Business Intelligence:  
Where have we been? Where are we now? Where are we going?

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Abstract

This paper examines the evolution of business reporting technology over the past 4 decades; and the emergence and maturing of Business Intelligence as an IT discipline. It is often said that history repeats itself. Through a study of past trends, this paper hopes to cast some lights on the Business Intelligence trends of the future.

About The Author

A frequent presenter at local and regional conferences, Howard has been working on database technology since 1991. Possessing in-depth experience in the planning and development of Business Intelligence and E-Business Applications, Howard and his team have helped many organisations deploy BI and E-Business solutions using a variety of technologies. Since 1997, Aurora Consulting has been delivering Data Warehouses and E-Business solutions to a wide variety of organisations including large government departments and ASX-listed companies.

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Introduction

It has been almost 40 years since IBM rolled out its System/360 series of mainframe computers in 1964. With the unrelenting pace of new innovations, new hardware, new software, and associated new IT architecture, the IT industry has undergone fundamental transformation in that time. Parallel to that, the IT discipline of business reporting (called Business Intelligence these days) has undergone transformation in a similarly unrelenting pace. Through a study of past events and present trends, this paper hopes to cast some lights on the Business Intelligence trends of the future.

Era of the Mainframe (1960s to 1990s)

The emergence of the mainframe computer, spearheaded by IBM, is widely recognised as the dawn of the modern computing era. The prevailing IT architecture of this era involves a central database (IBM DB2) residing on the central mainframe; accessed by a host of decentralised dumb terminals. Unlike modern devices, these dumb terminals have very elementary interface - character-based with no GUI interface.

The prevailing reporting tools of this era are 3GL procedural programming languages such as Cobol. The emergence of SAS in 1976 represents a significant change in reporting technology, where more complex business reports were produced from real-time in-memory data caches.

The advent of mini-computers, such as DEC’s PDP-11 in 1970s, makes computing available to many smaller organisations who cannot afford the mainframe. However, downsizing of the central computer aside, IT architecture remained largely unchanged.

Age of the Desktop Computers (1980s to Present)

Bill Gates’ vision of “a computer on every desk and in every home” ushered in a significant change to IT architecture. Collaboration between Microsoft and IBM saw the launch of the IBM PC in 1981. This represents the first step in user-empowerment by placing a computer on the user’s desks. Coinciding with the release of the
IBM PC, Ashton-Tate launched its flagship dBase II database on the IBM PC platform in 1982. With this, the computer on the desk is also host to a database. By creating local offline data caches on the desktop database, populated with corporate data from the central database, power users can for the first time develop their own business reports without the help of IT professionals. Through this simple architecture, an early form of Data Warehousing architecture was taking shape. Over time, as more and more users adopt this approach, the issue of inconsistency across the various local databases arises. In addition, having multiple sources of truth led to data reliability issues. Moreover, by its very nature, desktop databases do not provide a high degree of availability.

**Client-Server Computing (1990s to 2000s)**

The introduction of open-platform servers, such as Unix and Windows servers, provided a catalyst for the introduction of a new computing paradigm – Client-Server Computing. The availability of client-server reporting tools, such as Oracle Discoverer, Oracle Reports, Cognos Impromptu and Crystal Reports, causes business report generation to be decentralised to the increasingly powerful desktop computers.

At the server-end, central databases dedicated to corporate reporting are being built - the first Data Warehouses. At the same time database technology advances helped Data Warehouses perform better. It is during this period that the IT industry witnessed the introduction of specialised Data Warehouse databases such as Teradata and Red Brick Warehouse. It was not long before traditional database vendors such as Oracle and IBM introduced Data Warehouse optimisation features into their database products, features such as star queries and bitmap indexes.

To help move large amount of data into the Data Warehouse, a new breed of software is required – Extraction, Transformation and Loading (ETL) tools. Early ETL tools such as IBM DataStage and Informatica PowerCenter tend to be less feature-rich and more expensive. Over the years, software improvements would see the features enhanced and prices dropped.

Another new breed of Business Intelligence software that emerged at this time is the Online Analytical Processing (OLAP) tools. Express, the first OLAP tool, appeared as early as 1970. However, it was not until 1993 that E. F. Codd (of relational database fame) coined the term OLAP. Most OLAP tools introduced to the market at this time are use in use today. These included:

- Express
- Hyperion
- Cognos
- Business Objects
Server Partitioning

The evolution of client-server computing to N-tier architecture coincides with an ever increasing need for specialised server machines, e.g. Database Server, Application Server, Web Server, BI Server and File Server. With ever greater need for more processing power, it is no longer feasible for a generic server to serve all the server functions. In Server Partitioning, dedicated server machines are designated for specific server functions. This phenomenon is even more prevalent in the field of BI, where dedicated server machines are often required for specific BI server functions, such as:

- Data Warehouse (Database Server), e.g. Oracle, SQL Server.
- Report Server, e.g. web version of Oracle Discoverer, Oracle Reports, Cognos Impromptu, Crystal Report.
- OLAP Server, e.g. Oracle Express, Cognos Powerplay.

Over time, the processing power required became greater than what a single server machine can provide. The solution to this problem is server clusters, where multiple servers work collaboratively in a cluster to fulfil a specific server functions, as illustrated below:

True Mobile Computing

When IBM first introduced the desktop computer, it was given the name “Personal Computer” (PC). Over time, as more and more personal computing devices were introduced, the term “Personal Computer” became meaningless. These days, the preferred term for these computing devices are “Desktop Computers”.

When laptop and notebook computers were introduced, these were considered “Mobile Computers”. Over time, the term “Mobile Computer” also turned out to be inappropriate for these computing devices. For even though the devices are more mobile than their desktop counterparts, they are not mobile in their use – the user usually has to sit stationary at a desk when using these devices.

The advent of Smart Phones and Tablet Computers ushered in the age of true mobile computing. True to their name, these “Mobile Computers” is made to be used while the user is on-the-move.

Server Platform Consolidation

Years of Server Partitioning have greatly increased the number and types of components, and hence the complexity of IT infrastructure. Often, user organisations have to undertake complex system integration work, in order to assemble a working IT infrastructure. This in part has prompted the latest phenomenon – Server Platform Consolidation. Thus, rather than the user organisation constructing an IT infrastructure from individual components, vendors would assemble all-in-one appliance machines with all the required components. The appliance machine is powerful, integrated, optimised and pre-installed with server software – considerably simplifying the system integration task.
Through a series of corporate acquisitions, Oracle Corporation has evolved from a database company to an IT company with a suite of vertically integrated hardware and software products. This dominant position allows Oracle to spearhead the Server Platform Consolidation trend in the IT market place. To date, Oracle has released 4 appliance machines for 4 distinct server functions:

- Database Server: Exadata Database Machine
- Application Server: Exalogic Elastic Cloud
- Big Data Server: Big Data Appliance
- BI Server: Exalytics In-Memory Machine

In addition to Oracle’s appliance machines initiative, elsewhere in the IT market place Server Platform Consolidation are occurring on other server platforms:

- Desktop and server consolidation through Virtualisation.
- Storage consolidation through Storage Area Network (SAN) and Network Attached Storage (NAS).

Last but not least, there are the various Cloud products promoted by the likes of Amazon and Telstra. These products are the ultimate Server Platform Consolidation products, where one or more of the above-mentioned already-consolidated platforms may be further consolidated into.

**Recent BI Trends**

Within the BI space, another form of Server Platform Consolidation is occurring – blurring the delineating lines among various classes of BI software:

Increasingly, rather than being separate servers, it become increasingly common for OLAP capabilities to be built into traditional relational databases. E.g.

- Oracle Analytical Workspace
- SQL Server Analysis Services

At the same time, the line between true Multidimensional OLAP and Relational OLAP has also been blurred. So powerful have relational databases become that ROLAP now performs as well as MOLAP. Some examples of such ROLAP products are:

- Oracle BI Server
- SQL Server Report Services
Cognos Report Studio

Once attracting premium licence prices, ETL tools are now inexpensive and more powerful. Recent trends have seen many ETL tools incorporated with BI Data Modelling capabilities. E.g.

- Oracle Warehouse Builder
- Oracle Data Integrator
- SQL Server Integration Services
- Cognos Transformer / Framework Manager

Meanwhile, BI corporate has been undergoing some consolidation of its own:

- IBM acquired Cognos;
- SAP acquired Business Objects, Crystal Reports;
- Oracle acquired everybody else: Express, Siebel Answers (OBI), Essbase, Hyperion and Sunopsis (ODI);
- and Microsoft developed the rest: SSRS, SSAS and SSIS.

**Future BI Trends**

What will happen in the future? No one can say in certainty. But there is only one thing we can be certain of: changes are inevitable.

Glazing into the crystal ball, the likely future developments are:

- The wave of Server Platform Consolidation is set to continue, with more appliance machines to be introduced by Oracle and other vendors.
- Meanwhile, with further consolidation, Cloud will become bigger and Cloud services more functional. With these, the line between the in-house server and outsourced server would blur.
- A recent IBM study revealed that the world is generating 2.5 quintillion bytes of data every day - that is 2.5 billion billion bytes - in tweets, posts, SMS', emails, images, office documents, etc. If we compile this data into hard copy volumes, these will fill several hundred libraries! With vendor pouring R&D resources into the area of Big Data, over the next few years, Big Data tools will mature into more functional and cost-effective tools. The resulting explosion in the amount of analysable data will in turn facilitate the progression from Business Intelligence to Business Analytics.
- With Cloud gaining popularity and requirement for Big Data Business Analytics taking hold, the Application Service Provider business may finally take off.
- The emergence of more truly mobile devices will see more wide-area remote devices connecting to the 4G network; communicating with home and office appliances such as TV, Hi Fi, Photocopier and Printers. Inline with recent trends, rather than being physical hardware devices, many of these will simply be virtual devices – as apps installed on smart phones and tablet computers.
- With improvement in mobile network access speed, wide area Virtualisation will become a reality. With wide area Virtualisation, a system administrator can administer a server from anywhere where there is mobile signal.
- More BI services will be rolled-out to mobile devices, even through they might not be recognised as such. The blurring of the line between traditional and BI applications will result in high pervasiveness of BI services into every facet of our lives. We will be consuming BI services without even knowing it, e.g. a check of the settings of a remote printer could involve BI reports being streamed out to the mobile device without the user thinking that it is BI he/she is consuming.
Conclusion

The IT industry has made quantum leaps since 1960. However, in some way, the more things changed, the more they stay the same. To illustrate, consider the following 2 architectures, one from 1960s; while the other is the modern day state-of-the-art architecture.

Spot the similarities?