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In the world of Database Management, there are many tiers of complexity and financial expenditure that any one organization may choose to commit to the storage and manipulation of data. While Standards such as SQL have helped standardize the storage and retrieval of information, the ability of the user to access and manipulate data is an area of a great deal of customization and expense depending on the industry. As a result, while it can be relatively inexpensive to set up storage for a database, it can be very expensive and time consuming to create an user interface for the use of said data. This project seeks to create an open-source and easily configurable web interface for simple object-based research. With this tool, users should be able to quickly create a unique map for any individual database which will enable the script to provide easy and exhaustive research.

Headings:

End-User Searching

Application Software – Development

Information Systems – Design

Computer Software

CLOSING THE INFORMATION GAP: PIRE, A PORTABLE OPEN SOURCE INFORMATION RETRIEVAL TOOL

by
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I. Introduction

In the Knowledge Age, effectively utilizing information is one of the greatest factors in a workers productivity equation. Employees and managers who have all the information they need at their fingertips will always outperform those who do not. This need for Knowledge or Content Management is increasingly being recognized as crucial to the efficiency of any enterprise. It has thus become very important for institutions in all fields to find better ways to store, manage, and disseminate their data.

Database Management Systems (DBMS) are the technologies used to digitally store and retrieve data. One of the most challenging and important tasks of implementing an efficient DBMS is the delivery of information to the end users. These users generally have a superficial understanding of DBMS technologies and are not equipped to interact with the database directly through the Structured Query Language (SQL). As a result, a great deal of time and money is spent creating easy and intuitive user interfaces to facilitate information flow between user populations and their databases. These costs in addition to those of managing the database system itself can make for a sizable investment. Due to the financial burden that developing such interfaces incurs, it is a necessary fact of life that many systems are neglected and become relics of a bygone day. While these non-essential systems may not merit the financial investment of a custom interface, value may still be added through their continued use. This cost benefit dilemma and the ever evolving nature of database technology creates a problem of legacy databases accumulating over time. This project seeks to alleviate this problem through

the creation of a simple information retrieval tool that is database independent, open-source, and would require very little management by Information Professionals. In this way, with a minimum expenditure of labor information can remain easily accessible as long as necessary.

II. Literature Review

The main goal of this project was to solve a common Knowledge Management problem. The challenge of that, however, is to understand the need and the scope of the problem and solution. Because of the wide diversity of knowledge management needs, a discussion of Knowledge Management and how it relates to what many would call Content Management or the management of a company's store of information is appropriate before proceeding.

The very term "Knowledge Management" is one that holds many different interpretations for different authors. Like many recently coined terms it has become a buzz word whose meaning is colored by the individual's need. Conducting a review of the literature in this field will result in a variety of definitions. This can cause confusion and makes progress in this field hard to gauge. Regardless of the difficulties however, the need to deal with "knowledge" and capture its full potential has become an idea of increasing prevalence.

At the same time, an entirely new industry has arisen quite recently to facilitate "Content Management". This idea, originally springing from a need to manage the files and maintenance of large web sites, has evolved into a mechanism that encapsulates and more efficiently utilizes an institution's entire wealth of information.

Knowledge Management

There has been quite a bit written about Knowledge Management and what is should mean. It has been suggested that Knowledge Management refer to everything from systems that preserve experience derived knowledge to ways of streamlining an organization's information and work flow. In "Knowledge Management in Three Organizations: An Exploratory Study" (Southon, Todd, & Seneque), the authors describe a study they performed to discover the dynamics of knowledge management in three different work settings. The authors begin by raising several questions about the relevance of current knowledge management theory in a real world environment. For instance depending on the challenges that face any particular institution their perception of knowledge management may vary greatly. For some, Knowledge Management is simply an extension of the familiar archival process and for others it is a way to make the organization process information more efficiently. In essence, the authors found that due to the broad generalizations that characterize the tenets of current Knowledge Management theory, the average information professional is faced with an abundance of theories and definitions for knowledge and very little relevant, real-world guidelines. As a result, the authors performed a study in order to evaluate and study the current perceptions of "knowledge" and "knowledge management" in different "real world" settings. In their own words they "sought to explore some of [the] larger issues centering on how organizations conceptualize their information and knowledge environments and develop their information and knowledge strategies within that context."

They conducted extensive interviews at a law firm, a commercial higher education institution, and a city council in order to map out the knowledge relationships within each entity. Using semi-structured interviews, the researchers sought to get a better understanding of the interworkings of each office's knowledge environment. In this way, the researchers were able to develop a feel for how the clients perceived their knowledge environment and how they worked to improve it.

At the end of the day, each entity had its own unique situation and ways of dealing with knowledge management. One example is the organization of the law firm. Traditionally the law firm had been run as 30 different lawyers who shared secretarial staff but acted as individuals. In order to produce better value, the law firm had undergone drastic reorganization to become one cogent team of lawyers that interacted with each other to provide better service. This is clearly an example of an organization recognizing a flaw in the way knowledge was managed and subsequently adopting a new strategy to rectify the situation.

The end result of this study seems to be that there is no "silver bullet" for Knowledge Management, since each entity's KM issues derive from its unique makeup and organization.

In contrast to this, David Stern's article addresses the implications that recent innovations have had on the way libraries manage their information resources. In other words it works from the perspective of a knowledge or information dealer, and addresses the problem of increasing access for its constituents. It deals with some of the financial realities of the new issues of online knowledge management and discusses the need for

librarians to keep pace with rapidly advancing technologies. It starts by giving a checklist of current data manipulation tools and techniques, continues with new models for online subscriptions, and finishes with a rousing call for librarians to reconsider their role in the knowledge management schema. Rather than simply serving as facilitators for user's data retrieval/manipulation needs, librarians should also try to drive innovation to optimize their performance.

This piece is interesting in that it deals with the problem of Knowledge Management almost as a synonym for information management. Yet, it can't be ignored that the problem of intelligent information retrieval is more to do with knowledge and less with the austere simplicity of 1's and 0's. That is the reason that Librarians are an irreplaceable and vital part of any library, having information is useless without the intelligence to turn it into knowledge.

David Blair's piece on Knowledge Management seeks to outline the differences between Knowledge Management, Data Management, and Information Management. It explores the definition of "knowledge" and the factors that motivate Managers to deploy knowledge management systems. In this paper, "knowledge" is defined as something that only a human can possess and exercise. During an employee's tenure at whatever organization they will inevitably accumulate "knowledge" that is uniquely applicable and valuable to that particular work flow. The questions that Blair feels the Knowledge Management community should better address revolve around techniques that preserve this knowledge against the loss of a valuable and sometimes irreplaceable commodity once the employee leaves and that encourage expertise development in the first place.

By making a distinction between Data, Information, and Knowledge Management, Blair has diverged from the authors of the other two articles by limiting the scope of Knowledge Management to the intangible expertise of an organization's players. In contrast, Southon et all's article tracked all the information interactions that took place between the different entities in an organization and Stern was more concerned with intelligent utilization and retrieval of existing information.

While all three of these articles purportedly deal with Knowledge Management, it would seem that the three groups of authors have different views as to what exactly KM entails or the size of its scope. While I've only covered three of the plethora of Knowledge Management pieces available, these three help to illustrate that while there are no wrong answers, Knowledge Management can be found under many different guises. This is appropriate for a commodity of such an ethereal quality.

Content Management

The field of Content Management is one that has come into recent ascendancy in the public as well as private sector. Increasingly it is becoming recognized that the gains of effectively managing ones information content can be extensive in terms of efficiency and continuity. One of the most definitive publications describing the functionality of a "complete" Content Management solution is Bob Boiko's Content Management Bible. This book comprehensively articulates the basic design of a content management system that encapsulates the entirety of an organization's data content. For the most part, this

sort of system is focused on managing content in order to facilitate some sort of publishing process, such as publishing web sites or company documents.

In further exploration of the Content Management field, I decided to compare and contrast the views of Boiko with several papers that discuss two different implementations of Content Management Systems. I felt that this would help me get a better feel for the how the theory translates into the myriad different situations that modern content managers must deal with. One of the papers, "COPLINK, managing Law Enforcement Data and Knowledge" (Chen, Zeng, Atabakhsh, Wyzga, & Schroeder) deals specifically with a system put in place in order to leverage a slew of law enforcement databases in every day police work in Tucson Arizona, the other "Content and Knowledge Management in a Digital Library and Museum" (Yeh, Chang, & Oyang) describes the structure of a large digital library in Taiwan.

Hsinchun et all discuss a system that they helped put in place for the Tucson Police Department called COPLINK. The problem that the researchers were presented with upon starting the project is that in an environment where law enforcement officers need to draw information from a variety of databases it was time consuming and difficult to access everything they needed across a broad spectrum of available systems. COPLINK in its various manifestations is a system that they created to alleviate this problem. It is one interface that allows the officers in a wide range of positions in the Tucson PD to mine a variety of law enforcement databases with several levels of complexity. Their primary focus was to create a basic interface that would be available to every level of crime fighting personnel. It was to have a very simple interface and only four types of searches. In order to contain costs and make the system more

accessible they leveraged various open source technologies and utilized a web interface. Simply put, the researcher's team developed a set of online scripts that allowed officers in the field to access and upload data to central databases, thereby allowing the full force of the Tucson PD's information wealth to be levied towards keeping the peace. In this way, the authors' team greatly increased the effectiveness and usability of the Law Enforcement data collection and retrieval system at a minimal cost. While not quite the powerhouse of your typical commercial Content Management System, I believe that this system is a classic example of an organization consolidating information resources and streamlining output which is the goal of every good CMS system.

The subject of Jian-Hua et all's article was the design and structure of the new national Taiwan University Digital Library and Museum (NTUDLM). This management system is more of what might be called a traditional Content Management System since it also deals with the storage and maintenance of its archive. The NTUDLM's system is interesting because it adds a lot of functionality to its system via an object-orientated repository that helps to augment and control information retrieval and storage. This repository acts as a buffer between the actual content repository and the outside world. In addition, the NTUDLM system was designed with a suite of Knowledge management tools designed to seek out implied as well as temporal relationships. This package included an impressive amount of automation and functionality that allows users increased usability while minimizing human administration.

According to Boiko, "Content Management is about gaining control over the creation and distribution of information and functionality". The book goes over what Boiko considers the vital elements of the Web Content Management System (i.e. the

Collection System, the management system, the publishing system etc.) The system Boiko describes is a comprehensive system that covers all aspects of Content Management. While the Digital Library probably comes closest to this kind of system, neither really measures up to Boiko's perception. I think this is indicative of the current state of the Content Management Industry. As Boiko points out, "you'd find that the majority of content management systems in use today were created by programmers and Webmasters who were simply trying to keep up with their explosive sites". While solutions like COPLINK definitely seem to be "cheap and dirty" creations when stacked against some of today's Content Management Systems, they have a lot of value in their cost and the minimization of system disruption. I would imagine that the majority of institutions out there would still find the idea of one all-inclusive information management system too expensive or too risky a venture. I also believe, however, that all-inclusive Content Management systems will someday become inevitable as the amount of data institutions warehouse and the accompanying efficiency rewards to successful management increases.

KM vs. CMS

So what is Knowledge Management? It would seem that the definition of Knowledge Management like the nature of knowledge itself is rather hard to pin down. However an in-depth understanding or definition of knowledge and the knowledge environment may be unnecessary in lieu of a naturally intuitive sense of work flow. For instance, the Southon study reports that "the most cogent finding of the research was that, despite the limited awareness of knowledge management theory and rhetoric, there was a

pervasive understanding of the role of knowledge in the organization, with some quite well-developed strategies of embedding knowledge in the organization's operation." This implies that even with an absence of an acknowledged knowledge management strategy, humans are naturally equipped to recognized flaws or opportunities for improvement.

The reality is that Knowledge Management is not a new phenomenon in the scope of human history. Indeed all of recorded history has been a struggle to capture and pass on current knowledge. Technical progress is based on the fact that we no longer need to "reinvent the wheel". The only new component in the equation is how to adopt this very natural motive to harness the current wisdom in a digital environment. With the recent emergence of the internet, communication became nearly instant overnight, creating huge potential gains and few strategies to capitalize on them. Like the boom created by the emergence of rail power, the evolution triggered its own boom where new networks were created and more fiber was laid than railroad ties ever were. In what was sometimes termed "irrational exuberance", businesses raced to create whole new knowledge environments powered by internal networks, powerful web services, and efficient communications systems.

One can only imagine the enthusiasm with which the printing press was greeted in its time. When the wonders of the printing press became apparent, it must have been a heady moment. Unfortunately however, the quicker you are able to print the books the more difficult it is to store them and manage them. The Librarians of the first Alexandrian Library could probably tell you about all the niggling problems that come with large collections (i.e. flammability). This is where many would argue Content

Management comes into the picture. Now that everyone and their secretary in your company are churning out company documents, a mechanism of control and publication will increasingly become a matter of survival. According to Boiko, "Content Management is about gaining control over the creation and distribution of information and functionality". In other words, Content Management Systems will help organizations organize, store, control, and publish their store of information, so that when a Travel Agency wants to publish a pamphlet or IBM needs to update their website they don't have to "reinvent the wheel." Although complex schema that involve themselves in every level of publication may indeed be reflected by the leading CMS solutions available, it seems the term can also refer to any system that attempts to organize information and/or make it available for access.

So how exactly do they differ? It would seem that while KM is an idea as old as papyrus, CMS is the new digital manifestation of the same drive to organize and more efficiently utilize data stores. That is where this project seeks to provide a solution to a common problem. While it is by no means a comprehensive CMS it is a tool that helps to utilize information.

III. Program Rationale and Outline

The reality of our current technological situation is that as time goes by our digital legacies will continue to grow at an exponential rate that the Alexandrian Librarians would never have dreamed of. As communications across great distances becomes increasingly inexpensive and incredibly fast, our way of doing business will also change. Already activities such as commercial air travel are being affected by communication

technologies such as email and video conferencing. It will therefore be incumbent on every organization in the coming years to increasingly become concerned with their unique knowledge imperatives. Capitalizing on new technologies in order to provide better information throughput is already becoming vital for survival in the current atmosphere.

What seems of paramount importance for all of us in the Information Science field is to theorize strategies and formalize standards to make this challenge surmountable for all players. Currently if you were to price the CMS systems of the leaders in the field, you would find that the processes can be quite costly without guaranteed results. While these all-in-one products are indeed flashy and can be quite effective, in the current atmosphere I fear they will go the way of products such as Netscape Navigator that in the end were deemed superfluous to the market. With the emergence of open source software and many large institutions already paying large licensing fees, I would predict that new strategies will come to dominate this industry. Taking COPLINK as an example, one can appreciate the power of scripting languages such as PERL, ASP, or PHP to deliver and package information on the relatively cheap and easy.

The real trick, however, will be the creation of some sort of Knowledge Management standard or common schema. In an age where information holds the power to buy or sell, the idea of proprietary systems that can't talk to each other becomes laughable. What I propose will happen in the coming years is that like the internet browser, a cheap/free dominant player will arise and standards of communication will be formalized. Whenever you walk into a library be it public or private the books are all going to be organized in much the same manner. That's because the underlining system

of organization and retrieval has been codified. With the SQL standard I believe that much the same could be said of database information retrieval. However even this standard still puts retrieval out of reach for the average user. More should be done to make databases transparent and accessible to the common user. This project seeks to prove this point by the creation of what I call the Portable Information Retrieval Environment or PIRE.

PIRE's functionality is very straight forward. It is an ASP script that interfaces with an Access Database and allows the user to navigate the database by following tuple "threads". A user starts off by selecting a key table field such as Employee Number and entering search criteria to match with the Employee Number field in the Employee Table. Once the search is performed the user will either be presented with a list of potential matches or if the search criteria was specific enough one match. In the case of multiple matches, the user has the ability to select the correct record or "lock" it. Once the results have been isolated to one record, the user is presented with the option of searching other tables with the foreign keys contained in the selected record or with the current primary key listed as a foreign key in those tables. For instance, if the user successfully found Employee Number 33, he would then be able to search for all the orders that have Employee Number 33 listed as responsible in the Orders table. This script is capable of recursing indefinitely so that you could potentially follow the "thread" throughout the table. In the following sections I will go into more detail about the three components to the PIRE system as well as provide more detailed walk-throughs of the system.

IV. Part I: The Database

For the purposes of this project I decided to build my database using Microsoft's sample Northwind Access Database. This database had a lot of advantages beyond the obvious convenience of it already being located on my computer's hard drive. It is well formed, it is already populated with data, and it attempts to mimic the typical business database (See Figure 1). In order for the ASP script to be able to connect with the Access database, I installed Microsoft's Internet Information Services (IIS). Once that was done, I set up a system DSN for the database and gave the IUSR (internet user) object permission to interact with the database. I chose Access for this project because it is a piece of business software that is widely used in most office settings. It is relatively inexpensive, part of a software package that is included with most desktops, and is perhaps the easiest DBMS system to learn.

V. Part II: The Map Configuration

While for the most part, PIRE is completely portable between systems, there is a small amount of configuration necessary before the script can interact with the database. In order for the script to successfully interact with the database without hard coding database-specific variables, a means for communicating the objects within the database to the script must be initiated. A table must be created within the database called MAP (see Figure 2) that contains the information necessary for the program to run through the search algorithm.

At this point it should be noted that for this project the MAP table was created manually by the author within the Northwind database. It would be better if MAP could

be automatically generated by the PIRE script since this would allow total automation of the process. However, this was not deemed feasible for this particular project. A result of choosing the Microsoft Access DBMS was the limited SQL command options available within that environment. Had an environment such as MYSQL been chosen with its Describe command, an automatic MAP configuration might have been feasible.

Map contains four fields;

Table: Every table of the database should have a record in the MAP database.

Field: This field lists the name of the key fields located in the listed tables. These fields are the identifying features of each table object.

PK: This is a Boolean field that lists whether or not Field is the table's Primary Key.

Designation: This field links the different Field names that describe what is essentially the same variable. For instance in Figure 2, the fields ShipVia and ShipperID are actually the same variable and therefore have the same designation of 7.

The Table, PK, and Designation fields are essential to describing for the script the relationships that exist between the Fields. For instance if the user searches for a record with the OrderID field, the database will search in the Orders table since it always defaults to the PK table, and it then knows that it has variables in its tuple that can be used to search in the Employees table, Order Details table, and Shippers table (see Figure 3)

VI. Part III: The Script

PIRE is essentially an ASP script that can recursively build and run SQL queries depending on where in the process of searching the user is located. The real challenge and goal of this script is to make it completely portable or in other words to make it so that none of the script is databases specific. This is true for the most part except for the fact that the DSN of the Access database has been coded into the PIRE script for the sake of expediency. Apart from that, however PIRE draws all database specific information from the MAP table created within the database. Assuming the user was given the opportunity to point the script at any DSN, PIRE should be able to handle multiple databases. With some minor tweaking, I also believe that PIRE would be applicable to most SQL based databases such as MYSQL or Oracle.

VII. The Tour

In this section, I will walk you through the structure of PIRE as well as a few example scenarios within the Portable Information Retrieval Environment. Although the structure of PIRE is quite simple, only compromising several hundred lines of code, the multiple recursive iterations can become a bit burdensome. In order to better understand the layout of PIRE, I have included a flow diagram (Figure IV) that plots out the basic functionality of PIRE as it exists now. As mentioned earlier, the layout of the program is fairly simple; it basically consists of three levels or iterations of the search process. The most basic level is the first search that the user initiates from the Start page (Figure V). Upon loading, the Start page accesses the fields in the MAP table whose PK variable equals True (Figure VI). The user then chooses one of these fields and enters a search

text which will have SQL wildcards added to it by the program. Depending on the user's search, the program will then return one record, multiple records, or a "No Record Found" message.

If the program returns more than one record (Figure VII), then the user will be given the option of locking an individual record via another iteration of the program. Once a record is locked or if the search should only retrieve one matching record, the user will be given the option of performing further research on each of the main fields in the locked record (Figure VIII). In other words, if some of the fields in a record are foreign keys or primary keys in other tables the user will have the opportunity to research these pieces of information in those tables. For example, in Figure VIII the Product record for Grandma's Boysenberry Spread has been locked from Figure VII. When the record was locked the user is given the opportunity to search the table Categories with CategoryID equal to 2, the table Order Details with ProductID equal to 6, and the table Suppliers with SupplierID equal to 3. In this way, if you selected to search the Order Details table for orders of Grandma's Boysenberry Spread (Figure IX) not only would you find that there have been 12 orders for that particular product, but you could also find out information on all 12 of these orders.

Now let's say that you're a new supervisor at the Northwind plant and you'd like to learn a little about an employee's time with the company. You decide to look up Margaret Peacock, whose employee number is 4. When you perform the necessary search (see Figure X), you find out all the details of her employment. Then you can search the Orders table to see how many and which orders that Margaret has handled.

From this view (see Figure IX) you can tell that Margaret has originated 156 sales. From there you drill down to information regarding shippers, customers, and products.

There are a myriad of ways and scenarios in which PIRE can purvey to the user useful information. If you would like to test the system yourself, it may be accessed at http://www.pschen.org/thesis/Search.asp

VIII. Analysis and Discussion

One of the most difficult aspects of creating a new interface or program is the training necessary to equip users to actively use your product. I believe that one of the main advantages that PIRE provides is that it utilizes a very simple interface run through a medium (i.e. the internet browser) that almost every user is familiar with. While it does not provide the depth of quantitative data that the fully trained Access user can retrieve, it does allow a non-technical user to search the database and uncover relationships between objects of the database. By providing a means with which to traverse and link the multiple objects within the database, a closed book becomes transparent and a great deal of information can be gathered with very little expertise.

While PIRE is without a doubt a very basic implementation of the stated philosophy of this project, it has performed well. I believe it is capable of providing an easy and accessible means for simple database information retrieval. Its simplicity is also advantageously reflected in its small size which should guarantee quick performance for a variety of computing systems. Although the modest goals of this program are achieved there is as with any program much room for improvement. While this project was designed with solving real world computing problems in mind, the realities of this project

forced some compromises to be made in the name of expediency. Obviously PIRE doesn't meet the qualitative demands that most users would come to expect from a database interface. A lack of query building ability means that for the intermediate to advanced database user, this tool may prove inadequate or frustrating. In addition, PIRE is unable to create reports or otherwise save search results.

IX. Standardization

So what was the point? PIRE's two hundred or so lines of code contain not one reference to a table or field in the database outside of the MAP table discussed above. With only a small alteration, i.e. the addition of the MAP table, the data of the entire database suddenly became available to the web interface. This interface makes the data of the DBMS transparent and available to any user with basic computing skills. The small gains that PIRE provides, however, could be greatly improved upon if DBMS systems were required to provide object-orientated data. Rather than having to add a MAP table, if SQL was expanded to provide an equivalent data set then data could easily be drawn from these databases into other applications such as PIRE. Expanding the accessibility of DBMS systems through this sort of standardization would greatly abet the free flow of knowledge. In this way, although DBMS systems will inevitably become out-dated, their data would always be available to programs equipped with the proper protocols.

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Figure I
Northwind Database Relationships

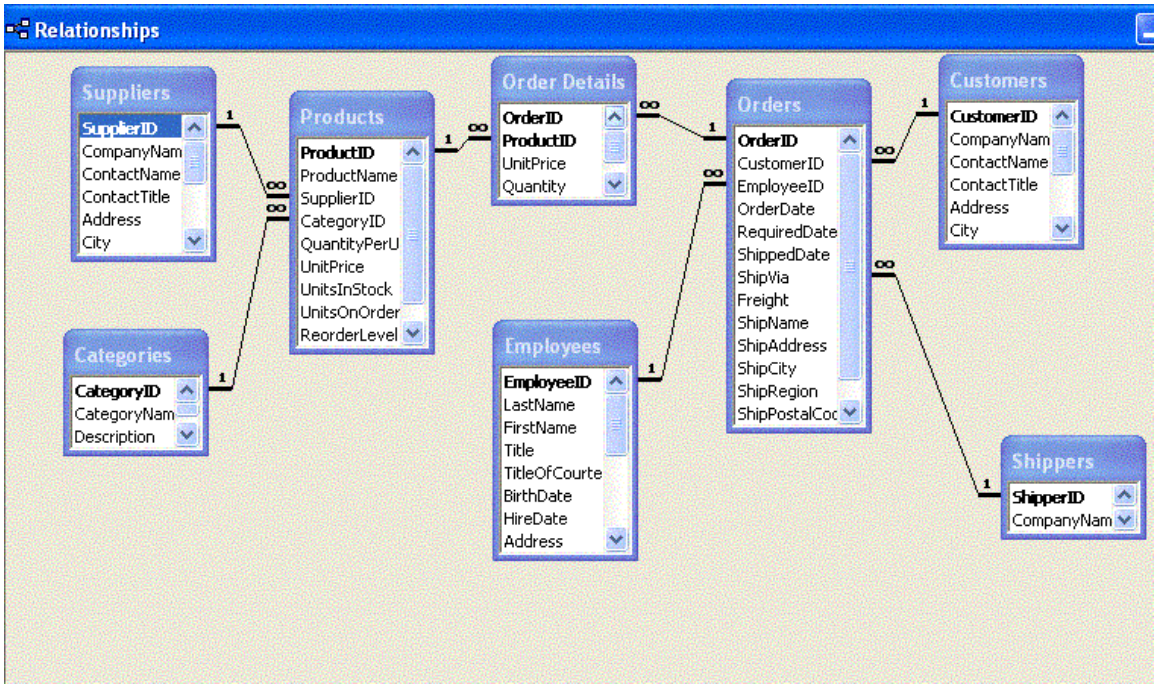
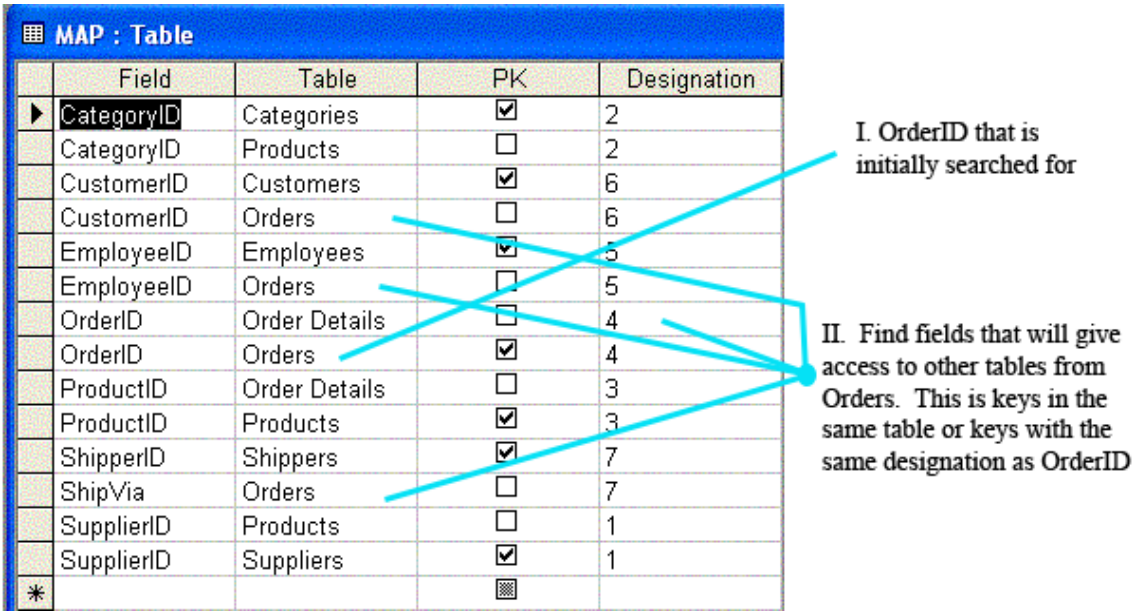


Figure II
Northwind Map Configuration

MAP : Table

	Field	Table	PK	Designation
▶	CategoryID	Categories	☑	2
	CategoryID	Products	☐	2
	CustomerID	Customers	☑	6
	CustomerID	Orders	☐	6
	EmployeeID	Employees	☑	5
	EmployeeID	Orders	☐	5
	OrderID	Order Details	☐	4
	OrderID	Orders	☑	4
	ProductID	Order Details	☐	3
	ProductID	Products	☑	3
	ShipperID	Shippers	☑	7
	ShipVia	Orders	☐	7
	SupplierID	Products	☐	1
	SupplierID	Suppliers	☑	1
*			▩	

Figure III
Northwind Map Example



MAP : Table

Field	Table	PK	Designation
CategoryID	Categories	☑	2
CategoryID	Products	☐	2
CustomerID	Customers	☑	6
CustomerID	Orders	☐	6
EmployeeID	Employees	☑	5
EmployeeID	Orders	☐	5
OrderID	Order Details	☐	4
OrderID	Orders	☑	4
ProductID	Order Details	☐	3
ProductID	Products	☑	3
ShipperID	Shippers	☑	7
ShipVia	Orders	☐	7
SupplierID	Products	☐	1
SupplierID	Suppliers	☑	1

Figure IV
PIRE Flow Diagram

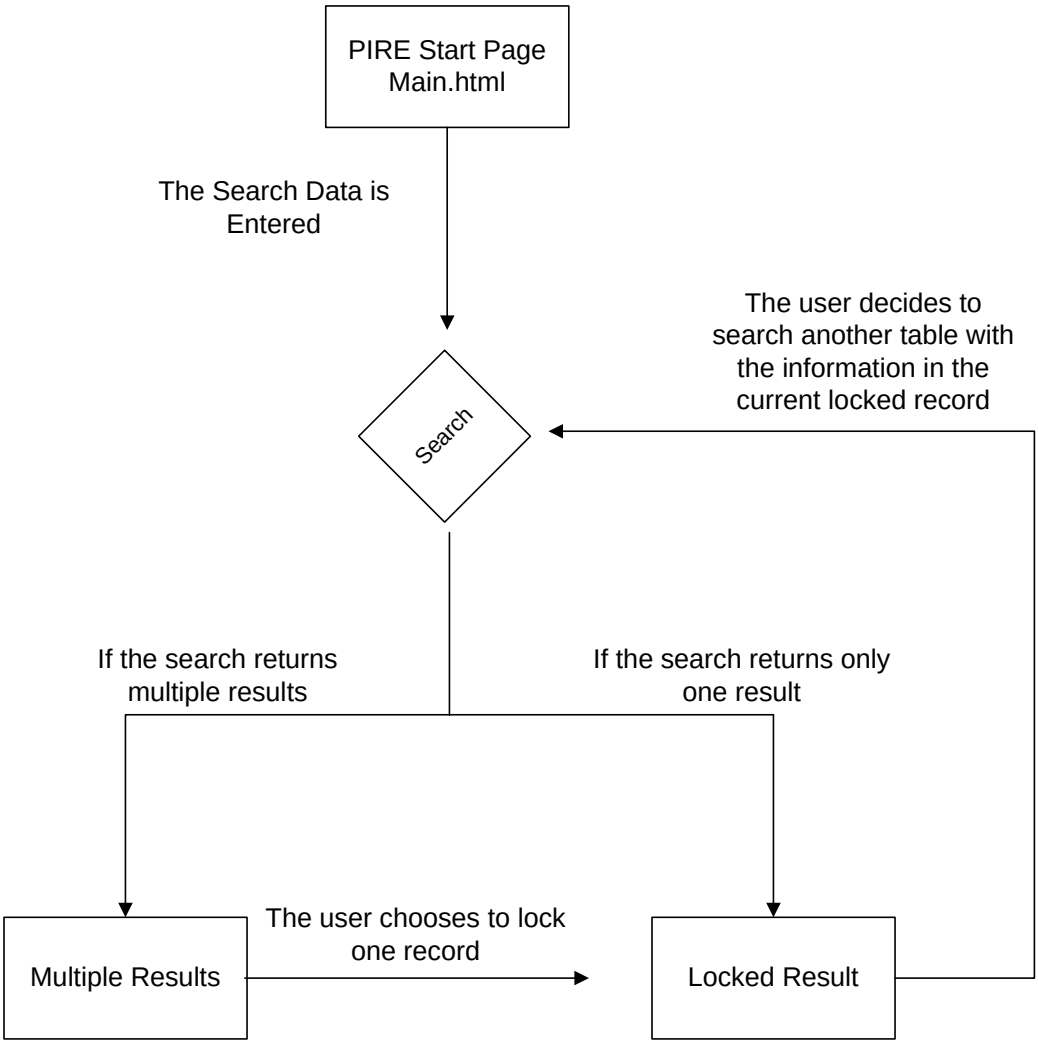


Figure V
PIRE Start Page

Figure VI

PIRE dynamically loads the Primary Key fields from Map

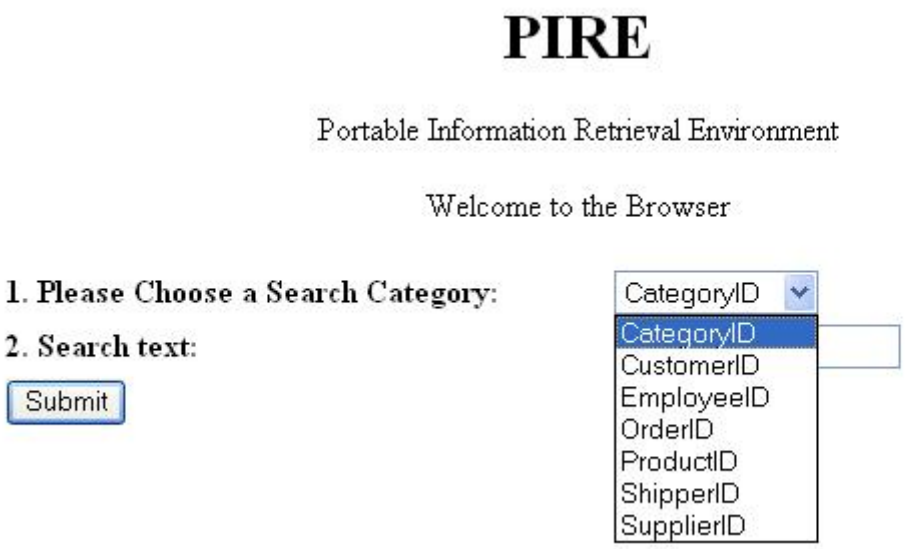
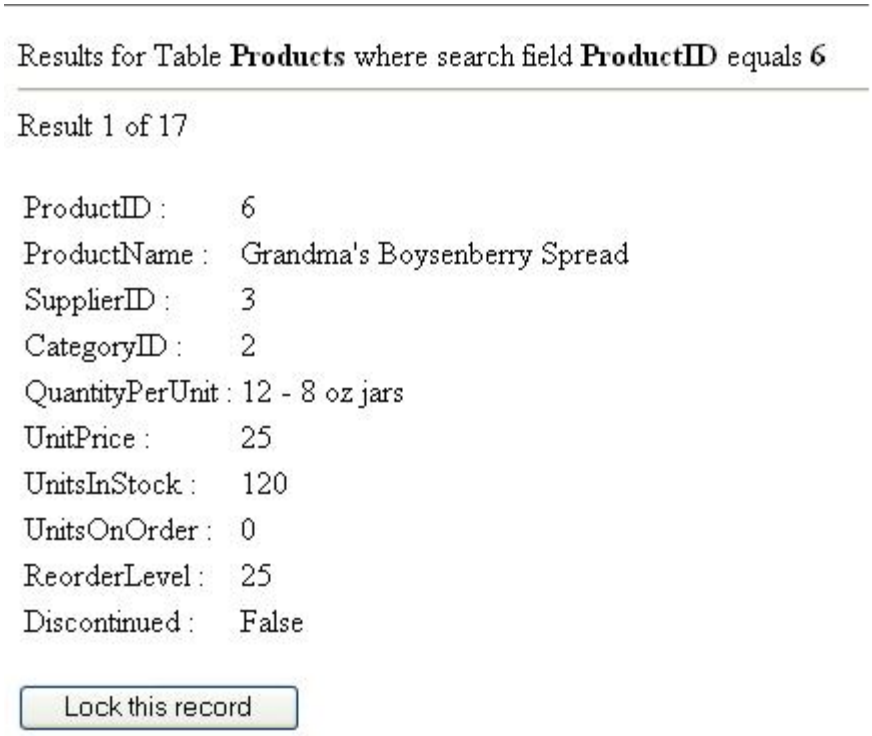


Figure VII
PIRE returns more than one search



Results for Table **Products** where search field **ProductID** equals **6**

Result 1 of 17

ProductID :	6
ProductName :	Grandma's Boysenberry Spread
SupplierID :	3
CategoryID :	2
QuantityPerUnit :	12 - 8 oz jars
UnitPrice :	25
UnitsInStock :	120
UnitsOnOrder :	0
ReorderLevel :	25
Discontinued :	False

Lock this record

Result 2 of 17

ProductID :	16

Figure VIII
One Record is Locked

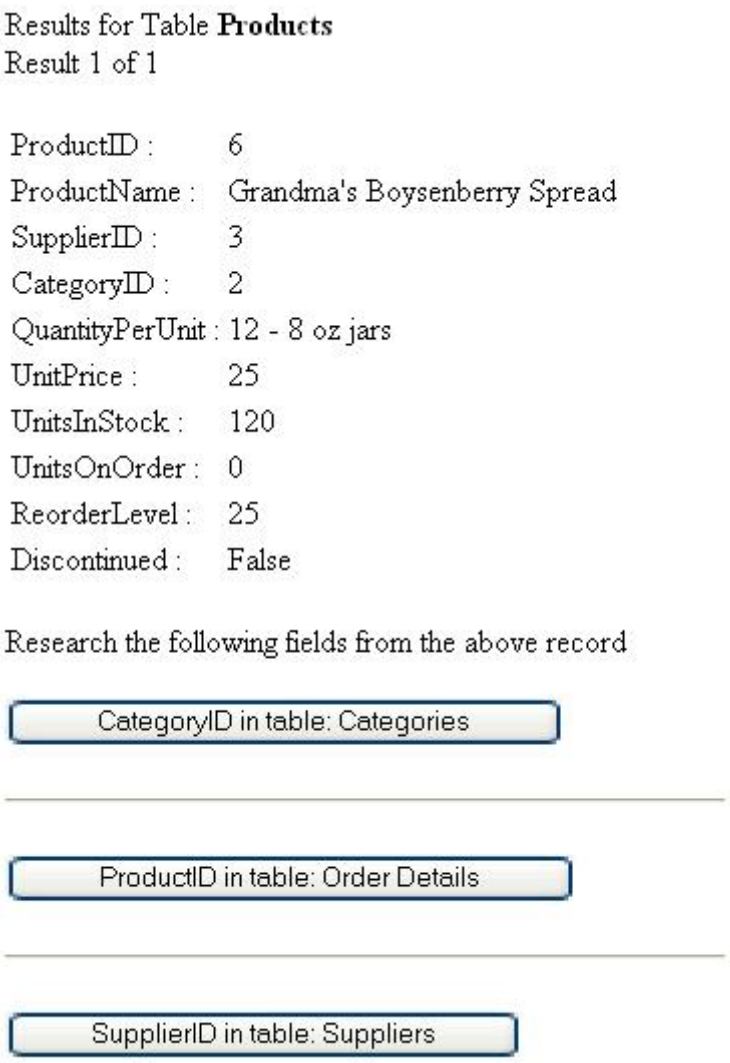


Figure IX
ProductID in Order Details

Figure X

Margaret Peacock's employee file

Result 1 of 1

EmployeeID :	4
LastName :	Peacock
FirstName :	Margaret
Title :	Sales Representative
TitleOfCourtesy :	Mrs.
BirthDate :	9/19/1958
HireDate :	5/3/1993
Address :	4110 Old Redmond Rd.
City :	Redmond
Region :	WA
PostalCode :	98052
Country :	USA
HomePhone :	(206) 555-8122
Extension :	5176
Photo :	EmpID4.bmp
Notes :	Margaret holds a BA in English literature from Concord assigned to the London office before returning to her pe
ReportsTo :	2

Research the following fields from the above record

EmployeeID in table: Orders

Figure XI
The orders that Margaret has completed