a support ticket on their web page: <http://helpdesk.knackhq.com/support/tickets/new>. Knack* lists their SLA's which are based on the pricing model of tiered offerings at their page: <https://www.knackhq.com/sla/>

Pricing: The least expensive offering the "starter" package costs \$39/Month. This package includes capacity and features that will easily satisfy the needs of this project. See Appendix III for the pricing as shown on the Knack* web Site, the "starter" includes:

- 20,000 Database Records
- 2 GB of File Storage
- 3 Applications can be developed
- 1000 API calls/day
- Unlimited users

Conclusion

The Knack Starter level solution easily satisfies the requirements of this project, and provides features beyond those specified by the Worcester Regional Chamber of Commerce for this MSIT Capstone project.

Knack Screenshot

The screenshot shows a customer portal interface. At the top right, it says "Logged in as Johnny Customer - [Account Settings](#) - [Log Out](#)". Below this is a horizontal menu with four buttons: "Submit Service Request", "View Service Requests", "Review Invoices", and "Update Account". The main heading is "Welcome to your Customer Portal!" followed by the instruction "Please select an option from the menu above." Below this is a section titled "Your Active Services" which contains a table with two rows of service data.

System Type	Services Needed	Instructions & Comments	Service Date	Status	Service Details
Printer	Troubleshooting and Repair	Our Printer won't feed paper correctly	04/30/2014	Open	view service
PC	Software Installation, Hardware Setup	Need two work stations set up for new employees	05/01/2014	Open	view service

Logged in as Suzy Manager - [Account Settings](#) - [Log Out](#)

Customers Services Invoices

Welcome to the Business Manager Dashboard

Please choose an option from the menu above.

Open Services

Customer	System Type	Services Needed	Instructions & Comments	Service Date	Status	Service Details
Johnny Customer	Printer	Troubleshooting and Repair	Our Printer won't feed paper correctly	04/30/2014	Open	view service
Manuel Estevez	Server	Networking	Need two new routers installed	04/16/2014	Open	view service
Johnny Customer	PC	Software Installation, Hardware Setup	Need two work stations set up for new employees	05/01/2014	Open	view service

[Customers](#) [Services](#) [Invoices](#)

View Customer details

Customer Account ID	1	Email	customer2@email.com	Billing Address	54 W South St. Philadelphia, PA 43321
Company Name	New Biz	Phone			
Name	Manuel Estevez				

[Edit Customer](#) [Add Service](#) [Add Invoice](#)

Services

Service Date	ID	System Type	Services Needed	Instructions & Comments	Status	Service Details
04/16/2014	3	Server	Networking	Need two new routers installed	Open	view service

Invoices

Invoice Date	ID	Status	Labor Total	Service Fee	Equip Fee	Tax total	Grand Total	Invoice Details
04/17/2014	4	Open	\$400.00	\$350.00	\$200.00	\$57.00	\$1007.00	view invoice
03/18/2014	1	Open	\$100.00	\$100.00	\$100.00	\$18.00	\$318.00	view invoice

[Back to Customers](#)

**2. Joomla! Content Management System, <https://www.joomla.org/> Hosted on Cloudaccess.net
<http://www.cloudaccess.net/products/joomla-hosting-support.html>**

Brief Description

Joomla! is an open source Content Management System that is used by developers and non-technical users for creating web sites of all kinds. Joomla! uses a (MySQL) database to store web page content, and the (PHP) programming language for interactive functionality and dynamic Web pages see Appendix IV. The site created by Joomla! is not a standalone cloud based product, it needs to be installed and hosted on a third party web hosting site in order to be used. To utilize this solution requires the two separate pieces, the web hosting site, and the Joomla! CMS application that is uploaded to the hosting site.

The hosting site provides the Domain Name and online access to the Web site built with the Joomla CMS application. Cloudaccess.net is such a hosting site that specializes in offering hosted Joomla! services. Cloudaccess provides assistance for getting Joomla! installed and running and provides support and tutorials for the hosted Joomla! User. Cloudaccess provides as part of their service a Graphical User Interface called "Cloud Control Panel"(Appendix V), this is the interface their customers use to install and manage the Joomla! instance. The following information is taken directly from the vendor's site and is included to show their claims of the product's capabilities, this information is their explanation of their product, and cannot be confirmed or denied with any authority.

Information From The Vendor Joomla!:

From the Joomla! web Site, https://docs.joomla.org/Planning_Your_Web_site

So what is Joomla!, and what can it do for my Web site?

Joomla! is a Content Management System (or "CMS") which enables easy control and editing of the content and presentation of your website. With Joomla! you can do things like:

- Edit the content of every page of your site through a word processor-style interface.
- Add new pages to your site using a point-and-click interface.
- Add images and other media through Web-based uploads.
- Control site elements like navigation menus and page layout.

Many additional functions are available within Joomla!'s default user interface. Essentially, Joomla! removes the need to have a "geek" involved in the day-to-day management of your Web site content: If you are able to surf the Web, interact with Web-based forms and interfaces, and handle basic desktop computing tasks, you will be able to use the Joomla! interface to manage the content of your Web site.

Out-of-the-box, Joomla! provides all of the primary functions of managing Web page content. It also includes a number of specialized elements which support specific functionality, for example, end user registration, interactive polls, advertising banners, a contacts directory, and much more. Included with Joomla!'s native capabilities is an "Extensions" system which enables additional features via third-party Extensions software packages. (See <http://extensions.joomla.org> for more information.)

Joomla! -powered Web sites are different from Web sites which contain manually updated, or "static," HTML files. Instead, Joomla! is a dynamic Web application. Joomla! uses a database (MySQL) to store all of the content and information about your site, and it uses a programming language (PHP) to power its interactive functionality and dynamic Web pages.

How much knowledge do I need to implement Joomla! ?

Although a low level of technical knowledge is required to use Joomla! on a day-to-day basis, you will need to know a bit more in order to install it. Joomla!'s installation process includes uploading files to a Web server via FTP, creating a new MySQL database, and then proceeding through Joomla!'s Web-based installation wizard. (Fortunately, many Web hosting companies include Web site control panels which make it easy to handle technical tasks, including adding a MySQL database, and installing Joomla!.)

Customizing the structure, content and presentation of your Joomla! site involves working within Joomla!'s Web-based interfaces; if you want to significantly change the Web site design from the default templates, you will need to either install a third-party template package or create your own template out of Web-ready images and HTML, Cascading Style Sheet (CSS) and/or JavaScript code.

Knowledge of the PHP programming language or programming concepts in general is **not** required to install, customise and administer Joomla!.

Information From The Vendor Cloudaccess:

From the Cloudaccess Web Site, <http://www.cloudaccess.net/products/joomla-hosting-support.html>

What is Joomla?

Joomla! is an easy-to-use, flexible and extendable content management system (CMS) that allows for the rapid development of complex websites. CloudAccess.net offers a comprehensive web hosting and support platform for the Joomla CMS. Choose our paid Joomla Hosting, or check out our new Free Joomla Hosting program.

Joomla! Hosting Platform

We provide optimized cloud servers built specifically for the Joomla CMS. By fine-tuning both MySQL and Apache, Joomla websites hosted on our platform perform noticeably faster than other hosting providers. If you need more server resources for your site we can easily help you scale by adding our Compute Booster.

The comparison of the Worcester Regional Chamber of Commerce requirements vs. the solution:

1. Ability to allow both internal and external users to access the application without downloading any software. No downloads are required to access or manage the Joomla! Cloudaccess solution. This solution produces a hosted web site that is accessible via the internet. The Worcester Regional Chamber will need to have the link to this site embedded in their existing website if users are to access it as desired.
2. Database needs to be searchable by keyword, name, and institution. This search functionality is supported, Joomla! uses a (MySQL) database which will be fully searchable.
3. "Live" database that can be added to as experts change and update their info. This is an online "Real Time" database solution that can be added to and changed at any time by its users, and those granted access.

Data security, Redundancy, Privacy, System Maintenance Considerations and Pricing:

Security: Cloudaccess maintains its own data centers and backbone network and run active threat monitoring with their security appliances. They use a three tiered firewall system between a client's system, their servers and the external internet facing network. Different clients within their environment are segmented so clients cannot access the resources of other clients within the Cloudaccess data centers using CloudLinux and CageFS technologies.

Redundancy: Cloudaccess maintains a backup plan for all customer databases. Any files that are new or changed are backed up incrementally on a daily basis. Backups are moved to a separate server in a different location, Cloudaccess uses R1soft to manage backups and retention of customer data. Cloudaccess can "restore a client site to any point in time within the last fourteen days. This includes both the database and the files" according to their web site.

Data Privacy: Data privacy is maintained using CloudLinux and CageFS technologies which keeps clients resources separate within the Cloudaccess infrastructure. To the end user, their site and database appears as a dedicated Linux system despite the fact it is running in a shared environment. There should be no way a Cloudaccess client can access a different client's resources or data outside of their own virtual environment.

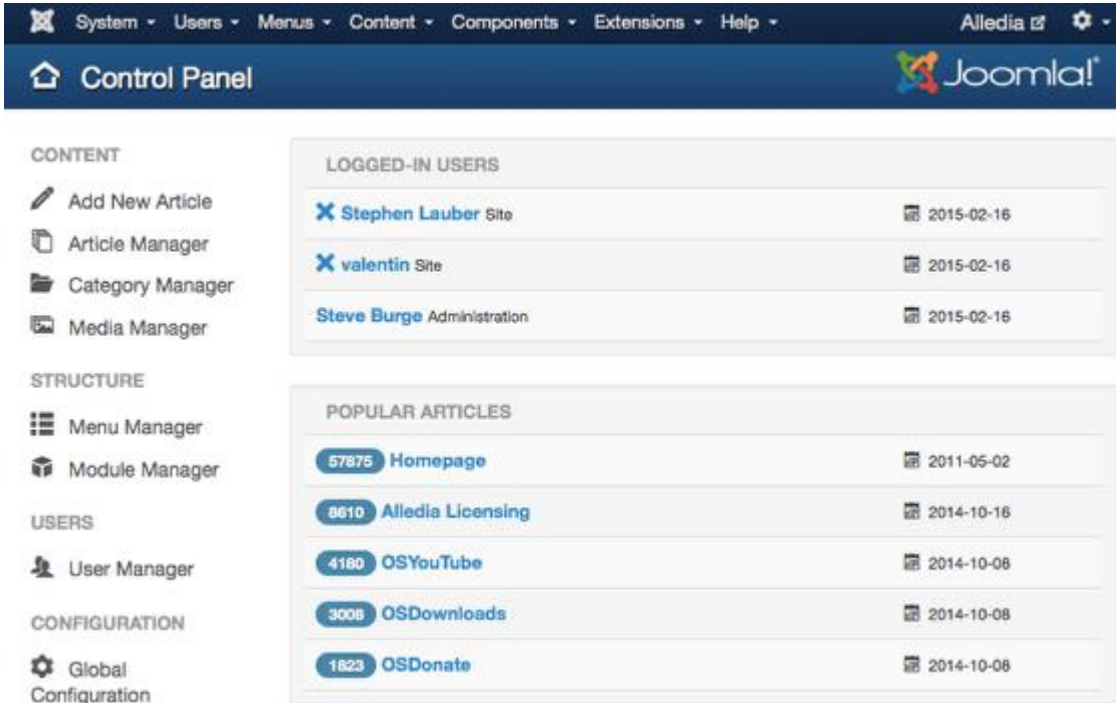
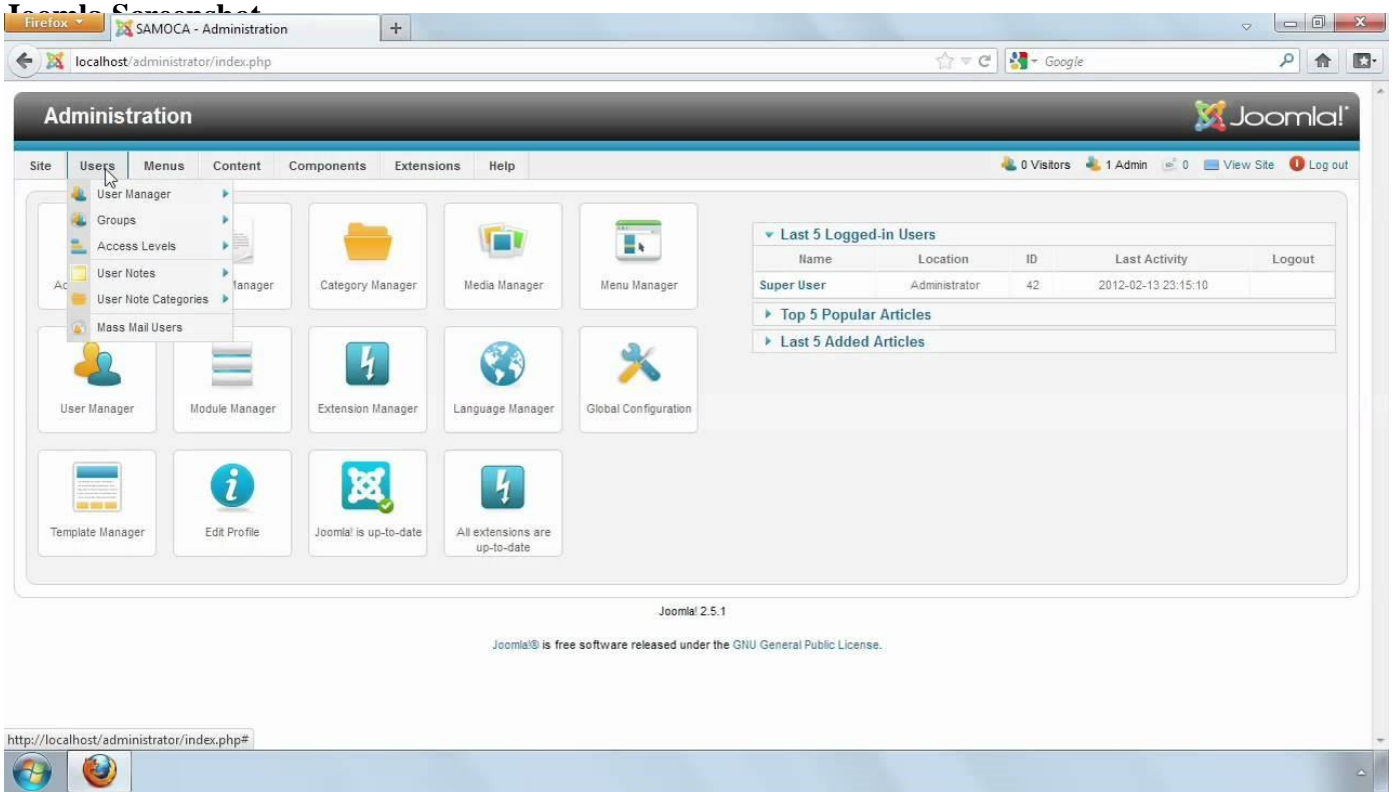
System Maintenance Considerations: As a Hosted solution the vendor assumes all responsibility for system maintenance, availability, patching, and all hardware and application upgrade and maintenance activity. In the case of the Joomla!/Cloudaccess solution, they maintain three dedicated Data Centers, their own DNS servers, and their own backbone network linking their three sites, Cloudaccess guarantees 99.9% system uptime. Customers can engage Cloudaccess support through their Cloud Control Panel account, and Service Level Agreements are tiered levels of support available on a pricing scale at <http://www.cloudaccess.net/support-sla.html>.

Pricing: The Cloudaccess Joomla! hosting plan at the "Mini" tier offers technology and support that is more than adequate for the implementation of the expert database. The "Mini" plan includes unlimited bandwidth, 20 GB of drive space, 2 CPU cores, 2GB of RAM, backups and a SLA. The cost for this service for two years is roughly \$130, and there are other tiers of service available at different prices. Cloudaccess' pricing information is at their page :

<http://www.cloudaccess.net/#pricing>.

Conclusion The Joomla! hosted on Cloudaccess solution will easily accommodate the scope of this project request, and is capable of hosting an entire web site. This solution will easily satisfy the needs of this project. To initially create the site does require some limited technical administrative work on the part of the client's admin. As the Joomla web site states " Joomla!'s installation process includes uploading files to a Web server via FTP, creating a new MySQL database, and then proceeding through Joomla!'s Web-based installation wizard." This is facilitated in Cloudaccess with their "Cloud Control Panel", Cloudaccess specialises in Joomla! hosting so they are the host of choice for this report.

Joomla! Screen shots



3. Microsoft SQL Server Express

Brief Description

SQL Server offers the right edition to meet needs of different corporates, including Enterprise for mission critical applications, enterprise business intelligence and data warehousing; Business Intelligence for self-service and corporate business intelligence; and Standard for basic database, reporting and analytics capabilities.

Information From The Vendor:

Easily manage SQL Server instances

Manage SQL Server Express databases with SQL Server Management Studio Express. Connect to local SQL Server Express databases and manage objects with full Object Explorer integration. Write, execute, and test queries by using visual query plans, and access management and maintenance options.

Basic reporting services

Reduce OS patching by as much as 50-60% with support for Windows Server Core. Create VMs efficiently with PowerShell 2.0 support, and enhancements to Sysprep. Easily manage permissions for data access with user-defined server roles to support separation of duties.

Build web and mobile applications for multiple data types

Support structured and unstructured data while storing business data with native support for relational data, XML, and spatial data. Add geographical information to business applications and build location-aware applications. Increase granularity of temporal data with date and time data types.

Embed lightweight database into basic desktop applications

SQL Server Express LocalDB is a lightweight deployment option for SQL Server Express with fewer prerequisites. This makes it ideal for developers who need an embedded SQL Server database for desktop applications or tools. LocalDB runs in-process with applications and not as a service.

Simplify and speed development with rich developer tools

Take advantage of existing Transact-SQL skills, and incorporate technologies like Microsoft ADO.NET Entity Framework and LINQ. Develop applications faster through deep integration with Visual Studio, Visual Web Developer, and SQL Server Management Studio. Take advantage of rich table and query designers and drag-and-drop IDE support.

Comparison of the Worcester Regional Chamber of Commerce requirements vs. Microsoft SQL Server Express:

1. Ability to allow both internal and external users to access the application without downloading any software.
2. There is no need downloading any software for both internal and external users. The database could be either embodied into the web page or a web application for users to check the database.
3. Database needs to be searchable by keyword, name, and institution. This search functionality is supported.
4. “Live” database that can be added to as experts change and update their info: The database is stored onsite. Any changes to database should be made by administrator.

Data security, Redundancy, Privacy, System Maintenance Considerations and Pricing:

Since Express is the simplest version among Microsoft SQL Server software, there is no additional data security, privacy functions that come with it. Basically, Worcester Chamber of Commerce has to have an IT intern to handle these issues. However, Microsoft does offer backup tool for database server. Microsoft SQL Server Backup to Microsoft Azure Tool enables backup to

Azure Blob Storage and encrypts and compresses SQL Server backups stored locally or in the cloud. And the good thing is that Microsoft SQL Server Express version is totally free.

Hardware Requirements:

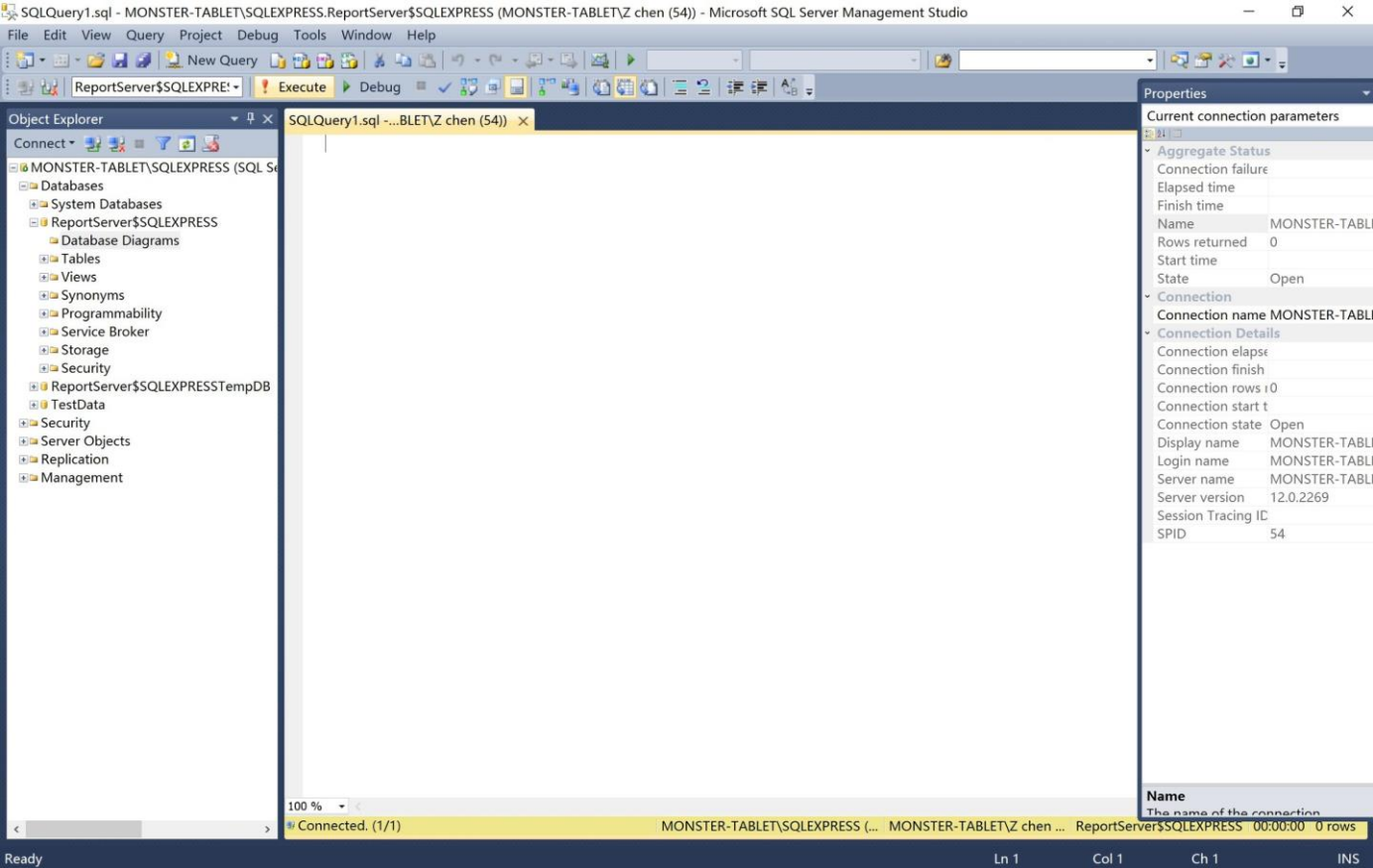
Processor, Memory, and Operating System Requirements

The following memory and processor requirements apply to all editions of SQL Server 2014:

Component	Requirement
Memory ^[1]	<p>Minimum:</p> <p>Express Editions: 512 MB</p> <p>All other editions: 1 GB</p> <p>Recommended:</p> <p>Express Editions: 1 GB</p> <p>All other editions: At least 4 GB and should be increased as database size increases to ensure optimal performance.</p>
Processor Speed	<p>Minimum:</p> <p>x86 Processor: 1.0 GHz</p> <p>x64 Processor: 1.4 GHz</p> <p>Recommended: 2.0 GHz or faster</p>
Processor Type	<p>x64 Processor: AMD Opteron, AMD Athlon 64, Intel Xeon with Intel EM64T support, Intel Pentium IV with EM64T support</p> <p>x86 Processor: Pentium III-compatible processor or faster</p>

[1]The minimum memory required for installing the Data Quality Server component in Data Quality Services (DQS) is 2 GB of RAM, which is different from the SQL Server 2014 minimum memory requirement. For information about installing DQS, see [Install Data Quality Services](#).

User Interface



Sample-SQL-File-100-Rows.sql - MONSTER-TABLET\SQLEXPRESS.master (MONSTER-TABLET\Z chen (53)) - Microsoft SQL Server Management Studio

File Edit View Query Project Debug Tools Window Help

master Execute Debug

Object Explorer

- MONSTER-TABLET\SQLEXPRESS (SQL S...
- Databases
- Security
- Server Objects
- Replication
- Management

Sample-SQL-File-...BLETZ chen (53) x

```

INSERT INTO `user_details` (`user_id`, `username`, `first_name`, `last_name`, `gender`, `password`,
(1, 'rogers63', 'david', 'john', 'Female', 'e6a33eee180b07e563d74fee8c2c66b8', 1),
(2, 'mike28', 'rogers', 'paul', 'Male', '2e7dc6b8a1598f4f75c3eaa47958e2f', 1),
(3, 'rivera92', 'david', 'john', 'Male', '1c3a8e03f448d211904161a6f5849b68', 1),
(4, 'ross95', 'maria', 'sanders', 'Male', '62f0a68a4179c5cdd997189760cbcf18', 1),
(5, 'paul85', 'morris', 'miller', 'Female', '61bd060b07bddfeccea56a82b850ecf', 1),
(6, 'smith34', 'daniel', 'michael', 'Female', '7055b3d9f5cb2829c26cd7e0e601cde5', 1),
(7, 'james84', 'sanders', 'paul', 'Female', 'b7f72d6eb92b45458020748c8d1a3573', 1),
(8, 'daniel53', 'mark', 'mike', 'Male', '299cbf7171ad1b2967408ed200b4e26c', 1),
(9, 'brooks80', 'morgan', 'maria', 'Female', 'aa736a35dc15934d67c0a999dcccff8f6', 1),
(10, 'morgan65', 'paul', 'miller', 'Female', 'a28dca31f5aa5792e1cef1df098569', 1),
(11, 'sanders84', 'david', 'miller', 'Female', '0629e4f9f0e01e6f20bc2066175e09f7', 1),
(12, 'maria40', 'chrishaydon', 'bell', 'Female', '17f286a78c74db7ee24374c608a2f20c', 1),
(13, 'brown71', 'michael', 'brown', 'Male', 'fa0c46cc4339a8a51a7dalb33e9d2831', 1),
(14, 'james63', 'morgan', 'james', 'Male', 'b945416fa907fac533d94efe1974ec07', 1),
(15, 'jenny0993', 'rogers', 'chrishaydon', 'Female', '388823cb9249d4cebc9d677a99e1d79d', 1),
(16, 'john96', 'morgan', 'wright', 'Male', 'd0bb977705c3cdad1e346c898f32a1b7', 1),
(17, 'miller64', 'morgan', 'wright', 'Male', '58b207ee33794b046511203967c8e0d7', 1),
(18, 'mark46', 'david', 'ross', 'Female', '21cdcb68a932871524e16680fac72e18', 1),
(19, 'jenny0988', 'maria', 'morgan', 'Female', 'ec9ed18ae2a13fef709964af24bb60e6', 1),
(20, 'mark80', 'mike', 'bell', 'Male', '084489b355edd349bca1c798788de19a', 1),
(21, 'morris72', 'miller', 'michael', 'Male', 'bdb047eb9ea511052fc690a8ac72a7d3', 1),

```

100 %

Connected. (1/1) MONSTER-TABLET\SQLEXPRESS (... MONSTER-TABLET\

Output

Show output from:

Properties

Current connection parameters

- Aggregate Status
- Connection failure
- Elapsed time
- Finish time
- Name MONSTER-TABLI
- Rows returned 0
- Start time
- State Open
- Connection
- Connection name MONSTER-TABLI
- Connection Details
- Connection elapsed
- Connection finish
- Connection rows 0
- Connection start t
- Connection state Open
- Display name MONSTER-TABLI
- Login name MONSTER-TABLI
- Server name MONSTER-TABLI
- Server version 12.0.2269
- Session tracing ID
- SPID 53

Name

The name of the connection

Ready Ln 14 Col 41 Ch 41 INS

4. IBM Data Studio

Brief Description

IBM® Data Studio provides an integrated, modular environment for database development and administration of IBM DB2® for Linux, UNIX and Windows. It also offers collaborative database development tools for IBM DB2 for z/OS®, IBM DB2 for i, IBM Informix® and Big SQL for IBM BigInsights®. This software is available at no charge. IBM Data Studio enables developers and administrators to create and manage heterogeneous database environments for increased productivity.

- Streamline database development with advanced query validation, object management and system deployment features.
- Improve collaboration through an integrated environment and shared platforms.
- Help save time and reduce errors using advanced data management, configuration and administration tools and features.

Information from the Vendor:

Data Studio is a comprehensive data management tool. You can use it to design and develop database applications, administer and tune databases, and monitor database health. It supports multiple database servers, such as DB2 for Linux®, UNIX®, and Windows® (LUW); DB2 for z/OS®; Informix®; Sybase; MySQL; Oracle; SQL Server; and others. It can be installed on Redhat® Linux, SUSE Linux, Windows, and AIX (limited to Data Studio web console component) operating systems.

Data Studio comprises three components: *full client*, *administration client*, and *web console*. The administration client is a lightweight tool for administering databases and to meet most of the basic development needs for DB2 for LUW and DB2 for z/OS. The full client expands the functionality of the administration client to support development of Java™, SQL PL and PL/SQL routines, XML editor, and other technologies.

For monitoring database health and availability, and managing scheduled jobs, use the Data Studio web console, available as a separate download, also at no charge.

Data Studio 3.1 consolidates the functionality of Optim Development Studio, Optim Database Administrator, and previous versions of IBM Data Studio into a single product. This way, Data Studio offers improved usability for database administration, and it supports most functionality found in Control Center. As a bonus, Data Studio includes enhanced Java database development capabilities as was previously provided by Optim Development Studio pureQuery™ support.

Software features:

Streamline database development

- Use customizable templates and editors to create, test, debug and deploy routines—such as stored procedures and user-defined functions.
- Simplify query building, editing, tuning and formatting (including support for XQuery). View access plan graphs and get statistics advice.
- Debug more efficiently with additional support for: triggers, PL/SQL anonymous blocks and declared routines, persistent breakpoints in both the routine editor and debugger and routine recompilation without having to redeploy.
- Manage objects and privileges, analyze dependencies, view data distributions and update object statistics.

Improve collaboration

- Collaborate roles using an Eclipse-based integrated development environment (IDE) to develop new applications, administer the database and monitor database health.
- Simplify database schema changes, develop and test routines and generate data-centric web services.
- Benefit from integration with IBM InfoSphere® Data Architect; IBM InfoSphere Optim™ pureQuery™ Runtime for Linux, UNIX and Windows; and IBM Rational® application development solutions.

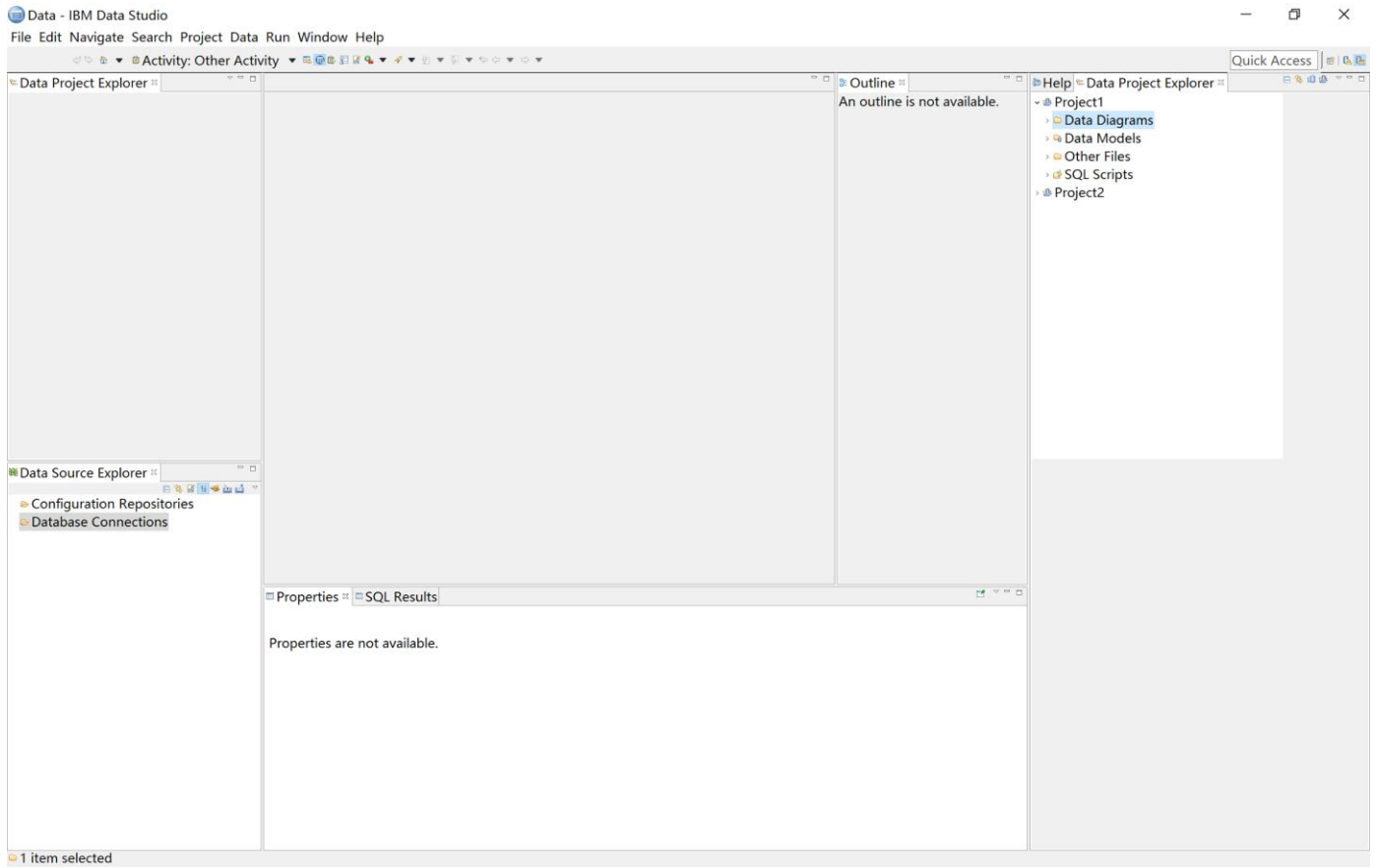
Help save time and reduce errors

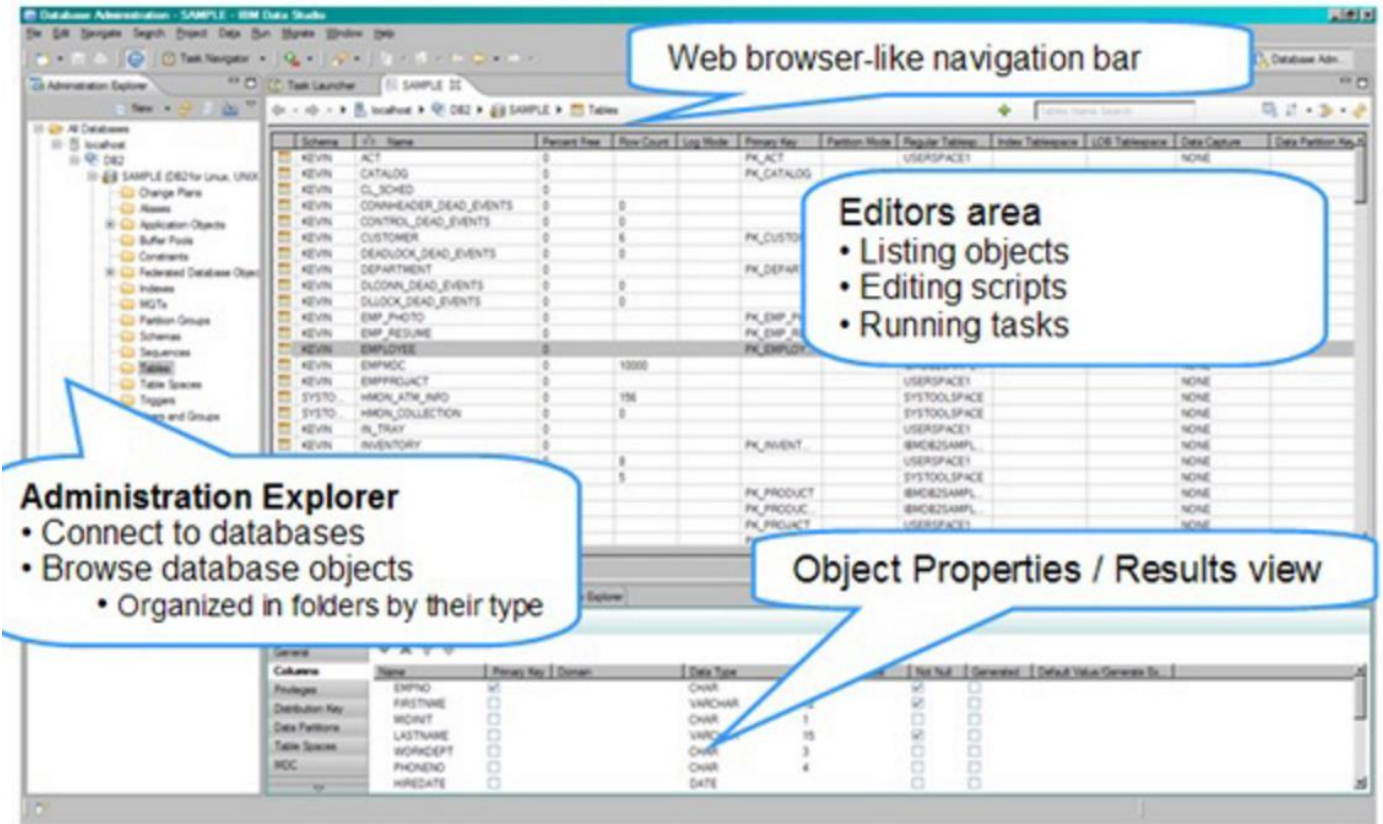
- Create, schedule and track command scripts and utilities. Manage jobs configuring email notifications in command scripts to report upon job completion.
- Efficiently manage database instances for standard, database partitioning features and IBM DB2 pureScale® topologies. Reverse-engineer databases into physical models and synchronize changes between models and databases.
- Manage change in database objects using model-based forward engineering, develop Java applications that use IBM pureQuery annotated methods and copy objects from one database to another.
- Run commands on multiple objects, and manage cluster members using the IBM pureScale environment.
- Support shadow and column-organized tables with the ability to create, alter or drop. And, convert row- to column-organized tables or create shadow tables from traditional tables.

The comparison of the Worcester Regional Chamber of Commerce requirements vs. IBM Data Studio:

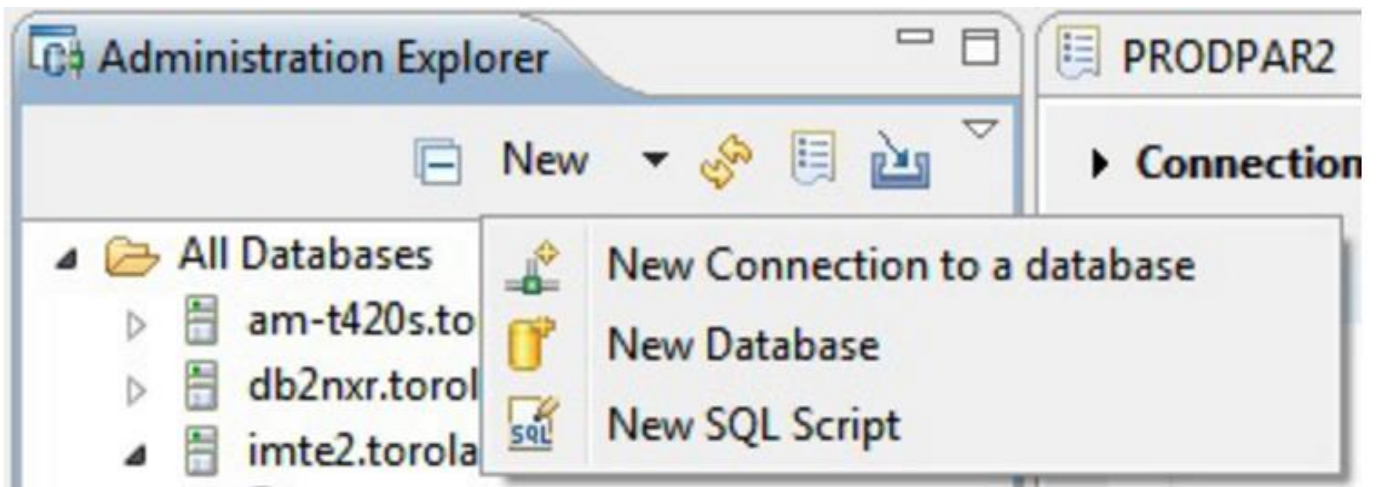
1. Ability to allow both internal and external users to access the application without downloading any software. There is no need downloading any software for both internal and external users. The database could be either embodied into the web page or a web application for users to check the database.
2. Database needs to be searchable by keyword, name, and institution. This search functionality is supported.
3. “Live” database that can be added to as experts change and update their info: The database is stored onsite. Any changes to database should be made by administrator

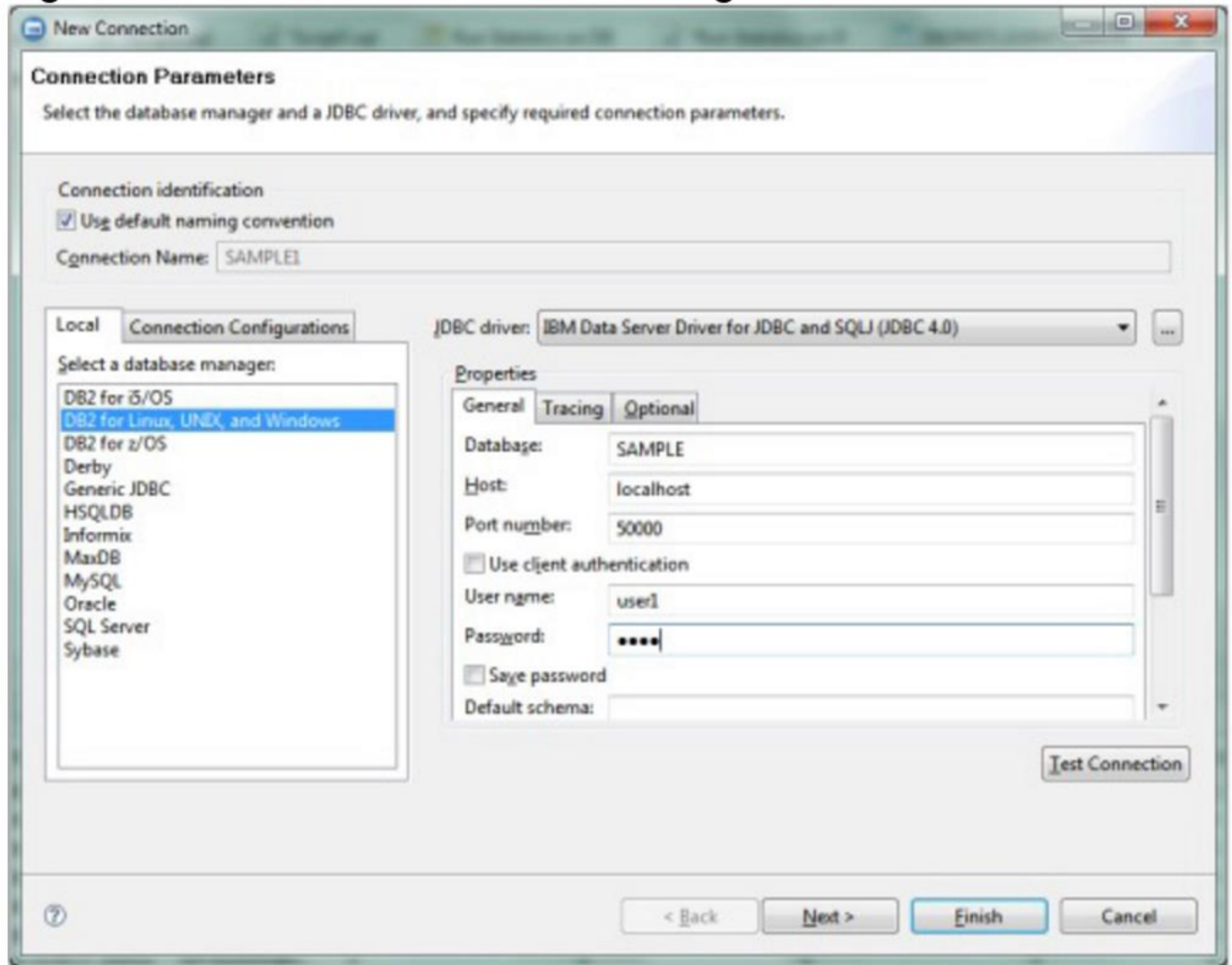
IBM Data Studio Interface



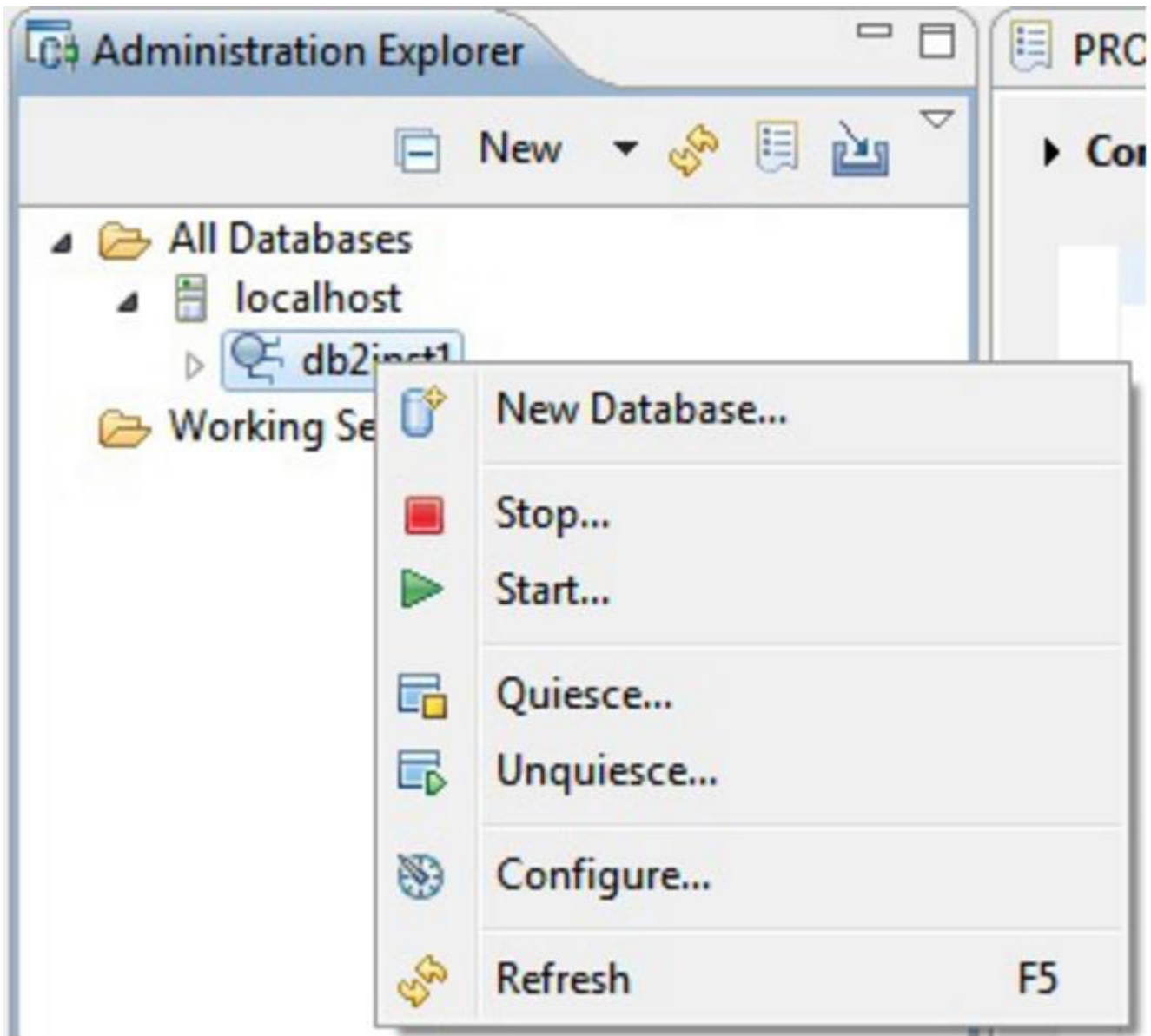


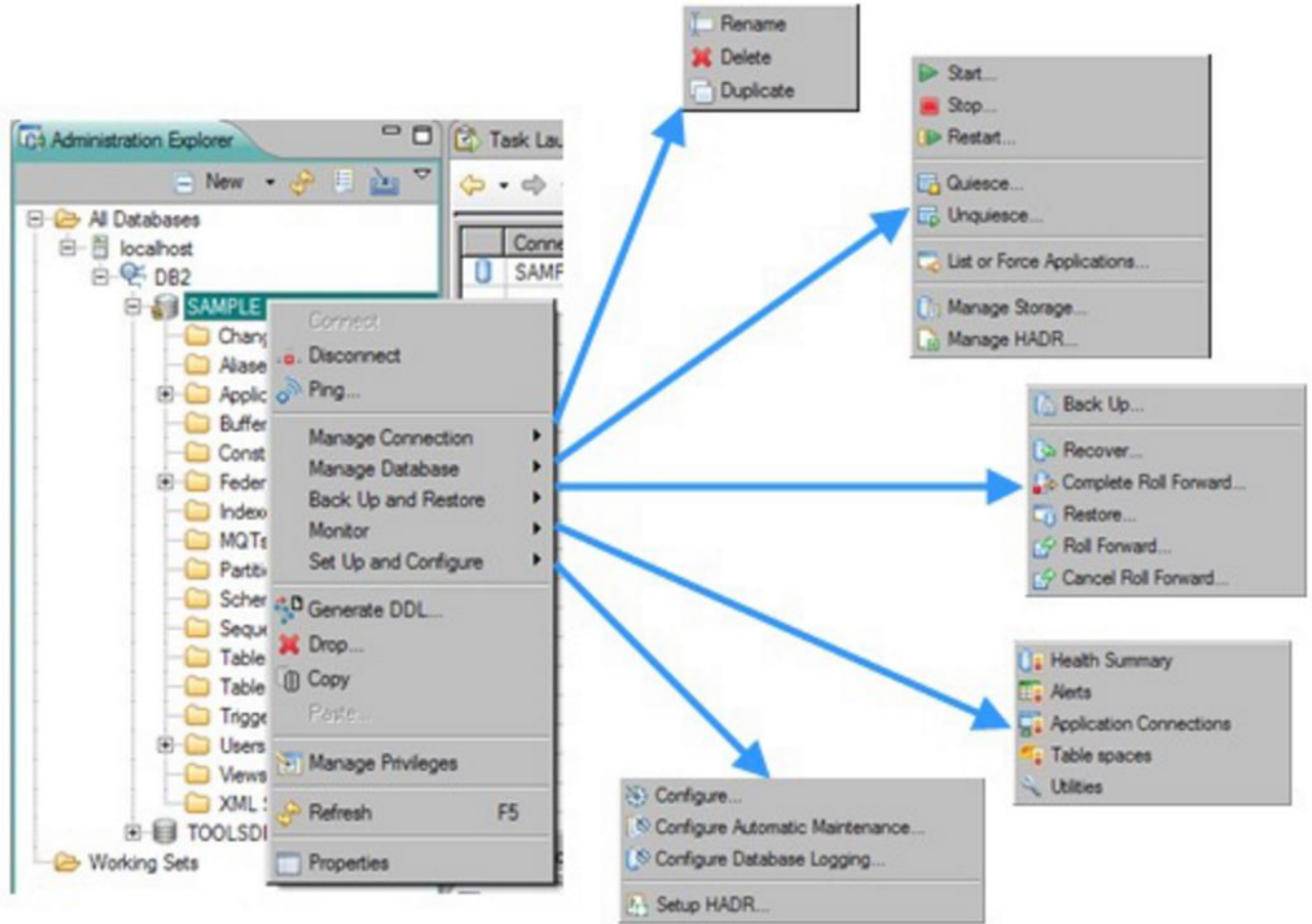
Connecting to databases



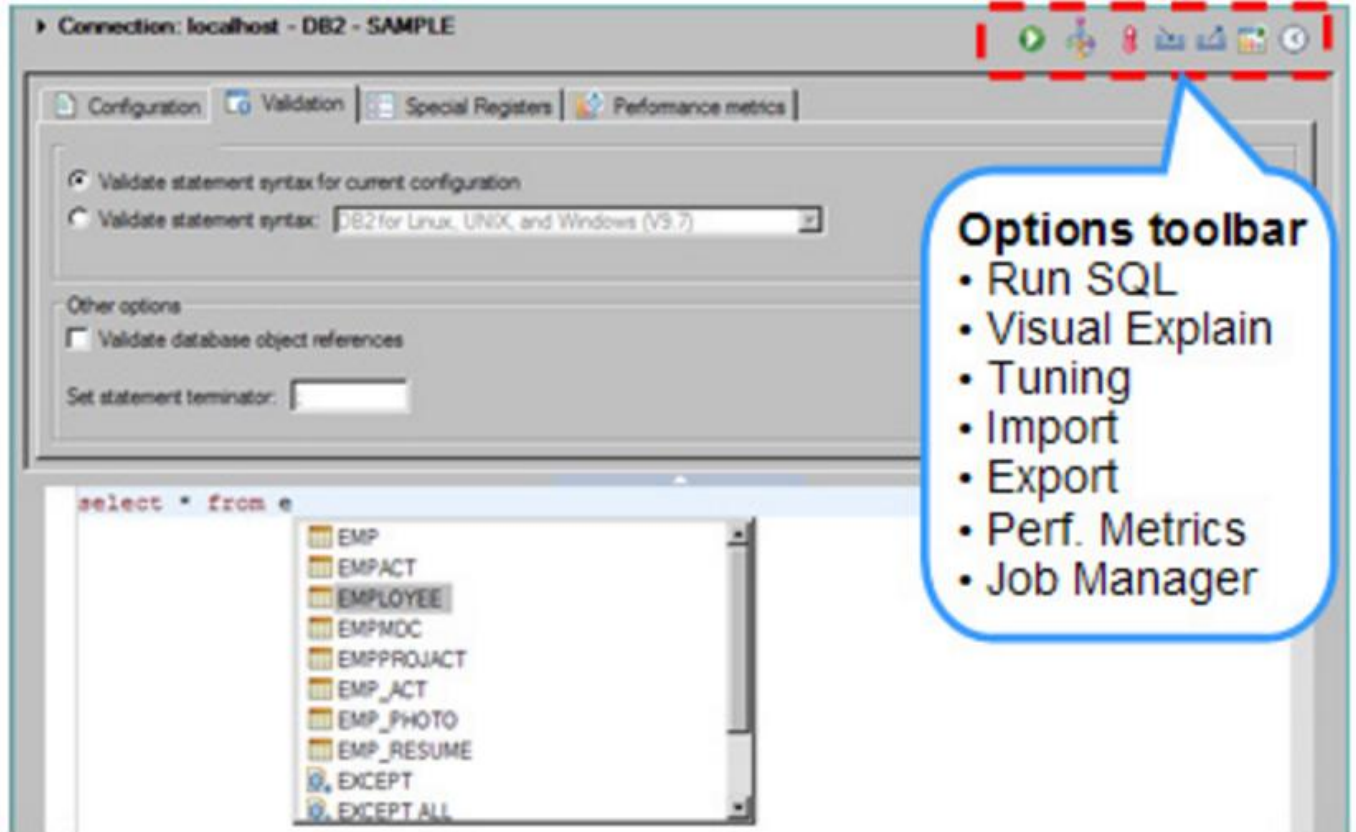


Running administrative tasks with task assistants





Working With SQL Editor



Run SQL

File Edit Search Script Data Window Help

Activity: Run SQL

Sample-SQL-File-100-Rows.sql

Click here to connect to a database

```

gender` varchar(10) DEFAULT NULL,
password` varchar(50) DEFAULT NULL,
status` tinyint(10) DEFAULT NULL,
PRIMARY KEY (`user_id`)
) ENGINE=MyISAM DEFAULT CHARSET=latin1 AUTO_INCREMENT=10001 ;

--
-- Dumping data for table `user_details`
--

INSERT INTO `user_details` (`user_id`, `username`, `first_name`, `last_name`, `gender`, `password`, `status`) VALUES
(1, 'rogers63', 'david', 'john', 'Female', 'e6a33eee180b07e563d74fee8c2c66b8', 1),
(2, 'mike28', 'rogers', 'paul', 'Male', '2e7dc6b8a1598f4f5c3eaa47958ee2f', 1),
(3, 'rivera92', 'david', 'john', 'Male', '1c3a8e03f448d211904161a6f5849b68', 1),
(4, 'ross95', 'maria', 'sanders', 'Male', '62f0a68a4179c5cd4997189760cbcf18', 1),
(5, 'paul85', 'morris', 'miller', 'Female', '61bd060b07bddfecceea56a82b850ecf', 1),
(6, 'smith34', 'daniel', 'michael', 'Female', '7055b3d9f5cb2829c26cd7e0e601cde5', 1),
(7, 'james84', 'sanders', 'paul', 'Female', 'b7f72d6eb92b45458020748c8d1a3573', 1),
(8, 'daniel53', 'mark', 'mike', 'Male', '299cbf7171ad1b2967408ed200b4e26c', 1),
(9, 'brooks80', 'morgan', 'maria', 'Female', 'aa736a35dc15934d67c0a999dcccff8f6', 1),
(10, 'morgan65', 'paul', 'miller', 'Female', 'a28dca31f5aa5792e1cef1d1fd098569', 1),
(11, 'sanders84', 'david', 'miller', 'Female', '0629e4f9f0e01e6f20bc2066175e09f7', 1),
(12, 'maria40', 'chrishaydon', 'bell', 'Female', '17f286a78c74db7ee24374c608a2f20c', 1),

```

Editor Configuration Validation Special Registers Performance Metrics

SQL Results

Status Operation Date Connection Pr...

History: No connection

Writable Smart Insert 1 : 1

Properties SQL Results Job Manager Console Model Report

Type query expression here

Status	Operation	Date	DEPTNO	DEPTNAME	MGRNO
✓	Succee select * fro...	12-01-11	1 A00	SPIFFY COMPUTER SERVICE ...	000010
✓	Succee Script9.sql	12-01-11	2 B01	PLANNING	000020
✓	Succee SELECT * F...	12-01-11	3 C01	INFORMATION CENTER	000030
✗	Failed SELECT dep...	12-01-11	4 D01	DEVELOPMENT CENTER	NULL
✓	Succee SELECT dep...	12-01-11	5 D11	MANUFACTURING SYSTEMS	000060
✓	Succee SELECT dep...	12-01-11	6 D21	ADMINISTRATION SYSTEMS	000070
✓	Succee SELECT dep...	12-01-11	7 E01	SUPPORT SERVICES	000050

Properties | SQL Results | Job Manager | Console | Model Report

Type query expression here

Status	Operation	Date
✓	Succee select * fro...	12-01-11
✓	Succee Script9.sql	12-01-11
✓	Succee SELECT * F...	12-01-11
✗	Failed SELECT dep...	12-01-11
✓	Succee SELECT dep...	12-01-11
✓	Succee SELECT dep...	12-01-11

DEPTNO	DEPTNAME	MGRNO
A00	SPIFFY COMPUTER SERVICE DIV.	000010
B01	PLANNING	000020
C01	INFORMATION CENTER	000030
D01	DEVELOPMENT CENTER	NULL
D11	MANUFACTURING SYSTEMS	000060
D21	ADMINISTRATION SYSTEMS	000070
E01	SUPPORT SERVICES	000050

Properties | SQL Results | Console | Problems

Type query express

ID	NAME	DESCRIPTION	PRODUCT_FAMILY	ID	COUNTRY_ID	CITY	STA	
1	58	Info...	Optim Inter...	Optim	7..	142	W...	200:
2	60	DB2 ...	DB2 Internal	DB2 for LUW	6..	13	Sy...	200:
3	60				6..	13	Sy...	200:
4	60				6..	13	Sy...	200:
5	60				6..	13	Sy...	200:
6	60				6..	13	Sy...	200:
7	60				6..	13	Sy...	200:
8	60				6..	13	Sy...	200:
9	60	DB2 ...	DB2 Internal	DB2 for LUW	6..	13	Sy...	200:
10	60	DB2 ...	DB2 Internal	DB2 for LUW	6..	13	Sy...	200:

Context Menu:

- Copy Row(s)
- Save
- Export
- Print
- Convert Row(s) To Hexadecimal

Sub-menu for Export:

- Current Result...
- All Results...

5. MySQL Workbench

Brief Description

MySQL Workbench is a unified visual tool for database architects, developers, and DBAs. MySQL Workbench provides data modeling, SQL development, and comprehensive administration tools for server configuration, user administration, backup, and much more. MySQL Workbench is available on Windows, Linux and Mac OS X.

Information From the Vendor

Design

MySQL Workbench enables a DBA, developer, or data architect to visually design, model, generate, and manage databases. It includes everything a data modeler needs for creating complex ER models, forward and reverse engineering, and also delivers key features for performing difficult change management and documentation tasks that normally require much time and effort.

Develop

MySQL Workbench delivers visual tools for creating, executing, and optimizing SQL queries. The SQL Editor provides color syntax highlighting, auto-complete, reuse of SQL snippets, and execution history of SQL. The Database Connections Panel enables developers to easily manage standard database connections, including MySQL Fabric. The Object Browser provides instant access to database schema and objects.

Administer

MySQL Workbench provides a visual console to easily administer MySQL environments and gain better visibility into databases. Developers and DBAs can use the visual tools for configuring servers, administering users, performing backup and recovery, inspecting audit data, and viewing database health.

Visual Performance Dashboard

MySQL Workbench provides a suite of tools to improve the performance of MySQL applications. DBAs can quickly view key performance indicators using the Performance Dashboard. Performance Reports provide easy identification and access to IO hotspots, high cost SQL statements, and more. Plus, with 1 click, developers can see where to optimize their query with the improved and easy to use Visual Explain Plan.

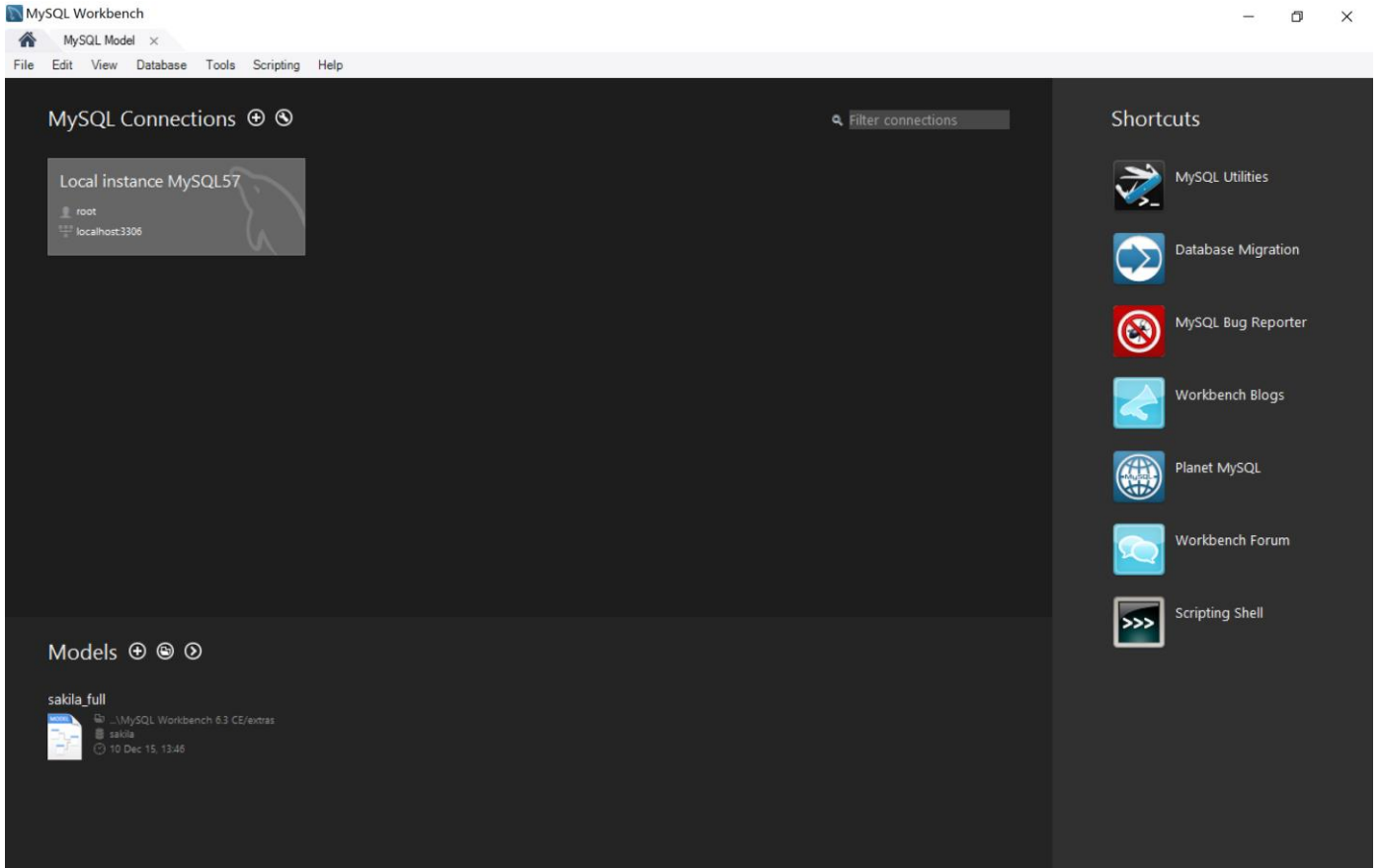
Database Migration

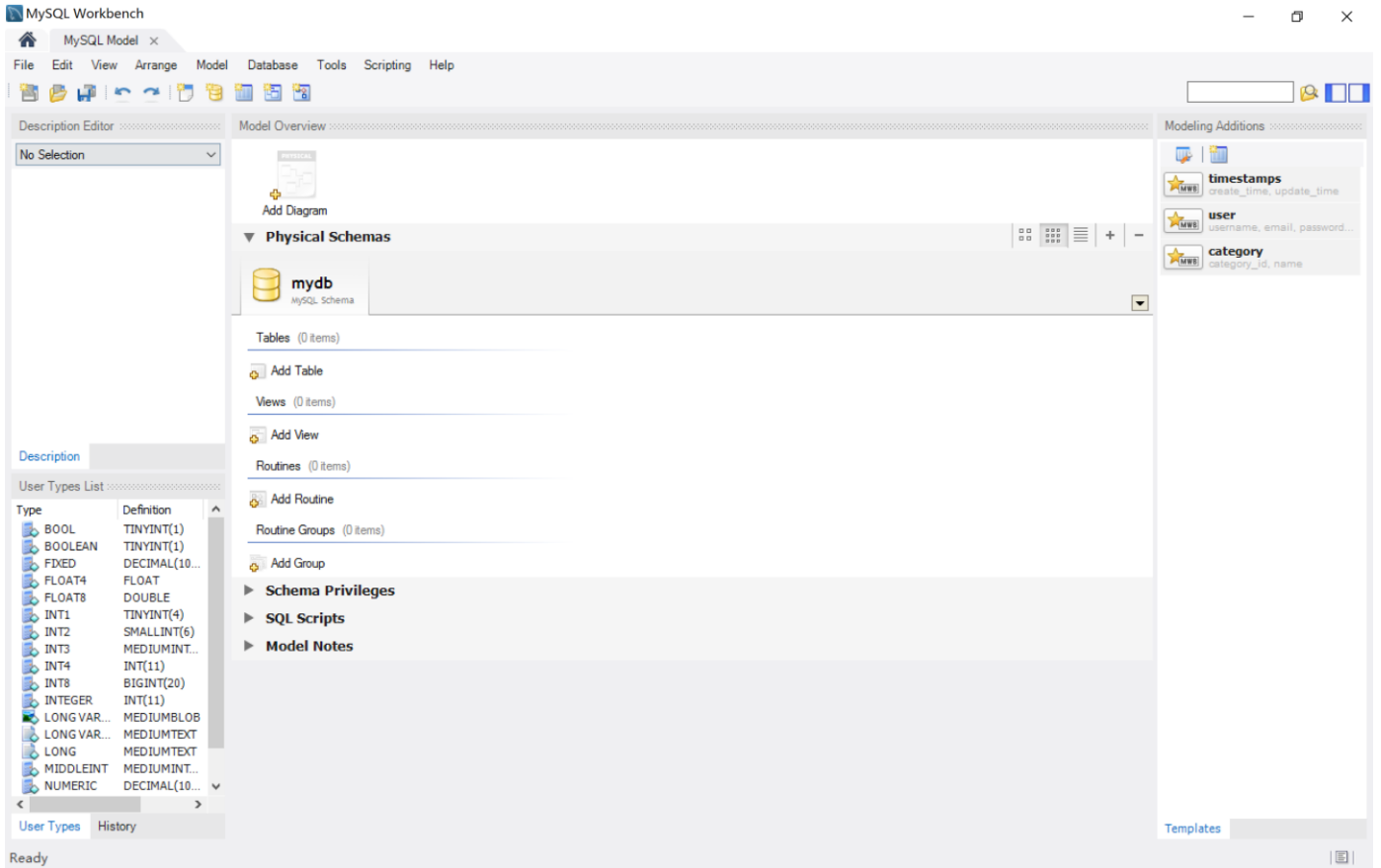
MySQL Workbench now provides a complete, easy to use solution for migrating Microsoft SQL Server, Microsoft Access, Sybase ASE, PostgreSQL, and other RDBMS tables, objects and data to MySQL. Developers and DBAs can quickly and easily convert existing applications to run on MySQL both on Windows and other platforms. Migration also supports migrating from earlier versions of MySQL to the latest releases.

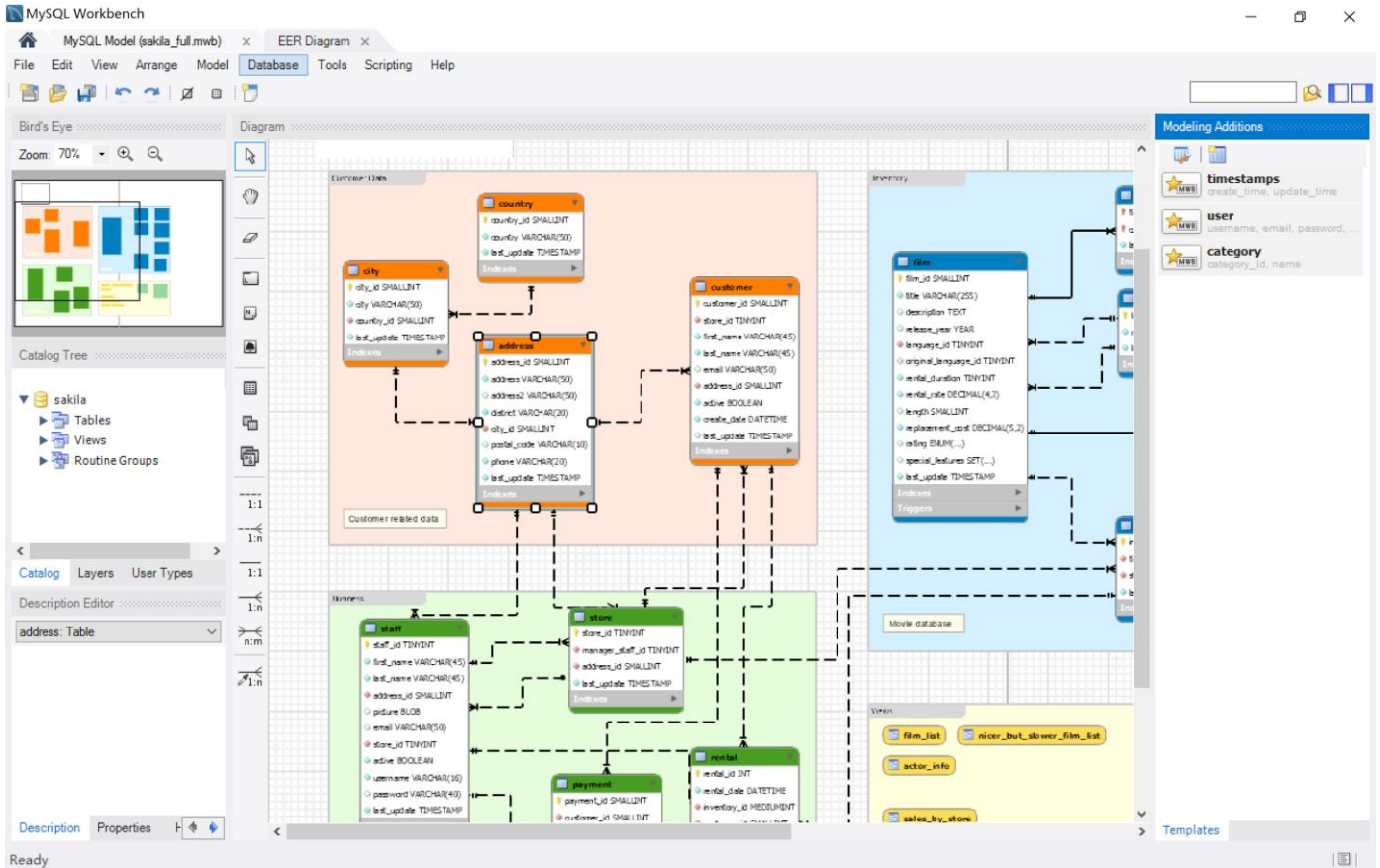
The comparison of the Worcester Regional Chamber of Commerce requirements vs. MySQL Workbench:

1. Ability to allow both internal and external users to access the application without downloading any software.
2. There is no need downloading any software for both internal and external users. The database could be either embodied into the web page or a web application for users to check the database.
3. Database needs to be searchable by keyword, name, and institution. This search functionality is supported.
4. “Live” database that can be added to as experts change and update their info: The database is stored onsite. Any changes to database should be made by administrator

MySQL Workbench Interface







address - Table

Table Name: Schema: sakila

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
address_id	SMALLINT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
address	VARCHAR(50)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NULL
address2	VARCHAR(50)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NULL
district	VARCHAR(20)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Column Name:

Collation:

Comments:

Data Type:

Default:

Storage: Virtual Stored

Primary Key Not Null Unique

Binary Unsigned Zero Fill

Auto Increment Generated

Evaluation

We made a simple evaluation chart to compare the features of all options and then decide to recommend the best one to Worcester Regional Chamber of Commerce. Although there is no

Summary Conclusion

The Worcester Regional Chamber of Commerce intends to create and maintain a searchable online database of faculty members of the higher learning institutions in the greater Worcester area. Their vision for this database is for it to help facilitate their mission of attracting businesses to locate themselves in Worcester Massachusetts. Attracting business to the greater Worcester area is their main mission, and this expert database represents another asset for them to use in achieving their mission.

Many outsources Information Technology options are available to organizations at present. These As A Service offerings provide IT resources at a minimal cost and do not require a major investment in technology or IT personnel on the part of the consumer organization. The Greater Worcester Regional Chamber of Commerce can easily take advantage of such an offering to create this database they desire.

Any one of the solutions provided in this report will satisfy the needs of the Worcester Regional Chamber of Commerce's request for an online searchable database of industry expert names. If they intend to engage an intern to create and populate the database, they can use these recommendations when working with an intern to decide which solution best fits their needs.

References

BrightPlanet White Paper (2014 May) Data-As-A-Service (DAAS) – The Next Big Thing.

BrightPlanet <http://www.brightplanet.com/data-as-a-service-daas-faqs/>

CAIT Web Site <http://cait.wri.org/>

World Resources Institute

10 G Street NE Suite 800

Washington, DC 20002, USA

Cloudaccess.net Web Site <http://www.cloudaccess.net/support-sla.html>

EMC Solutions Group. (2012 July) Big-Data-As-A-Service, A Market and Technology

Perspective. *EMC Corporation*

Greater Boston Chamber of Commerce Web Site <http://bostonchamber.com/networking-and-events/our-programs/>

Greater Boston Chamber of Commerce

265 Franklin Street, 12th Floor

Boston, MA 02110

Greater Providence Chamber of Commerce Web Site

<http://www.providencechamber.com/finding-talent>

Greater Providence Chamber of Commerce

30 Exchange Terrace

Providence, RI 02903

Greater Worcester Community Foundation Consultant Directory Web Site.

<http://www.greaterworcester.org/Nonprofit-Support-Center/Consultant-Directory>

Greater Worcester Community Foundation

370 Main Street, Suite 650

Worcester, MA

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Splunk® Inc. Headquarters

250 Brannan Street

San Francisco, CA 94107

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APPENDIX

Karen Pelletier

Worcester Chamber of Commerce

[Enter Email address]

508-753-2924

Project Proposal – MSIT Capstone

Overview - Project Background and Description

The Chamber is looking to create and manage an expert database--of all the industry experts at our local colleges and universities. This could be a great resource in recruiting new businesses to the area, as well as fostering partnerships for research etc.

This is an example of a database we like: <http://experts.news.wisc.edu/>

It would need to be something that would be housed on our website and easily updated year to year. We need an intern to create the framework and software to store the data so it can be searchable by keyword, name, and institution.

Project Scope

Project scope defines the boundaries of a project. Think of the scope as an imaginary box that will enclose all the project elements/activities. It not only defines what is being requested (what goes into the box), but it sets limits for what will not be done as part of the project (what doesn't fit in the box). Scope answers questions including what will be done, what won't be done, and what the result will look like.

The Worcester Regional Chamber of Commerce Higher Education - Business Partnership wants to establish this searchable expert database in an effort to connect new and existing businesses with industry-specific experts in the region. This database will also be designed to assist in showcasing faculty expertise and help promote interdisciplinary collaborations and research partnerships with area businesses and other institutions.

To identify a faculty expert, simply search for a topic, a name, etc.

High-Level Project Goals

Describe the high level goals for the project. What are you requesting students to provide as an outcome for your organization?

Worcester, with its population just over 182,000 and more than 35,000 students, is home to 12 colleges and universities. From the founding of the College of the Holy Cross in 1843 to the most recently opened Massachusetts College of Pharmacy and Health Sciences, Worcester offers students a wealth of learning opportunities - including a first-rate teaching hospital, and a top-notch veterinary, pharmacy and bioengineering school.

Worcester area colleges and universities have hundreds of faculty members with a variety of expertise in almost every discipline. Some of their areas include robotics, gaming development, big data, and franchise development.

The new system must include the following:

- Ability to allow both internal and external users to access the application without downloading any software
- Ability to interface with the existing data warehouse application
- Database needs to be searchable by keyword, name, and institution.
- “Live” database that can be added to as experts change and update their info:

Example: Faculty members and administrators are invited to submit information about themselves to the database via this online form. The questionnaire includes options for submitting new entries, as well as updating existing entries. Please note that only Worcester area faculty and administrators are included in the database and all submissions are reviewed before they are posted online.

Deliverables

List high level deliverables on what you expect students to deliver to meet your success criteria of the project. This would include Solution Recommendations, Software Design

Specifications, Research Outcomes and Industry Best Practices, Diagrams, Graphs and Charts, ROI Figures, etc. Typically, MSIT students will not be delivering any working functional software unless development expertise is present or infrastructure is provided by client firm

Solution Recommendations, Software Design Specifications, Format recommendations

Affected Parties

List agencies, stakeholders or divisions which will be impacted by this project and describe how they will be affected by the project.

Chamber, business community, students conducting research, faculty both for research and as experts in the field, business recruitment efforts (ie. Connecting robotics company looking to come to the area with campus experts)

Affected Business Processes or Systems

List Business Processes or Systems that are affected by the project or proposed solution. Please include vendor details and any relevant information/

Housed on Chamber website www.worcesterchamber.org

Specific Exclusions from Scope

List and items to be excluded from the scope of the project as to set boundaries for the project team.

Confidentiality, Privacy and Security Requirements

Please provide any organizational requirements on Confidentiality, Privacy and Security Requirements your organizational policies require that may impact the project or project team.

Approval and Authority to Proceed

We approve the project as described above, and authorize the team to proceed.

Name	Title	Date
Rick Cehon	Adjunct Professor – MSIT Capstone	
Karen Pelletier	Director Higher Ed- Business Partnerships	

Approved By Date Approved By Date

II

Knack* builder from <https://knack.freshdesk.com/support/solutions>

Introducing The Builder

The Knack Builder is used to build and manage your online database application. The Builder has 3 key areas:

- 1. Database**

Your database is where all the information for your app will be stored. Step 1 in building your app is to define how this information should be structured.

Objects and Fields

Knack uses objects and fields to structure your database. Objects are used to separate your data into common groups. Think of an object like a spreadsheet or a database table. Fields are used to

define specific attributes of an object. Think of a field like a spreadsheet column. The following is the database for an example Contact Directory app:

- Your **objects** are listed on the left. Click an object to activate for editing. Add a new object with the button below the list.
- All the **fields** for the active object are listed here. Click on a field to edit it. Add a new field with the button below the list.
- Edit or delete the object with options in the right column. Add **connections** to other objects with the "Add a new connection" link.

Records

All the records stored for each object are also available in the database. Records can be added to the database here or through the app using forms.

Click on the "Records" link for each object to view all the records currently being stored.

Here are the records for a *Company* object from the same Contact Directory example:

- Edit each record by clicking directly on the field you'd like to change.
- Click the "Add" button at the bottom to add records manually.
- The right column contains options for importing records, updating records in a batch, and clearing out the records.

2. Interface

Your interface is where you add visual elements like *forms* and *tables* that enable your users to view and update the records in your database.

Pages and Views

A view is a visual element you add to your interface that works with records in your database.

Types of views include:

- Forms to add and update records.
- Tables, Lists, and Calendars to display multiple records.
- Searches to find specific records.
- Details to view a specific record.
- Reports to view summaries and calculations of multiple records.

Multiple views are collected into pages. Your users will begin on a *start* page and navigate to other pages with links and menus.

Here's what the Interface looks like for our example contact directory app:

- All the pages are listed on the left. Click "+ Add" in the left column to add a new page.
- Click a page to view that page's views.

You can click on each view to edit different options. Each view will work with fields from one of your objects. For example, here you can control which fields from the *company* object to display as columns in the table:

Each View works with records from a specific object in your database. When you click "Add View" you can choose which object you want that view to work with. Knack will always present you with the best options:

3. View & Embed

Once your interface is built you can now view and use your app. Click on the "View App" button in the top right of the builder to view your app in a new window or browser tab:

If you have more than one start page you can use the drop-down arrow to select which you want to view. As you make changes in your builder you can refresh your app to see those changes instantly.

Embed

Knack makes it easy to embed your Knack app directly on your own website and blog. First click on the settings link in top left corner of your app:

Then the "EMBED APP" link:

You can pick which page to embed and then receive an **embed code** (similar to how embedding a YouTube video works) you can copy and paste into your site's HTML.

III

Knack Pricing from <https://www.knackhq.com/pricing/>

PRICING PLANS:	STARTER \$39/month	PRO \$79/month	CORPORATE \$179/month
Database Records	20,000	50,000	125,000
File Storage	2 GB	10 GB	50 GB
# of Apps	3	8	25
Support	Basic <i>email, chat</i>	Priority <i>phone, skype</i>	Premier <i>support manager</i>
App Consultation			
Shared Builders	2	5	15
Unlimited Users			
E-Commerce			
Reports			
API	1k calls/day	5k calls/day	10k calls/day
White Label			
IP Blocking			
Custom Domains			
Scheduled Tasks			
Maps & Geo-Location			
Single Sign-On	Basic	Advanced - \$35 / month	Advanced
SEO Snapshots		\$25 / month	
Record History			
App Restore	hourly fee	hourly fee	
Additional Records	\$10 / month 5,000 records	\$25 / month 15,000 records	\$50 / month 40,000 records
Additional Storage	\$10 / month 1 GB	\$25 / month 5 GB	\$50 / month 20 GB

IV

Joomla! Evaluators from <https://docs.joomla.org/Evaluators>

Evaluators

As someone charged with evaluating Joomla! for your requirements, you want to find out as quickly as possible whether Joomla! is a good fit with your project. How do you evaluate Joomla! to see if it will fit your requirements? There is no one answer to this question, but this page will provide some suggestions.

There are several resources that can help you get a view of the overall capabilities of Joomla!. Here are some of the main considerations you might need more information on while evaluating Joomla!

Contents

1. Quick Technical Evaluation
2. High-Level Evaluation
 - a. Web sites running Joomla
 - b. Extensions
 - c. Community
 - d. Support
 - e. Independent market studies
3. Functional Evaluation
 - a. Joomla! Core Functionality
 - b. Joomla! Extensions
 - c. Other Joomla! Customization
4. Security Evaluation

Quick Technical Evaluation

Joomla! is built using PHP and MySQL, the most widely used web technologies anywhere. Joomla! is of course an open source project, as are PHP and MySQL. The technical design of

Joomla! recognizes that, although there are great benefits from using a pre-packaged CMS package to build a website, each web site is different and there is no single approach that will work for everyone.

The solution is to make Joomla! as easy to extend as possible, while providing a rich and reliable core feature set. As discussed earlier, Joomla! can be extended in a number of ways, including with pre-built extensions, custom templates, custom template overrides, and by customizing the core programs.

High-Level Evaluation

There are several resources that can help you to get a high-level view of the overall capabilities of Joomla!.

Web sites running Joomla

One way to evaluate a CMS package is to look at Web sites that run on it. It is impossible to say exactly how many Websites run Joomla, but we do know that over 30 million copies of the software have been downloaded since March 2007. Joomla is the world's most popular full-featured Content Management System (CMS) and powers approximately 2.7% of the largest 1,000,000 Web sites in the world.

Joomla maintains The Joomla! Community Showcase that allows you to look at a number of sites running on Joomla. Obviously, these only represent a tiny fraction of the total number of Joomla sites worldwide.

A simple demonstration site is available for viewing. This site contains a lot of useful information about Joomla features and its community.

If you are evaluating Joomla for a school, university, or non-profit organization, you might want to look at the Schools and Universities forum.

And, of course, don't forget to include all of the Joomla.org sites as examples of what can be done with Joomla, since they of course are all run on our favorite CMS package.

Extensions

An important feature of Joomla is the ease - by design - with which its core functionality can be increased by installing 'Extensions'. This extensibility is a major strength of Joomla and a large

and active third-party developer community has helped create over 9,000 extensions that are currently available, with more being added daily. Most, like Joomla, are Open Source, whilst the others are offered as commercial software. To get an idea of the variety of extensions available, visit the Joomla Extensions Directory(JED). It should also be noted that the JED does not include templates within its catalogue and there are many thousands of these available for free or commercially.

Community

The developer community is just one part of a larger Joomla community. For example, there are over 425,000 active registered users on the various Joomla forums, with over 150 new participants every day. These forums are very active, with over 1,200 posts per day, and they provide a high level of free support to Joomla users. This support is given voluntarily by other community members. To get an idea of the types of questions answered in the forums, visit the Joomla! General Questions forum or the Joomla! General Questions forum.

Support

An important question when evaluating any software package is the quality of support available. In addition to the support forums, Joomla has a large community of skilled Web professionals and consulting organizations who use Joomla to create and maintain a wide variety of Web sites. Take a look at the Professional Services forum to get a view of this community. There are also a growing number of local Joomla user groups.

Independent market studies

A 2009 report by the independent consulting firm *water & stone* concluded that "Joomla is the Web's most popular Open Source content management system". [Click here to read the complete report.](#)

Functional Evaluation

As part of the evaluation process, you may want to understand in more depth exactly what Joomla! does and how you create a website in Joomla! There are two aspects to evaluating

Joomla!'s functionality. The first is to understand the core functionality that ships with Joomla!. The second is to understand how extensions will be used in your site.

Joomla! Core Functionality

When evaluating Joomla!, it is useful to understand its core functionality. If you are new to web development and CMS software, the Absolute Beginner's Guide to Joomla! is a good place to start. You may also need some help with unfamiliar terminology

If you are more experienced, then you might prefer to try out Joomla! using the Joomla! Demo site. Or you can download and install Joomla! on a local computer, along with the Joomla! sample website. Instructions for this are contained in the Quick start Guide. (Note that, to install the sample data, just press the "Install Sample Data" button during step 6 of the installation wizard.)

In either case, you can try out the "back end" administrator functions of Joomla! and see how you create menus, pages, articles, and other components of your web site. Everything you see in the sample web site is created with the core functionality of Joomla!.

Joomla! Extensions

As discussed earlier, over 9,300 extensions are currently available for Joomla!, with more being added daily. Although sites can be built using only the Joomla! core software, it is likely that you will want to use extensions. Most Joomla! web sites of any size or complexity include a number of extensions, and the identification of the major extensions that you will use to provide important functionality should be part of your evaluation.

Other Joomla! Customisation

Extensions provide pre-packaged solutions that require no programming to use. Another way to extend Joomla! is to customise it. Joomla! is designed to be extended and customised in several different ways.

The appearance of the website—the colours, graphics, typeface, and so on—are controlled by the site's "template". Joomla! comes with three built-in templates, and there are many templates available as pre-built extensions. If you are familiar with HTML and CSS, it is not difficult to

build your own customised template. You can look at [Creating a basic Joomla! template Tutorial](#) to get an idea of how templates work.

Since Joomla! is open source, any part of the program can be customized as needed. In addition, Joomla! includes a feature called "Template Overrides" which allow you to create one or more small customized programs that override parts of the standard Joomla! program. These programs work with the Joomla! core programs, and using them does not require modifying any core files. Template overrides allow you to easily customize almost any part of the way in which Joomla! renders a page.

Security Evaluation

Evaluators should also be aware of how Joomla! handles security issues.

- Joomla Security Checklist
- Security and Performance FAQs
- Top 10 Stupidest Administrator Tricks
- Secure coding guidelines (for developers)

Joomla Security Forums

- Joomla 3.x Security Forum
- Joomla 2.5 Security Forum
- Joomla 1.5 Security Forum

Joomla Security Feeds

- Joomla! Security Updates
- Joomla! Vulnerable Extensions

V

Cloudaccess Cloud Control Panel. <http://www.cloudaccess.net/products/cloud-control-panel.html>

CCP Features

Upgrading a Free Site

Upgrade a free site to a hosting & support package. We have a variety of hosting and support plans that meet all client needs. [Learn more.](#)

One Click Application Login

Get one click administration access to each application and never worry about remembering multiple usernames and passwords again.

Backups

Create & manage backups for the entire application. Restore your site from a backup or download it to your machine. [Learn more.](#)

FTP/SFTP/SSH Details

Access or change your file transfer protocol (FTP), secure file transfer protocol (SFTP), or secure shell (SSH) login credentials. [Learn more.](#)

MySQL Database Access

Access your MySQL database tables remotely, edit records, create reports, troubleshoot issues and more. [Learn more.](#)

Server Information

View your domain name status, access your staging URL, view your IP addresses, view your disk space usage and more.

Application Information

Discover more about the application you're using including the version, the database prefix, your username and your password and more.

Web Application Firewall

Lockdown your site files and database tables at the server level, leaving your application 100% hack proof. [Learn more.](#)

Error & Access Logs

Enable error and access logs for the application to add a higher level of security and user monitoring. [Learn more.](#)

Changing a Domain Name

Search for and purchase a custom domain name for your application. Create domain aliases and point multiple domains to one site. [Learn more.](#)

Requesting a Cancellation

Of course we'd like to keep you as a client, but you can cancel any service - any application or domain name - at any time. [Learn more.](#)

Transferring Service

Working with other account holders? Transfer any product - any application or domain name - to a different CloudAccess.net account holder.

Replicating a Site

Replicate a site to a staging area for testing and development and easily migrate back to production. [Learn more.](#)

Resetting an Application

Reset any application back to a fresh installation of Joomla or WordPress. You can even reset to a different version of the application. [Learn more.](#)

Importing a Site

Easily import a Joomla or WordPress application and purchase a domain name or override an existing application.