STRATEGIC ANALYSIS OF REFERENCE DATA MANAGEMENT FOR CONNOR, CLARK & LUNN FINANCIAL GROUP OF COMPANIES

By

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ABSTRACT

This report is a strategic analysis of how an investment management firm can structure its reference data management to facilitate a "parent-affiliate" corporate strategy. This report discusses several approaches that Connor, Clark & Lunn can take with respect to its reference data management processes. Approaches range from centralizing the raw data download, all the way to outsourcing the entire reference data management function to a third party vendor. In recommending the best approach for CCL, a number of key considerations will be analyzed and discussed. Key considerations mark the important features or characteristics that make a good data management process. In addition, a few company specific characteristics, or contextual factors, will be used to analyze the overall "fit" of each approach to the company. Final recommendation is based on quantifying and ranking of each approach against the key considerations as well as the contextual factors described.
EXECUTIVE SUMMARY

Commenced operations in Vancouver in 1982, Connor, Clark & Lunn Investment Management Ltd is one of the largest money management firms in Canada. In 2003, it went through a reorganization that created the Connor, Clark & Lunn Financial Group that delivers all of the non-investment management functions to Connor, Clark & Lunn Investment Management and other affiliate investment managers. Hence, the ‘parent-affiliate’ corporate strategy was born. The concern now is that Connor, Clark & Lunn Investment Management still performs much of the reference data processing both for itself and for the other affiliate investment managers. This arrangement raised several issues and considerations that led to the need to restructure the reference data management function at Connor, Clark & Lunn.

Reference data management encompasses all the processes from data acquisition through to the production of the Golden Copy; the Golden Copy is the cleansed and enriched reference dataset that is ready to be consumed by the rest of the organization. At CCL, uses of the Golden Copy includes, but is not limited to, making investment decisions, client reporting, sales pitches, compliance and risk management, and regulatory audits. This report analyzes four alternative approaches to reference data management available to Connor, Clark & Lunn Financial Group of Companies to line up these processes to its corporate ‘parent-affiliate’ strategy.

Key issues that Connor, Clark & Lunn has to consider are 1) privacy of data across all affiliate investment managers, 2) accuracy of data given responsibility and accountability structure, 3) efficiency of processes given multiple data entry points, 4) priority of processes
given informal responsibility structure, and 5) future expansions given increasing product types and distribution channels. Each of the four approaches discussed aims to solve some or all of the issues described.

One of the best ways to solve the issues described above is to centralize the reference data management function and develop a ‘charge-back system’ in which the affiliate investment managers pay for what they use. Centralization implies moving the function to the Connor, Clark & Lunn Financial Group, the provider of non-investment functions. It is, however, to distinguish which parts of the reference data management function are considered investment or non-investment management related activities. Thus, in developing the various approaches that Connor, Clark & Lunn can take, existing reference data management process was broken down into three phases. The first three of the approaches involves moving the responsibilities and accountabilities of the phases towards the Financial Group incrementally, with the fourth approach suggesting outsourcing entirely to an outside third party service provider. The four approaches are:

1. Centralize Phase One – data acquisition
2. Centralize Phase One and Phase Two – data cleansing and enriching
3. Centralize Phase One through Phase Three – non-analytic ex-post data
4. Outsource entire reference data management function

Centralizing phases one through three is the final recommended approach to reference data management for Connor, Clark & Lunn to take in order to align this process to the ‘parent-affiliate’ corporate structure.
ACKNOWLEDGEMENTS

I would like to thank my supervisors Howard Kalthier and Andrew Lefevre for the continuous support and guidance in methods of research for this project. In addition, I would like to acknowledge my colleagues Ron Cooney, Derrick Crowe, Kevin La, and Patrick Robitaille for providing time, effort, and encouragement in formulating the key ideas and arguments on this paper.
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<td>Assets Under Management</td>
<td>Asset under management, often used as a gauge as to the size of the investment management firm, is the market value of portfolios under management in a specified time period.</td>
</tr>
<tr>
<td>Brokers</td>
<td>Brokers are agents or principals in which investment management execute trades with.</td>
</tr>
<tr>
<td>CUSIP</td>
<td>Committee on Uniform Security Identification Procedures represents a uniform security identification system.</td>
</tr>
<tr>
<td>Custodian</td>
<td>Custodian is a bank appointed by clients of investment management firms to hold cash and securities of the portfolio. The custodian keeps a book of record of all securities and transactions and do not execute trades on behalf of the clients. Having a custodian provides checks and balances, as well as provide transparencies for the investment managers' trading activities.</td>
</tr>
<tr>
<td>Data Vendor</td>
<td>Data vendor gathers economic and stock data directly from exchanges, companies, and various statistical organizations, packages the data, and then sold to investment management firms.</td>
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<td>Golden Copy</td>
<td>Golden copy refers to the cleansed and enriched reference data ready to be consumed by the rest of the organization.</td>
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<tr>
<td>Portfolio Administrators</td>
<td>Portfolio administrators are employees of the investment management firms responsible for trade entry into the portfolio management system, reconcile holdings, and resolve any trade settlement or other issues with the custodians.</td>
</tr>
<tr>
<td>Portfolio Management System</td>
<td>Portfolio management system refers to the application in which portfolio accounting is maintained. This application allows portfolio administrators to enter trades, calculate costs and total market values, and perform various account reporting.</td>
</tr>
<tr>
<td>Reference Data</td>
<td>Reference data refers to economic, stock, and portfolio related data used by investment management firms for forecasting, reporting, and trade settlement purposes.</td>
</tr>
<tr>
<td>Reference Data Management</td>
<td>Reference data management refers to the process management of acquiring, cleansing, storing, and distributing reference data to be consumed by other parts of the organization.</td>
</tr>
<tr>
<td>Statement of Investment Policies and Procedures</td>
<td>Statement of Investment Policies and Procedures is a document signed between the investment managers and clients outlining rules, responsibilities, and rights of each party.</td>
</tr>
<tr>
<td>Static Data</td>
<td>Static data is either data that do not change on a frequent basis, or data that could be used 'as-is' without further cleansing or enriching.</td>
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1 INTRODUCTION

Connor, Clark & Lunn is a medium sized Vancouver based investment management firm that has recently gone through a significant change in its corporate structure to serve its clients better and be competitive in the money management arena. One of the most notable developments from this structural transformation is the creation of the entity Connor, Clark & Lunn Financial Group (CCLFG). CCLFG was created to perform the non-investment management functions for each of the affiliate investment managers. While many of the non-investment management related functions such as portfolio administration and information technology services have been successfully centralized and migrated to CCLFG, as the parent of this ‘parent-affiliate’ structure, questions still remain regarding the appropriate home for the firm’s reference data management function.

Currently, the reference data management function is primarily managed by one of the affiliate investment managers Connor, Clark & Lunn Investment Management (CCLIM) for the entire firm. However, CCLIM has no formal relationship or accountability to manage reference data for the other affiliate investment managers. This study attempts to look for alternative approaches to the management of data for multiple affiliates in absence of this formal relationship. Four alternative approaches to reference data management will be accessed and analyzed, of which one will be recommended for CCL to adopt. The paper starts with an overview of what reference data management is, uses of reference data, and key trends in reference data management. The subsequent section provides an overview of CCL as the empirical case. An analysis of CCL’s current data management process is then performed.
followed by a discussion on key considerations in developing the approaches to reference data management. Next, the four alternative approaches to reference data management will be assessed and analyzed, followed by the last section in which the final recommendation will be made.

The intention of this paper is not to provide an implementation strategy, but rather an overview analysis to start a conversation with upper management regarding the overall direction that CCL should take regarding its reference data management. Also, for the purpose of this study, the definition of reference data will be extended to include any commoditized data. Commoditized data refers to raw external and internal data, as well as data that is manipulated or calculated in a predefined and consistent manner. The distinction here is to take reference data to include data up to the point that investment managers can take the data directly for investment modelling and investment decision-making. An assumption made for this study is that the production of reference data itself a non-investment management function that can be scaled and centralized, aligning it with the 'parent-affiliate' company structure.
2 RESEARCH METHODOLOGY

Much of the research for this project is based on interviews with key partners and members of CCL. The author is also in a unique position to provide details of the company structure and important evaluation criteria from six years of experience as an employee of the firm. For the research of the approaches of reference data management, a combination of discussions with internal personnel and some theories discussed as part of the curriculum from the Segal Graduate School of Business, Masters of Business Administration, Management of Technology program will be used. In addition, examples of approaches to reference data management adopted by other investment management firms will be used. Since CCL's 'parent-affiliate' company structure is rather unique to the investment management sector, it is inappropriate to select any particular competitor firms as a direct comparison. Rather, data management services offered by third party providers will be used as a proxy to approaches used by other firms. Services offered by third party providers would constitute as one of the four approaches that CCL can take as an attempt to scale and centralize its reference data management function.
Reference data management refers to the management of reference data that is shared across or used by multiple user-groups within a firm. For financial services firms, reference data refers to the external and widely available economic and individual stock related data that is used for investment analysis, risk management, and client reporting. Depending on the granularity of investment managers' analyses, reference data can also refer to the proprietary internal portfolio and account specific data such as holdings, transactions, and other calculations.

This section of the paper provides a brief description of the components of reference data management, uses of reference data for an investment management firm, and finally, a discussion on the overall trends and findings for reference data management.

3.1 Components of Reference Data Management

Reference data management includes the entire process from data acquisition to processing the so-called Golden Copy. This Golden Copy refers to the reference data that has been cleansed and enriched in such a way that it is readily available to be consumed by other parts of the organization for various uses. Reference data management generally comprises of three processes and the overall systems infrastructure that supports it. The first process in data management is acquiring the raw stock and economic data (Figure 3.1). From a business process...
point of view, this is part of the Data Vendor Management function that requires coordination between external parties and various internal departments in the firm. The second set of processes involves data cleansing and reconciliation to correct holes in the data. The third process involves enriching data by custom calculations and formatting that eventually leads to the Golden Copy. The second and third components thus encompass 1) data analysis, problem resolution, 2) Data modelling and mapping, and 3) database management. Figure 3.1 provides a graphical representation of a typical reference data management for a firm in the financial services industry.

Figure 3.1 Reference Data Management for a Typical Firm in the Financial Services Industry

Reference Data Management for the Financial Services Industry

Data can either come from an external or an internal source. External data includes economic and stock related data is published and through various sources. (Appendix A includes
a sample of data series typically purchased by an investment management firm). Data is then obtained or purchased through a variety of data vendors depending on the data types and needs of the investment managers. Data vendor management involves managing the relationships between investment managers and data providers. At any given moment, an investment management firm can have fifty or more data providers. Multiple data providers are needed since there is not one data provider that could provide the complete data needs of an investment manager. For example, Morgan Stanley Capital International Inc. (MSCI) mostly provides data related to the MSCI indices while other data providers supply large capitalization stocks and data for small cap stocks. In addition, multiple data sources are required to facilitate data checking, confirmation, and cross-references. Data vendor management also includes setting up the data-feeds from different geographical areas and using multiple application platforms. Part of this process is anticipating and managing application upgrades and database maintenance as the provider evolves. Good relationships with vendors can not only ensure fair pricing for the data acquired by the investment managers, but also bulk pricing made and sometimes, custom data sets may even be available for large consumers at no extra charge.

The next data set that goes into the reference data-warehouse is the internal portfolio or account specific data such as account descriptions, stock holdings, costs and mark to values, transactional related data, and corporate actions data. Internal portfolio data is normally a nightly or monthly feed from the firm’s portfolio management system into the reference data-warehouse. A considerable amount of coordination is required since these transactional data are often sensitive to the time dimension in the data-warehouse. For example, ticker changes and other corporate actions have to be retroactively adjusted to ensure a normalized performance as well as portfolio activity calculations. Other coordination efforts include the need to recalculate holding positions due to trade errors, failures in automated processes, and other unanticipated abnormalities.
The second process of reference data management is the process of cleansing, verifying, and cross-referencing between data sources to fill data gaps and fix any data errors. In addition, estimates are often used for data in which there is a time lag between the referenced and the reporting date. For example, the true Price-to-Earnings ratio for companies are normally estimated initially for the referenced date and revised with the true figure when the company publishes its financial statements.

Lastly, data enriching encompasses custom calculations like performance and attribution, and portfolio level characteristics calculations. Calculated results here are normally proprietary and not available to the general public.

The overall systems infrastructure refers to the platforms, applications, and databases that encompass the whole reference management process. The systems infrastructure ensures that applications can communicate with their external and internal counter-parts to receive data, accept queries, disseminate information with ease, disaster recovery, and systems upgradeability. As new technology standards are constantly evolving and ensuring that companies do not fall into the trap of following behind due to legacy systems.

3.2 Uses of Reference Data

Reference data is intended to be distributed and consumed throughout the firm. The key uses of reference data include the following:

**Investment decision-making** – Investment managers use reference data to make investment decisions on behalf of clients. Using reference data, managers can analyse trends,
probability ratings, and stochastic to look for areas of opportunities for his or her account mandates.

**Client reporting** – Periodic client reporting is a requirement for all investment managers. In addition to market values, holdings, and transactional data, quarterly reports, for example, also include performance data, relative sector weightings, and changes in the investing environment over the given time period. Most of the data come directly from the reference database. See Appendix B for sample report.

**Sales pitches** – Sales managers often submit ‘Request For Proposal’ documents and give presentations to prospects using materials derived from the reference data-warehouse. Examples of data provided include risk/return ratio analyses across different products and time frames, complementary analyses across different asset classes, and historical ‘batting averages’. See Appendix C for sample of presentation material.

**Compliance and risk management** – Risk management involves checking for trading of restricted securities, overexposure of certain assets, and any other custom constraints that individual clients may have. See Appendix D for sample report.

**Regulatory audits** – Investment management firms operate in highly regulated environments. In addition to the various securities commissions, there are membership organizations such as the CFA Institute that sets standards for processes and controls of firms that claim compliance. Investment management firms have to conduct periodic audits and reviews that require data generated from the Golden Copy.
3.3 Current Trends in Reference Data Management

Reference data management received much attention from investment management firms in recent years (McEachern, 2002). With the advent of information technology and the Internet, having quick and accurate data is moving from a source of competitive advantage for investment management firms to a commodity, or “must have” in order to survive. In addition, the global trends toward the focus on business process efficiencies are forcing investment management firms to look at accurate, standardized, and centralized reference data to improve operational efficiencies for the firm. An article published by the Venture Navigator also described an effective reference data management to impact the entire investment trade lifecycle, as well as other downstream functions and applications (Luro, 2006).

In addition, the industry-wide risk management initiatives are driving financial institutions steadily toward automation of processes that rely on accurate reference data. The following sub-section describes some of the key trends in the arena of reference data management in the financial services industry.

3.3.1 Increased Trends Towards Automation

In this post 9/11 and Enron era, risk management has become an increasingly important issue for firms in the financial services industry. This is evidenced by the increased number of regulations and acts, such as the USA Patriot Act\(^1\), Basel II\(^2\), and the Sarbanes-Oxley Act\(^3\), designed to govern the ways in which data is processed and transferred within and outside the

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\(^1\) The USA Patriot Act expands existing regulations against fraud and money laundering, requiring stronger verification and tracking processes.

\(^2\) Basel II Accord imposes new standards for risk measurement, capital adequacy, and transparency, requiring greater consistency and integrity in a firm’s information systems.

\(^3\) Sarbanes-Oxley Act prescribes new controls to ensure the honesty and transparency of company financial statements and business controls, requiring prompt and accurate processing of accounting data.
organization. A risk management survey conducted by AIM Global in 2006\(^4\), indicates that 28% of financial services firms surveyed worldwide currently have plans to invest in the operations of static data. The major driving force behind this automation is the growing number of institutions that are using the Golden Copy of reference data to manage their processes and investment decision-making. The Golden Copy refers to the verified and cleansed raw as well as proprietary data that can be consumed directly by users of the firms. In the investment management industry for example, there is an increased effort put forth to increase Straight-Through-Processing (STP) when transmitting trades between investment managers and the custodians of the accounts. STP is described as the streamlining of transactional processing by establishing single points of entry and minimizing the need for manual data intervention throughout the transaction processing cycle (Drebot, 2006). In addition to reducing errors, the trend towards shortening settlement cycles has also increased the needs for STP (Dunlop, 2000). As such, as the industry strives towards STP, the Golden Copy of the reference data has become an important priority for investment management firms.

In addition to the cost savings through automated communication processes with external parties, there are other motivations for improving the quality of reference data management for investment management firms. Improving efficiency, for example, reduces the communication efforts used within the firm to coordinate all the databases (to synchronized data), which eventually leads to decreased operational costs in the mid and long term. Effectiveness of the data management system reduces the occurrences of duplicate or even wrong data being used throughout the firm. A research commissioned by the TABB Group revealed other reasons for improving included the reduction of trading risk, support for client reporting, provide competitive advantage, and support for compliance and financial reporting (Wall Street & Technology, 2006).

Figure 3.2 displays the top reasons for improving reference data as indicated by financial services firms surveyed.

**Figure 3.2 Why Reference Data Problems Should be a Priority to Fix**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
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<td>Compliance/Fin Rptg</td>
<td>40%</td>
</tr>
<tr>
<td>Stmt/Acctg Rptg</td>
<td>35%</td>
</tr>
<tr>
<td>Competitive Advantage</td>
<td>25%</td>
</tr>
<tr>
<td>Client Reporting</td>
<td>10%</td>
</tr>
<tr>
<td>Trading Risk</td>
<td>5%</td>
</tr>
<tr>
<td>Cost/Efficiency</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: TABB Group

### 3.3.2 Focus on a Centralized and Standardized Data Set

The popularity of networked computers has also given rise to a preference of centralized and standardized reference data over maintaining multiple databases in different parts of the firm. A centralized and standardized data set can offer more efficient data dissemination information across multiple applications and platforms within an investment management firm. For example, changes in a custodial account only have to be submitted in one central location before they become accessible to the portfolio management system for the administrators and the customer resources management application for the client solutions team. In a study by the TABB Group, 89% of the financial services firms prefer to have a centralized location for their reference data set versus a decentralized (Figure 3.3). A centralized data management approach can lead to
benefits such as cost savings by eliminating silo-management and single point of entry, decreased risk of data error, improved data quality and consistency, and various operational efficiencies (Meilinis, 2004).

Figure 3.3 The Best Organizational Structure to Achieve High Quality Reference Data

Source: TABB Group
4 COMPANY OVERVIEW OF CONNOR, CLARK & LUNN

This study focuses on reference data management at Connor, Clark & Lunn, an investment management firm headquartered in the west coast of Canada. This section provides a company overview to help readers conceptualize the internal environment that the new reference data management structure has to conform to. The following sub-sections discuss the company history and structure, followed by its current data management process.

4.1 Company History and Structure

Connor, Clark & Lunn commenced operations in Vancouver in 1982 as Connor, Clark & Lunn Investment Management Ltd (CCLIM). The organization later expanded to include a diverse family of affiliates offering complementary investment style options in each of the major asset classes. Connor, Clark & Lunn is one of the largest and fastest growing investment managers, with over $35 billion in assets under management (Connor, Clark & Lunn, 2007). The organization conducts business across Canada with offices in Vancouver, Calgary, Edmonton, Regina, Toronto, and Montreal.

The current company structure was formalized in 2003 with the creation of Connor, Clark & Lunn Financial Group (CCLFG). CCLFG delivers all of the non-investment management functions to each affiliate, including the original CCLIM. For the remainder of this study
Connor, Clark & Lunn (CCL) refers to the overall company including the business and operations management group, distribution, and the affiliate investment managers. (Figure 4.1)

Figure 4.1 Business Structure of Connor, Clark & Lunn

Non-investment management functions performed by CCLFG include the following:

- **Business Management** – Governance, strategic planning, and oversight of operations.
- **Sales and Marketing** – Brand management, market assessment, communications, and sales support.
- **Client Administration** – Portfolio administration, performance measurement and attribution, and client reporting.
- **Compliance Support** – Registration, contracts, and regulatory development.
- **Corporate Administration** – Corporate accounting, treasury management, facilities, and human resources.
By centralizing non-investment management functions, the organization enables all affiliates to benefit from better resource allocation and access to operations professionals. In doing so, the affiliate investment professionals can focus on “providing advice and making investment decisions to create value for clients” (Lefevre, A., personal communication, March 20, 2007).

4.2 Investment Resource Group

The Investment Resource Group (IRG) is the particular department within CCLFG that handles the client portfolio administration functions for the affiliates. This study has a particular focus on this department since it extensively utilizes data derived from the reference data-warehouse to conduct its operations. This section provides an overview of the structure and goals of the IRG.

4.2.1 Structure and Function

The Investment Resource Group is divided into four sub-teams: 1) Institutional Portfolio Administration, 2) Retail Portfolio Administration, 3) Performance Measurement & Attribution, and 4) Client Reporting. The teams work integrally and together cover all client administration needs from the beginning of a trade to the subsequent reporting of portfolio results to clients.
4.2.1.1 Institutional Portfolio Administration

This sub-team delivers administration for institutional pooled and segregated funds. Portfolio administration involves trade entry and settlement, reconciliation of investment balances, data entry, coordinate account transfers, price verifications, and accounting audits.

4.2.1.2 Retail Portfolio Administration

The Retail Portfolio Administration sub-team performs duties similar to the institutional administration team. Requirements for retail client administration are similar to the institutional but with added tax complexities, and higher volume in transactions and number of accounts.

4.2.1.3 Performance Measurement & Attribution

The Performance Measurement & Attribution (“Performance”) sub-team provides post investment analytics for investment managers, clients, consultants, and sales consultants. This sub-team is responsible for maintaining the performance and attribution database, as well as gathering various economic and portfolio characteristics data from different sources for reporting.

4.2.1.4 Client Reporting

The Client Reporting sub-team manages the monthly and quarterly client report production. The sub-team gathers data from all the three previously described sub-teams and package them in the proper reporting format to be delivered to the clients. Throughout this process, the Client Reporting sub-team has many interactions with the account and investment managers to include the proper market commentaries, graphs, and subsequently, final approval for each report.
4.2.2 Business Model and Strategy

The Investment Resource Group operates in a “charge-back” where the group charges the affiliates for services according to time spent administering the accounts and general complexity of the processes involved. The goal of IRG is to service each affiliate investment manager with utmost integrity, providing customized and focused solutions for its administration needs. The objective is to deliver the services at the lowest cost possible through economies of scale, but be adaptable to various requirements as different investment mandates emerge.

Adaptability in IRG results from the maximum utilization of multi-talented staffs as well as the innovative information systems available. Employees are cross-trained to perform in a number of functions within the IRG, at the very least for back-up purposes, but more so for employee learning and succession planning. In addition, employees are encouraged to enroll in the Chartered Financial Analysts program or computer courses expensed by the company. State of the art information systems and technologies are at the IRG’s disposal, and application developments are often pursued in a joint effort between the systems team and the final users from IRG. Thus, the combination of knowledgeable employees as well as customized and dedicated systems support indeed creates an environment for IRG to adapt quickly as business needs arise.

4.3 Current data management process

Connor, Clark & Lunn currently processes all of its data management in-house, ranging from data acquisition directly from vendors to the final production of databases used for investment analysis, risk management, and client reporting. To illustrate the current process
structure, this study uses the modified general reference data management model described in Section 3. This modified model consists of three phases as well: 1) Data acquisition, cleansing and verification, 2) Non-analytical data generation, and 3) Ex-post data generation. Figure 4.2 shows a graphical representation of the current process.

**Figure 4.2 Connor, Clark & Lunn Modified Reference Data Management Process**

As to be described more in details in a later section, the first phase consists of external economic and stock data acquisition, as well as the gathering of internal portfolio specific data. Second phase is the cleansing and validation of economic data, stock, and portfolio specific data from Phase One of the reference data management process. Here, certain calculations and series are created as well according to predefined business rules. The third phase of the data management process is the calculation of ex-post analytical data. This includes attribution and other portfolio characteristics data according to what has happened in the past. After this third phase, data is then posted to the final reference database and considered Golden and ready for distribution to the rest of the organization.
The current data management process and structure was retained from the legacy relationship when CCLIM was the sole provider of the non-investment management functions for the entire firm. With the exception of a few attribution and performance functions, the data management of virtually all three phases are retained by CCLIM even after the structural change of CCL as a firm. At the time of the structure change over, the incremental cost for CCLIM to continue managing the database for other affiliate managers was virtually zero. Hence, the data management process stayed intact and remained unchanged; CCLIM serving itself as well as other affiliate investment managers.

The only caveat now is that CCLIM does not have a formal relationship or agreement with the other affiliate managers to manage or support their data. For example, access to the reference data is not done directly by the affiliate investment managers, but through the IRG’s Performance team. When information is requested, a member of the Performance sub-team will retrieve the data from this, and other, databases to analyze, repackage, and send results to the affiliate managers. In addition, Phase Two of the data management process is processed according to the business rules of CCLIM, and not the affiliates. Affiliates’ changes to calculation methodologies, for example, are requested through IRG to CCLIM which maintains most of the databases and processes. This study attempts to look for alternative approaches to the management of data for multiple affiliates in absence of this formal relationship. Figure 4.3 below shows an alternative view of the current data management structure with relationship and responsibility indications among the companies and the database. The weight of the lines acts as rough indications of degree of responsibilities and/or reliance.
Figure 4.3 Connor, Clark & Lunn Reference Data Processes and Relationships

Source: Connor, Clark & Lunn
5 KEY CONSIDERATIONS

The current decentralized data management structure has raised several concerns that led to the deliberation about migrating towards a more centralized structure. The concerns identified in this study include the need to ensure privacy and accuracy of data, the efficiency of processes, regulatory requirements, considerations for future expansion, and strategic advantage from data management structure. In this section, origins of each of these concerns will be. At the end of this section, each key point of considerations will be restated into characteristics of a reference data management structure in which the final recommendation analysis will be based upon on.

5.1 Privacy of Data

The current data maintenance and support arrangement could create a potential privacy issue for clients of affiliates. Since portfolio data resides in a database owned by CCLIM, employees of CCLIM currently have full access to review and manipulate the data as needed. It is not to say, however, that CCLIM is actively monitoring the portfolios or accounts of the affiliates. There is no incentive for CCLIM to engage in such activity because its investment strategy is different than those of the affiliates; this is the whole point of having complementary investment managers as affiliates. Potential privacy issues could arise however from at least two plausible events: 1) Clients of the affiliates explicitly indicate no data be allowed to be viewed by
other investment managers, and 2) Affiliate investment managers market new funds that compete directly with the funds of CCLIM.

5.1.1 Client Mandates

Consistent with Porter’s Five Forces model, customers can have tremendous influence on the way that a firm conducts its business (Porter, 1980). At Connor, Clark & Lunn, each client signs a Statement of Investment Policies and Procedures (SIPP) document that outlines the manner in which their fund shall be invested. Most SIPPs include a section on conflict of interests and any disclosure requirements that involve the privacy of data of the clients. Depending on the way that clients view CCL’s ‘parent-affiliate’ structure, they might include as part of the SIPI to ensure that no other affiliate investment managers be authorized access to portfolio specific data. A more indirect means for clients to ensure privacy is through the use of the Canadian Institute of Chartered Accountants’ Section 5900 audit for service organizations. Part of this audit states that no affiliate shall be given access to data of another affiliate investment manager. A client can choose to have Section 5900 policies and procedures enforced as part of the agreements outlined in the SIPI. Thus, current and potential client must be considered when developing the new data management process.

5.1.2 Direct Competition

Much of the data privacy issues could be silenced by the fact that there is little direct competition between the affiliate investment managers. In fact, CCL’s business model is derived

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1 Section 5900 is a standard set by the Chartered Accountants of Canada to audit internal policies and procedures of service organizations. For more information please visit www.cica.ca.
from providing clients access to complement investment managers under one umbrella. In the absence of direct competition, it could be argued that there is no incentive for any affiliate manager to tab into the database of another. Hence, no conflict of interests exists and protecting data from one affiliate to another is not an issue.

Although this is true for the current status, senior managers should consider the potential and possibility of the affiliate managers to grow and eventually be marketing to the same segment. When competing for the same business, it is often advantageous to have detailed portfolio data of competitors for comparison. By having access to date, historical and current, managers can analyse the strengths and weaknesses of competitor portfolios to adjust marketing pitches accordingly. Thus, proper access and division of data must be ensured when looking at a new data management structure.

5.2 Accuracy of Data

Accuracy of data is of utmost important in money management. Investment managers rely on golden data to make key trade decisions on behalf of their clients. In fact, it is the managers' fiduciary duty to stay well informed and abreast of the dynamics of the financial markets to make sound decisions according to the clients' investment objectives. In an increasingly complex and fast paced environment, having timely and accurate data not only translates to cost savings through favourable trade price and commissions, but also minimizes cost of trade errors, settlement problems, and rectifying compliance issues.

Connor, Clark & Lunn is recognizing that accuracy of data is becoming a problem that requires attention. Asset under management (AUM) is growing at an unprecedented rate, and
product offerings requiring custom data needs are getting complex. In the equities arena alone, the types of products offered include market neutral, core, growth, and value funds.

These generic types of funds are further broken down into funds managed based on quantitative versus fundamental models, buy-hold versus active-trading strategies, and even pooled multi-strategy funds. As such, reference data management is increasingly getting more difficult and involved due to the increased data requirements and scrubbing efforts. With the onset of this, CCLIM is also finding it difficult to properly service the data requirements for other affiliate investment managers.

As mentioned above, reference data management is currently maintained by CCLIM and other affiliates ‘piggy-back’ their data in the system to get their portfolio and market figures. As such the affiliate investment managers are considered to be borrowing a space in CCLIM’s database to reap the benefits of the sophisticated system free of charge. They have no formal agreement with CCLIM specifically to maintain, verify, or audit their portfolio data. Given this, CCLIM has no formal responsibility to ensure that the calculated results are accurate in any form.

CCLIM’s system for data management is very sophisticated and customized for its needs. The data is clean, or ‘golden’, but only for their portfolios and stocks within their investable universe. In an event of a data discrepancy of a stock held by the affiliates outside of this universe, CCLIM will investigate as an act of good faith and only when time allows. When CCLIM cannot afford the time to launch the investigation, a member of the IRG is assigned to check the data. The drawback of this arrangement is that the assigned IRG investigator is not a data expert. It would take much more time to navigate through CCLIM’s database and to identify the error. He or she will also not be fluent regarding the various assumptions or estimates used in generating these portfolio characteristics. As such, since the IRG works in a ‘charge-back’ system, this process may cost the affiliates more money than intended.
In addition to the lack of a formal agreement or accountability that may hamper data accuracy for the other affiliate managers, there is an appearance of a disconnect between middle office and data management staff. This may lead to the production of a less than optimal data set that would affect all affiliate managers, including CCLIM. Trade errors and reconciliation issues are inevitable in portfolio management. Often, purely due to the complexity of a trade or security setup, transactions can be backdated to several days or even weeks. There is currently no formal procedure for the middle-office portfolio administrator to loop the details of these corrections back to the data management team for proper adjustments. As such, any time series calculations is inaccurate for the periods affected.

A formal procedure could be drafted to address these issues. However, any procedures set up across multiple companies or affiliates could be prone to communication problems and coordination efforts may be difficult. For example, corporate action items such as a stock split are communicated in an informal email reminder basis between the CCLIM data management team and CCLFG portfolio administrators (Crowe, D., personal communication, March 15, 2007). The existence of a corporate action that needs to be addressed could be known throughout the firm all at once. However, details such as timing and the amount for each item requires much more coordination to ensure that they are entered into the portfolio management system and the data-warehouse correctly. The more time it takes to coordinate these efforts, the higher the chance investment managers make decisions based on wrong portfolio data. Wrong portfolio data, for example, can come in the timing difference between when the proper quantity held is put into the system and when the post stock split price per unit is posted.

One of the many uses of stock and portfolio data is for performance measurement and attribution. To further increase the accuracy of performance figures, IRG portfolio administrators will need to play an integral role in maintaining the data-warehouse. Currently, security level performance figures are calculated based on daily weights as well as day-over-day price
fluctuations. A complete picture of stock performance however, requires an analysis of dividends paid and transaction costs incurred. As such, any stock level performance data is deemed to be a rough estimate for reporting and decision-making purposes. The specific impacts resulting from the standard errors are beyond the scope of this study. However, if management would like to start tracking stock performance by account at a finer granularity to obtain a more accurate data set, then the amount of coordination efforts required between the IRG administrators, CCLIM data managers, and affiliate investment managers needs to be seriously considered. Future expansion and improvement considerations will be discussed in Section 5.5 below.

5.3 Efficiency of Processes

The onset of IT spending and development has certainly increased the speed at which trades are processed and query reports generated. The volume of trades and complexity of accounts have increased as well. This, as well as pressures from regulators are forcing financial services firms to look evermore closely at improving operational efficiencies and increasing S1P in the middle and back offices. Efforts spent on improving efficiency aim at cost savings in the long run through faster results, increased accuracy, decreased trade errors, lower number of support staffs, and other indirect costs.

As mentioned above, the disconnect between IRG and the reference data management team creates an increased need for better coordination in order to produce accurate data. The problems there apply here as well. The current communication system between the two teams is fairly manual, and the problem is amplified if the discrepancy to be resolved is related to other non-CCLIM affiliate managers. Again, because there is no formal responsibility laid out for the
CCLIM data management team to monitor stocks and tickers of the other affiliate investment managers, it is up to the specific account managers or portfolio administrators to communicate and explain to CCLIM for processing. In practice, errors are most often detected only during quarter-ends and other reporting periods. Once detected individuals involved are really squeezed for time to get the issues resolved in order to meet the reporting deadlines. These urgent requests truly disrupts the workflow of the entire IRG from getting the data fixed, to recalculating performance figures, and to reproducing client reports for final approval.

From the systems or technical point of view, STP is something that can never be achieved 100 percent in reference data management itself and the flow of information through to the IRG and finally to the clients or portfolio managers for decision making. Connor, Clark & Lamm, however, can channel some efforts to improve the throughput ratio by either reducing the number of redundant data, or the number of personnel involved in managing redundant data. As an example, data experts in the data management team are quite diligent in ensuring that stock sector changes are reflected properly and timely in the data-warehouse for CCLIM's analytical needs. Change notifications however are not efficiently communicated to the IRG to make the necessary change in the main portfolio management system. As a result, there is an added function of periodic and manual reconciling between the two systems. The result of this inefficiency can over time result in added costs or even erode the company's operational image should the wrong data get published to clients and consultants. If either the two systems can be referentially linked, or one person or sub-group be in charge of entering data into both systems, inefficiencies due to data errors or repetitive reconciling would be greatly reduced. Such a process would also make for a better risk management practice and the process auditable.
5.4 Priority of Processes

Priority of processes refers to the sequence in which portfolio characteristic calculations performed during the normal overnight processes, as well as any custom or special calculation requests that are more non-day-to-day and project based. Unlike the strict regulations regarding priority of securities trade transactions, there are currently no rules or guidelines regarding the priority in the middle and back-office processes. However, client data processes should be controlled in similar fashion as trade allocations. After all, timely processes and quick response times toward custom data requests has value to the firm and is a source of competitive advantage.

As such, the entire reference data management process should be structured in such a way that it is not biased towards a particular affiliate investment manager or sets of clients. As an example, priorities placed towards processing data relating to a particular client due to personal relationships are unjust for other clients of the firm. This consideration applies to the relationship between the data processing personnel and individual affiliate managers as well. There are, however, cases where biasness in the priority of data processes would be legitimate. For example, due to differences in requirements and needs, different reporting due dates could be negotiated for different clients. It would be fair for the data processing team to prioritize their work accordingly to deadlines specified the contracts.

This suggests that priority of transactions should be client centric and not affiliate focused. Thus, the new data management structure has to ensure that the responsibilities and allegiances are properly aligned for the new data processing. Since this ‘parent-affiliate’ structure is quite unique in the industry, senior managers would need to take extra care in establishing the proper controls and checks to ensure clarity in the roles and responsibilities in the priority of processing arena.
Connor, Clark & Lunn is an innovative investment firm whose philosophy for growth is not through market growth, but growth through increasing new assets through the door. As such, with a ‘parent-affiliate’ structure, Connor, Clark & Lunn has to be able to add more products, accounts, affiliate managers, as well as new distribution channels at the grand level without affecting the other investment managers; specifically in this case, CCLIM.

The current process for adding new accounts or raw external data required by any affiliate investment managers involves personnel from both the IRG and CCLIM. The IRG creates the new accounts or portfolios into the portfolio management system, Advent Asys, while CCLIM sources and prep the new external data as required. This arrangement is not necessarily an issue if the new additions belong to CCLIM. If however, the new portfolios belong to another affiliate manager, then the firm will run into some of the issues described in the above sub-section regarding priority of processes and accuracy of data. In order to position CCL to be able to absorb potential growth with minimal disruptions from a data management point of view, it is worthwhile to consider moving more of the data processes towards the CCL-FG consistent with the company structure.

Having a dedicated data management group with a global point of view allows for CCL, to innovate data processing procedures better and to adapt to the growth of the. Also, having this global point of view helps the firm break away from prior technology drags that may exist with the legacy CCLIM system. Prior technology drag refers to the notion where established installed base of prior technology provides negative network externalities to the adoption of innovation (Hovav, Patnayakuni, and Schuff, 2001). This could pose a problem if the firm is not fully utilizing the newest technology to improve and make efficient, the reference data management.
processes in comparison to competitors. Determining whether prior technology drag exists in CCL is beyond this particular study, but from an initial observation, a number of database structures have remained unchanged for the past five to ten years and any new requirements such as adding a new asset class have been done through writing patches that fit in the context of the existing structure. Furthermore, some of the applications used to interact with data vendors are so outdated that the data-vendors themselves no longer provide technical support to.

Most of the concerns raised in this sub-section stem from the combined notion of limited resources and accountability for data management for the firm as a whole. In searching for a new approach to data management, CCL also needs to consider the longer-term expansion requirements.

5.6 Strategic Advantage

CCLIM's reference data management system is a state-of-the-art system that took many years of development and data gathering to achieve. From the author's working experience in the industry, it is noted that data is stored at a finer granularity and retrieval of data from the Golden Copy is more efficient than the many competitors. This system has served CCL well to provide competitive advantage in providing fast and accurate data, however, this competitive advantage is not seen to be sustainable. This is so since the financial services industry as a whole is demanding faster data at higher frequency through regulations that ensured shortened trade-settlement cycles and increased reporting frequencies for various types of clients. This in turn has forced other competitors to respond by either ramping up development of their own systems or outsourced to third party service providers.
CCL's current data management system is easily duplicable. For sustainable competitive advantage, CCL must focus away from information technologies and towards the structure of this function. A reference data management structure that leverages the 'parent-affiliate' strategy is an advantage that is not easily mimic-able. Not only do competitors now have to duplicate the systems, they now also have to reconstruct the synergy, experience, and dedicated support structure created by a centralized configuration. Other investment management firms that manage their own reference data in-house will have a difficult time recreating a centralized, 'parent-affiliate' structure. A centralized structure increases the reach of data available to affiliate investment managers of the CCL. Also, lessons learned from development and support of data as a result of the mandate of one affiliate manager can be immediately be disseminated throughout the organization and built into the knowledgebase. This is actually a key strength or benefit for outsourcing the entire data management function to a third party service provider, which will be discussed in a later section. However, instead of servicing a wide range or customer types and acquire basic and broad knowledge that outsourced companies do, CCLFG as the centralized provider will easily adapt to and provide for the unique needs of the relatively few affiliate investment managers of CCL.

Just like credit unions that look out for the interests and benefits of their local members, CCLFG will be relatively smaller than a typical reference data service provider to be able to focus its efforts on the interests and benefits of the affiliate managers. At the same time, CCLFG would be able to leverage the lessons learned and scalability from servicing multiple affiliates that render difficult for any particular investment manager to replicate.

5.7 Characteristics of a Reference Data Management Structure
The discussions in the sub-sections above implied several key issues that a new centralized data management structure should solve. As a result, these issues and considerations are restated into characteristics that the recommended reference data management structure should provide strong protection for privacy of data, produce accurate and reliable data, have efficient processes, ensure fairness in the priority of processes, be adaptable for future expansions, and provide competitive advantage by leveraging off the ‘parent-affiliate’ structure.

The strengths of each characteristic will be quantified and assessed for four approaches to data management discussed in the following section. In the final recommendation section, the scores received will be used to rank for the most appropriate approach to reference data management for CCL.
6 ALTERNATE APPROACHES TO REFERENCE DATA MANAGEMENT

This section analyses four approaches that Connor, Clark & Lunn can take to structure its reference data management function for the whole organization. Each of these approaches is drawn from CCL’s current data management structure described in Section 5. In particular, the first three approaches represent one or more of the phases of the reference data management structure. The fourth alternative approach represents outsourcing the entire reference data management function to a specialized third party service provider. Figure 6.1 shows a graphical representation of the alternative approaches and the respective phases they represent.

Figure 6.1 Alternative Approaches versus Phases of Reference Data Management

Source: Albert Yong
6.1 Approach One – Phase One Data Acquisition

Phase One in reference data management consists of data vendor management and data acquisition. Alternative approach one suggests that Phase One of the data management process be centralized and managed by CCLFG. This is different from the current process where CCLIM is in charge of the daily data acquisition processes, as well as the contract negotiation with the data vendors. Vendors that provide to the firm include Datasync, Research Insight, Thomson One, Bloomberg, MSCI, Research Insight, Starmine, and ITG.

Most of the data are loaded directly into the data-warehouse through custom applications and automated overnight processes. Vendor data acquired consists of static information about securities including identification data, corporate actions data, prices, financial statement ratios, and other descriptive data. Types of securities include equities, fixed-income securities, and derivatives traded in Canada and internationally. Other data downloaded from vendors include economic data such as interest rates, exchange rates, and data on leading and trailing indicators.

The portfolio management system is used mainly by the IRG for account maintenance and processing activities such as trades, dividend payments, and corporate actions. In an automated nightly process, data is then synchronized and loaded into the data warehouse as part of the working model reference data. Responsibility and maintenance of this data is then moved to CCLIM for further processing.
At this point, data acquired is considered non-proprietary and does not pose a particular competitive advantage for the firm. This dataset is considered to be raw data that still needs to be processed and manipulated in order to be useful for analytical and reporting purposes. For example, to get the London Stock Exchange noon CAD/USD exchange rate to load into the portfolio management system, the data management team has to download the raw CAD/GBP and USD/GBP exchange rates from MSCI, and then divide the former by the latter to get a final figure. Phase One is primarily concerned with getting the raw data and not the calculations, which will be done in Phase Two.
6.1.1 Pros

The first benefit of having CCLFG manage the data acquisition process is that it can serve multiple affiliate investment managers at one time. Having a central or parent entity manage the external data acquisition allows for a more unbiased distribution of static data across all affiliate managers equally. This means that affiliates will get their economic and securities data all at once. This will reduce the appearance of unfair, priority of processes currently lingering between CCLIM and the affiliates.

Centralizing external data acquisition provides an improvement in the efficiency in which this process is currently handled. Acquisition of economic and securities data involves interacting with external entities in terms of costs and actually transferring the data into the data-warehouse. Having a single entity managing vendor relationships reduces the effort required for contract negotiations as well as the process of bill payments. As an example, in acquiring performance and holdings data for the FTSE index, Scheer, Rowlett & Associates, an affiliate investment manager, had to pay full price versus what would have been able to acquire at a preferred rate if CCLIM was to acquire the data instead (Kallner, H., personal communication, March 10, 2007); contracts with data service providers have historically been signed with CCLIM. Having CCLFG manage Phase One of the reference data management also reduces any legal confusions regarding who actually owns the rights to the data acquired. Further, bill payments can be processed more efficiently by CCLFG; after-all, CCLFG’s main function is to provide business and operations support for all affiliates. As such, a data management group within CCLFG will have closer ties and natural working relationships with the accounting department for bill payments and transfers. This puts the structure closer in line with the ‘parent-affiliate’ strategy, thus providing some competitive advantage for CCL.
6.1.2 Cons

The biggest disadvantage of bringing external data acquisition into CCI FG is that there will be a disconnect between data acquisition and data cleansing within the group. Although the firm uses raw data directly from vendors, most of these data need to be extensively processed before they can be used. The disconnect here will hamper the efficiency in which data problems are resolved. For example, for many economical data such as the CPI or unemployment rate, there is a time lag between the reference time period and when it is actually published. Lag times can be as much as one month or one quarter. For affiliate firms that conduct analysis on a daily basis, many of these data have to be estimated and artificially entered into the database creating a series that is usable and at the same granularity as other data. As the actual data come in, estimated data will need to be replaced with actual, and estimates will need to be revised for the now current period. Thus, efficient coordination between the data acquisition and the cleansing teams will play an important role in generating the Golden Copy.

From an organizational structure or human resources point of view, it may be difficult to find qualified individuals to fill the positions in a long-term basis. Furthermore, the head of IRG may find it difficult to structure a consistent workload for this team. In theory, since most of the data feeds are automated overnight processes, the team will have a very light workload indeed for the days that there are no problems and everything is downloaded as intended. However, if there are computer related problems or new data requirement emerges, the time it takes to solve these issues could take hours or even days. It would be difficult to agree on an appropriate compensation scheme or even plan for future projects with such fluctuation in workloads over time.
6.2 Approach Two – Phase Two Non-Analytical Data Functions

A second approach is for IRG to take over the data acquisition as well as the cleansing, validating, and estimating critical economic and portfolio related data for investment decision-making and client reporting. This process is done after all the raw data has been confirmed to be delivered into the firm’s data warehouse and ready to be processed further. It is Phase Two of approaching to the Golden Copy of the firm’s data, ready to be used by the affiliate managers.

Figure 6.3 Phase Two – Non-analytical data

Cleansing and validating data involves crosschecking data from various vendors to ensure accuracy and consistency. In the event that data from the master series is missing due to a vendor related problem, a proxy could be estimated using data from another series supplied by
another vendor. For example, the firm has a convention to use the noon rate at the London Stock Exchange for currency exchange rates used to convert values of international stocks into Canadian Dollar. As such, if the master exchange rate series provided by the MSCI is missing due to an IT related error, then the day’s exchange rate movements can be estimated with closing rate at the New York Stock Exchange for the day. Data checking and validation of data gaps here are fairly straightforward and programmed; generally governed by rules in which exceptions are rare to find. There are, however, other estimations or data smoothing that require more judgement and experience of a financial analyst and investment manager from CCLIM.

As mentioned in the above section, there are certain data series in which a time lag exists between publication and reference dates. For many data such as the Floating Market Capitalization of a company, the publisher needs the time to collect, verify, and analyze the data before publishing. This particular process can take between two to three months. Problems can occur if clients of CCL, as agreed in their Statement of Investment Practice & Policy (SIPP), are to receive quarterly reporting statements within one month of quarter-end that include the floating market capitalization exposure of their portfolios. This conflict in deadline forces the investment managers to make the best estimates of market capitalizations for most stocks in their invested universe.

At this stage, the additional accountabilities for IRG in terms of data management would increase dramatically. The responsibility has now extended from gathering static data to some analysis and using judgment to make the appropriate estimates to key data series rendering useful for investment decision making purposes. To accommodate for this, the new data team under the IRG supervision will have to both increase in size and in expertise in terms of financial data analysis as well as database management. The functions described in this phase, however, are still considered to fall outside of any of the affiliate investment managers’ core competencies. As such, outsourcing Phase One and Two of the data management process to IRG is a natural
progression to free all affiliate investment managers from data related distractions and focus on what they do best.

6.2.1 Pros

In-sourcing phases one and two into the CCLFG will further allow the affiliate managers to engage more with core-competency and value added activities. The data that goes into investment models are utmost important for the investment managers. The actual function of checking and validating the data should fall outside the realm of day-to-day activities of investment managers. Phase One and Two of the data management process should be considered as an 'operations' function, and thus be transferred into the IRG consistent 'parent-affiliate' business model of Connor, Clark & Lunn. Furthermore, bringing non-analytical data functions outside of CCLIM would provide more equality, fairness, and privacy towards other affiliate investment managers who use the data since no particular affiliate investment manager has complete discretion or influence on the data team.

With this second approach towards data management, all non-analytical data would be processed simultaneously for all affiliate investment managers. This approach would provide fairness in the priority of custom and standard data processes, as well as ensure higher quality of the data being produced. As described in the key considerations Section 5.4, custom data request for non-CCLIM affiliate investment managers are handled based on the availability of CCLIM personnel. Having a central group to handle these non-analytical data processes will ensure fairness in terms of speed and priority in which data is processed. IRG will simply charge back the affiliate investment managers for the efforts spent producing the data. Problems or custom requests will also be dealt with in the fairest manner as now there is a dedicated group to process these requests with equal accountability towards all affiliate investment managers.
6.2.2 Cons

As IRG takes on more complicated processes, the group become a little more difficult to manage. Leaders of the IRG now have to acquire a completely new skill set to the group both to lead and give advice to solve problems that may arise. Qualified personnel with the specific mix of skill set may also be difficult to acquire. The new team would have to have a solid understanding regarding financial and economic related data, database management, as well as the intricacies of relationship management with internal and external stakeholders.

Validation and checking of static data are fairly straightforward given the proper rules and guidelines. Certain estimates for economic and stock specific data, however, are more difficult to achieve and may require inputs from the investment managers directly. Even if Phases One and Two are outsourced to IRG, there still will be a need for investment managers to get involved in this data smoothing process. The interactions and coordination between the data team and investment managers may be more efficient should the entire function be kept within CCLIM. Further, with the current system, there is a clear priority or approach to resolving data conflicts. For example, if there is a conflict of what sector a particular stock falls under between another affiliate manager and CCLIM, CCLIM's decision prevails. For data that require judgement, if they are outsourced to the IRG, then data conflicts between affiliates investment managers would be more difficult to resolve as it is now more difficult to distinguish who the data actually belongs to, and who has priority.
6.3 Approach Three – Stage Three Ex-Post Analytical Data Functions

The third approach for CCL’s data management is for IRG to take over Phases One through Three of the reference data management process. Phase Three of the reference data management is the calculation of ex-post analytical data used for client reporting as well as a foundation of data input to investment models for investment management purposes. Ex-post analytical data shows how the accounts and portfolios performed in the past. Here, the data of interest include stock and portfolio level performance and attribution, tracking error, standard deviation, and other risk measures. Managing Phase Three is the most difficult process of the reference data management as this is where the external data, portfolio data, data estimates, and analytics come together. This is also the last stage of prior to achieving the Golden Copy of the firm’s reference database. See Figure 6.4 below for a graphical representation of the ex-post analytical data process.

Figure 6.4 Phase Three – Ex-Post Analytical Data

Source: Connor, Clark & Lunn
The data processes in Phase Three is much more complicated and involved than the
previous phases. Calculations here involve processing conjunctively cleansed economic and
portfolio investment data according to custom portfolio mandates, preferences of investment
managers, as well as calculation rules governed by the regulators in the industry. In calculating
performance attribution, for example, the query relies on accurate stock sectors, weights, prices,
dividends, trading costs, and adjustments for corporate actions for both the portfolios and
benchmarks. The analysis gets even more complex when handling blended benchmarks or
accounts with multiple strategies across time.

Currently, IRG’s Performance & Attribution sub-team is managing the process for a first
 generation performance attribution system for the affiliate investment managers. This provides
sector level attribution for pure equity accounts as well as asset mix and selection attribution for
balanced accounts. This is a simple and accurate system that is now used mostly for client
reporting purposes. For investment decision-making purposes, however, CCLIM is now using a
more sophisticated system that incorporates security level data for attribution purposes. This
finer granularity allows investment managers to construct performance data both from a top down
as well as a bottom up approach. Further, security level data allows investment managers to
define their own sector definitions and receive stock selection attribution to get an even more of a
drill down view on where added values are attained in each portfolio. This new system is built by
CCLIM and is based on the customized quantitative investment approach that they take for their
equity portfolios. The database is maintained and supported entirely by CCLIM personnel.

In the recent periods, other affiliate managers are seeing the benefits of stock level
performance analysis and have since asked to query for some of the stock level data in order to
combine the results with their own portfolio data for analyses. These custom queries and
calculations are processed by the Performance & Attribution sub-team using MS Excel VBA
scripts and require a thorough double-checking as the underlying data used is not managed by
IRG on a daily basis, and data is more customized to suit CCLIM’s needs. As the volume of these customized requests increases, it is becoming clearer that CCLFG would need a more streamline approach towards providing security level data for affiliate managers. Approach three suggests that IRG takes over the maintenance and calculations of both ex-post analytical and non-analytical data for all affiliate investment managers. The new sub-group formed would be closely tied to the Performance & Attribution group to share in analytical and systems abilities. The work flow for this new Performance & Attribution sub-team may look like described in Figure 6.5.

Figure 6.5 Investment Resource Group and the Golden Copy

6.3.1 Pros

The biggest advantages of approach three are of two folds: 1) increased data availability to non-CCLIM affiliate investment managers, and 2) closer synchronization between portfolio management application and attribution systems. A third major benefit of IRG taking over all
three phases of data management is the potential for the ability to create and track new data given this dedicated resource in the IRG.

With IRG fully accountable for the source and analytical data, it can now better provide customized and accurate information for non-CCLIM affiliates. As mentioned in a Section 5.2, inaccurate data can result from coordination issues between the portfolio administrator and the current CCLIM data management team. Bringing the three data management phases into IRG will also create synergy between the two functions. Thus, analytical data provided will be more accurate in general and any discrepancies will be investigated in a more timely and fair manner. As the new team builds more experience and expertise in handling such queries, it will also be in a better position to create customized calculations and reports previously not available before. In an increasingly complex and competitive market, a customized and focused approach towards analytics and presentation materials is vital to the sustainability of the affiliate managers.

Synergy and better synchronization between the portfolio administration and data management teams will benefit CCLIM investment managers as well, in terms of reduced coordination efforts and time to resolve discrepancies. Much of the CCLIM’s analytical data comes from a combination of external economic and stock data as well as the internal portfolio management system. Data from the portfolio management system is currently processed by the IRG. As such, it could be seen as a natural progression that the IRG takes over the maintenance of the external data as well. So far, all three phases of the data management program within CCLIM are considered non-added values, in another words do not necessary provide competitive advantages, in terms of investment management activities. Passing the data management function up to and including ex-post analytical data to IRG leaves CCLIM to focus more on the ex-ante analytical data instead. Looking backwards on performance and characteristics is vital for portfolio management; however, it is the final results and their use by investment managers that set apart first and last quartile investment managers. Once the managers establish calculation and
estimation methodologies, on-going maintenance and support should be passed along to the
operation unit, taking advantage of the parent and multi-affiliate structure.

Another benefit is that the data warehouse would be now better positioned for growth as
the firm grow in terms of number of affiliates, assets under management, and types of offerings.
By focussing on scale and the multi-affiliate structure, databases can be developed at a more
enterprise level and offered to the affiliates at more efficient and fair ways. Although needs of
different affiliate investment managers vary greatly, there reality is that there now now multiple
systems and platforms that the firm currently has to synchronize for data accuracy, client
reporting, and even data disaster recovery from the IT point of view. As an example, CCLIM,
SRA, PCJ, and CCLPC all have different approaches to manipulating and accessing data in the
current system (Figure 6.6).
Figure 6.6 shows the multiple users (IRG, CCLIM, and other affiliate managers) of each functional database for the firm. The weight of each line and arrow represents the degree in which each user is responsible for maintenance and/or performs queries for each database. Being
a legacy system, CCLIM has a heavy responsibility for most of the databases. Being responsible for providing data for all other affiliate investment managers, IRG is partially involved in updating and maintaining the data as well. As a result, there are a number of teams or different parts of the company updating the same or interconnected databases that increase the efforts required to coordinate between updating and querying the latest data. Having all three phases of data management maintained by IRG, better positions the firm towards a more centralized data management model such as illustrated in Figure 6.7.

In achieving such a model, the firm will reduce the number of redundant databases, and processes. A term used often by database designers is ‘referential integrity’. This refers to a structure where data needs only to be changed or updated in one place and reflected everywhere else in the system that uses it. This notion of referential integrity should be emulated throughout Connor, Clark & Lunn as a firm. Having one common platform would reduce calculation errors due to timing differences and communication errors. Further, having one database to update will reduce duplication of efforts that ultimately cost the company in operational inefficiencies.
Figure 6.7 Alternative Users and Responsibilities to the Reference Data Management Process

OTHER AFFILIATES:
PFI
SRA
CGLPC
(CCLIM)

IRG
(Administration,
Performance &
Attribution)

Portfolio Data
Econ. & Stock

Reference Data
(Working Model)

Non-Analytical
Data
Up/Post Analytical
Data

Golden Copy

Distribution:
Operators, Customers, Sales,
Clients, Consultants, Regulators

Distribution:
Investment Banking, Clients,
Consultants, Regulators

Source: Albert Yong
6.3.2 Cons

The major disadvantage of having IRG manage all three phases of the reference data management is the appearance of loss of control that CCLIM would have regarding data calculation and processing. Historically, CCLIM has spearheaded the innovation and implementation of data related calculations and systems developments. Over the years, CCLIM has continued to dedicate funds and expertise towards building the system, and assuming responsibility of it. If the reference data management function were to be passed to IRG, the ownership of the existing systems and processes would be in much dispute. Ownership is very important for control and business risk management purposes. By having full control of the data management process or function, CCLIM is able to dictate, without outside influences, the development roadmap of the system, selection of priority items to be processed, and changes to business rules and calculations customized to suit their needs. Hence, developing a business argument for CCLIM to give up control of the reference data management process may be quite challenging.

Another challenge is getting approval from the other affiliate investment managers such as PCJ and SRA to start paying for data usage in a more systematic way. Historically, they can tab into the economic and stock data at little to no cost. Having a centralized reference data-warehouse means that a ‘charge-back’ system will be implemented. The affiliates may be resistant to agreeing to potentially having to pay more for the data. Further, the centralized, and shared ownership, of reference data means more parties will be involved in the strategic planning of the roadmap regarding future developments of this system or platform.
6.4 Approach Four – Outsource External Data Management to Third Party

Outsourcing has become a popular choice in recent years for investment management firms to reduce cost and improve on operational efficiencies. Connor, Clark & Lunn should consider as one of its options to outsource reference data management to a third party entity. In doing so, CCL hires a third party to perform data maintenance functions such as cleansing data and resolving discrepancy issues. CCL will also have access to multiple data vendors simultaneously through this third party relationship, reaping the advantages of scale and data expertise of the outsourced firm. Two types of reference data management services being offered in the market for financial services firms are Hybrid Data Solution, and full service data solution.

6.4.1 Hybrid Data Solution

The Hybrid Data Solution refers to the notion that both the investment managers and service provider jointly contribute to producing the Golden Copy. Here, the service provider is only responsible for providing cleansed and calculated external economic and stock related data. The service provider thus manages the relationships with multiple data vendors, downloads the data into their data warehouse, processes the data according to the managers’ business needs, and finally transmits the results into the investment managers’ data warehouse for further processing. The investment managers then combine this with the internal portfolio data to be processed ultimately to the Golden Copy. An example of a Hybrid Data Solution provider is Accenture’s Managed Reference Data Services with early adopters including Wachovia and Citidel Investment Group (Accenture, 2006).
6.4.1.1 Pros

The biggest advantage of outsourcing to a third party service provider is the cost savings that CCL as a firm will realize in the long run. Hybrid Data Solution providers can process data at a much larger scale and utilize their employees fully in cleansing and reconciling data. As well, large volume transactions allow service providers to negotiate better pricing with data vendors that CCL will not be able to do as one firm. Similar to a ‘charge-back’ system, CCL will pay only what it uses. Thus, there is no longer a need for CCL to pay for data that comes as a package, but is not needed for investment decision-making purposes. Further, this ‘pay as you go’ system means that CCL will pay for slices of employee time versus compensating full-time employees with benefits for data cleansing. In addition, systems development costs will be shared among all the clients of the service provider, reducing the need for CCL to manage the database and applications currently needed to manage the external feeds from vendors.

6.4.1.2 Cons

The largest drawback for going to third party is losing control to the service provider. For example, changes in any data request will have to be processed through the service provider and the turn-around time cannot be estimated reasonably as CCL will now be dealing with another enterprise. Schedules, staffing and network processing speeds, which could have otherwise been controlled depend on others had the data management been processed in-house. Further, although the service provider tries its best to provide the correct data, accuracy is not guaranteed. For example, if by chance all data vendors provided the wrong information simultaneously, then there is not recourse if the investment managers traded based on these erroneous data. This raises another concern with outsourcing to third parties, accountability. The investment managers have a fiduciary duty towards the clients that they manage the money for.
Entering into a contract with a third party does not relieve the managers from ensuring that data used for making investment decisions are correct. Thus, there might be a requirement for duplicate data checking within CCL should there be a compliance need.

Lastly, outsourcing to a third party vendor does not necessarily clear up the confusion regarding which company or affiliate within Connor, Clark & Linn actually owns the data. There is still a need for CCLIM to hold vital portfolio information of the other affiliate investment managers within the reference data framework. Once the cleansed external data get transmitted to the internal data warehouse, CCLIM would still need to combine and process it in conjunction with the portfolio data that would include portfolio of other investment managers. Most of the issues and considerations raised in the earlier section would still have to be dealt with. However, if the IRG is charged with the responsibility of managing the third party data service providers, then it would at least be a step closer to the direction of ensuring fairness, priority of data processes for all affiliates.

6.4.2 Full Service Data Solution

The Full-Service solution is an extension of the Hybrid Data Solution in that the third party provides support for proprietary calculations in addition to the commoditized external market and stock data. The service provider maintains and supports the entire systems infrastructure providing a centralized data warehouse that is accessible by the client firm. For example, Sungard's Managed Data Services is a full-service outsourcing solution that provides support areas such as Vendor Management, Data Management, Client Management, MDS Support, and Technology Support (Figure 6.8).
6.4.2.1 Pros

In a study conducted by Sungard, companies can share as much as 75% costs of overall infrastructure and services in outsourcing to a full-service provider (Sungard, 2006). Savings come from the sharing of similar resources and structures typically used by financial services firms. In addition to cost savings through efficiencies and economies of scale, outsourcing to full-service providers can realize a reduction in business risk through leveraging proven infrastructure and processes from these specialized firms and data experts. Further, the typical realization of the operational and administration burdens associated with data management is observed. This leaves the investment managers to be able to focus on their core business and growth. Growth, for example, into different asset classes or geographical areas, can be implemented without much burden or new investment into systems and infrastructures. The full-service provider can quickly adapt to the needs and requirements of such growth through the pool of investments and research acquired through experience from other clients.
6.4.2.2 Cons

The downsides of outsourcing to a full-service provider are similar to those present in the Hybrid Data Solution option. The only difference is that any of the concerns are amplified since the exposure is greater. As an example, loss of control would be greater than in the Hybrid option, since not only the production of external commoditized data is out of the control of the investment manager, but also the proprietary data and systems infrastructures. The ownership of data will also remain a confusing topic under the full-service structure.

6.5 Summary of the Approaches

Table 6.1 below provides a summary of the key points discussed in the sub-sections above. Although these points are qualitative in nature, they will be quantified, assessed, and ranked in the following section of this paper, which helps form the final recommendation for the reference data management structure of CCL.
### Table 6.1 Summary of Key Points for Each Approach to Reference Data Management

<table>
<thead>
<tr>
<th>Approaches</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Privacy</strong></td>
<td>No significant advantage</td>
<td>Most data processed outside of CCLM</td>
<td>All commoditized data controlled by CCLM facility</td>
<td>Data stored in affiliate facility</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>Disconnect between data acquisition and data cleaning group</td>
<td>Dedicated team for data processing</td>
<td>Less coordination between data acquisition and data processing</td>
<td>Database monitored continuously by dedicated professionals</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>One point of contact with data vendors</td>
<td>Dedicated team for data processing</td>
<td>Less coordination issues between administrative and data processing</td>
<td>Continuous improvement by specialized firms</td>
</tr>
<tr>
<td><strong>Fair</strong></td>
<td>Unbiased distribution of data</td>
<td>Non-analytical data processed simultaneously</td>
<td>All commoditized data functions centralized and processed in an unbiased way</td>
<td>Processes bounded by contracts</td>
</tr>
<tr>
<td><strong>Adaptable</strong></td>
<td>Moderate improvement in adaptability</td>
<td>Dedicated team for core function and development</td>
<td>Closely synchronized with portfolio and attribution systems</td>
<td>High knowledgebase from other investment management firms</td>
</tr>
<tr>
<td><strong>Competitive Advantage</strong></td>
<td>Slightly more in line with parent affiliate structure</td>
<td>Investment managers can further focus on core competencies</td>
<td>Better positioned to streamline efforts and focus on scale</td>
<td>Loss of proprietary data or models</td>
</tr>
</tbody>
</table>

Source: Albert Yong
7 RECOMMENDATION

Reference data management is a topic that is gaining momentum among firms in the financial services industry. Connor, Clark & Lunn is no exception, benefits from an analysis of the current reference data management structure and a series of some alternative approaches toward this function that may be more suited for a company with a ‘parent-affiliate’ business structure. The preceding section outlined four alternative approaches for reference data management. In this section, each alternative will be analyzed and assessed for the best strategic fit for CCL’s company structure and strategy for growth. This section starts with a brief discussion on how each alternative will be evaluated followed by a sub-section for the actual evaluation. The section will close with a final recommendation for the approach for reference data management that CCL should adopt.

7.1 Evaluation Criteria

Evaluation of each alternative will be based on the key considerations discussed in Section 6 of this paper. A good reference data management structure should at least provide strong protection for privacy, provide accurate data, have efficient processes, ensure fairness in the priority of processes, be adaptable for future expansions, and provide a sustainable competitive advantage.
Although all of the above items are must-haves for CCI, they may not be all equally important. To provide a true analysis of which of the alternatives is best suited for CCI, each has to be put in context of the unique characteristics of the firm. The unique contextual factors include the firm size, overall business strategy, and CCI’s approach to risk management:

The size of the firm is directly linked to the available resources dedicated to manage data used for investment management purposes. Resources here refer to the number of staff available, analysts and programmers who develop a workable system, and IT infrastructures. In general, smaller firms should outsource more functions that represent significant fixed costs to take advantage of scale provided by specialized service providers (Ono & Stango, 2005). Larger firms however with the ability to achieve scale of data acquisition across multiple portfolios, and a strong bargaining power to obtain the best contract or arrangement for data feeds should consider developing in-house.

Strategy refers to the firm’s method to achieve competitive advantage; that is, to provide premium, differentiated products and services, or low cost, generic solutions to customers. The core competency for firms providing differentiated solutions is their analytical and forecasting ability to calculate risks and bets in their investments. Reference data themselves do not provide any insights as to how money should be managed. They serve as raw material inputs into a black box for such value added analyses. Firms competing with the differentiated strategy may choose to outsource most, if not all, of their non-investment management functions such as reference data management in order to stay focused on their core competencies. At the other extreme, for investment management firms that take the low cost approach, their core competency and competitive advantage is achieving lowest cost of operations through economies of scale. It makes more sense then, for these firms to keep the entire reference data management function in-house, and perhaps offer this as a service to other firms as a source of revenue.
For risk management, regulators prescribe suggestions and not specific regulations to the way in which financial services firms conduct their risk management processes. Thus, it is up to the individual investment managers to set their tolerance levels of accuracy of data as well as the control they have on data management processes. Firms may also have strict client policies that allow only for limited use of third party partnerships to handle data management processes. The sheer auditing costs and processes may diminish any advantages of outsourcing any part of the reference data management process.

7.2 Analysis

The evaluation of alternative approaches requires a two-step process. First, each must-have characteristic will be rated by a scale of -5 to +5 for each alternative approach. Each rating represents the strength of the characteristic compared to the current data management structure. A negative rating indicates that the alternative approach provides less of a positive impact as compared to the current structure in terms of the characteristics discussed; CCL should keep existing structure and reject the alternative. A zero rating indicates that the alternative and current approach are equally valued in terms of the characteristics; CCL should be indifferent in keeping the current structure or adopting the alternative. A positive rating indicates that the alternative approach is superior to the current structure in terms of the characteristics being discussed; CCL should adopt the alternative approach over the existing.

The second step is an analysis and rating for the overall ‘fit’ to CCL’s business strategy and structure. The three contextual factors will be rated from zero to three for each approach to reference data management. A higher rating indicates a more suitability given CCL’s unique
needs and characteristics. Once ratings from both steps have been assigned, the ratings will be added up for each of the two steps and be graphed in a scatter-gram, indicating the most suitable approach for CCL.

Ratings will be assigned in a qualitative manner versus a fully quantitative analysis of costs, times, and/or actual percentage increase or decrease in efficiencies or accuracies. The ratings by themselves are also meaningless; the focus instead, is on comparison between the four approaches. Once the best approach has been chosen, CCL will need to dedicate more time and effort into developing a more in-depth analysis of that approach in order to determine the actual go, hold, or drop strategy for a new reference data management.

Table 7.1 Characteristics Scores For Approaches to Reference Data Management

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privacy</td>
<td>0</td>
<td>+3</td>
<td>+5</td>
<td>+5</td>
</tr>
<tr>
<td>Accuracy</td>
<td>-1</td>
<td>+3</td>
<td>+5</td>
<td>+4</td>
</tr>
<tr>
<td>Efficiency</td>
<td>+1</td>
<td>+2</td>
<td>+2</td>
<td>-3</td>
</tr>
<tr>
<td>Fair</td>
<td>+2</td>
<td>+3</td>
<td>+5</td>
<td>+5</td>
</tr>
<tr>
<td>Adaptable</td>
<td>+2</td>
<td>+3</td>
<td>+5</td>
<td>-3</td>
</tr>
<tr>
<td>Competitive Advantage</td>
<td>+1</td>
<td>+2</td>
<td>+4</td>
<td>-2</td>
</tr>
<tr>
<td>Total</td>
<td>+5</td>
<td>+18</td>
<td>+28</td>
<td>+6</td>
</tr>
</tbody>
</table>

Source: Albert Yong

7.2.1 Characteristics Ratings for Approach One

Implementing Approach One provides not particular increase in data privacy across the affiliates investment managers. Recall that the focus on Approach One is to pass the data acquisition function to the Investment Resource Group. Calculated or enriched portfolio level data will still reside in a database controlled by CCLIM. For privacy, Approach One receives a rating of 0.
It is estimated that there will actually be a loss in accuracy in the data distributed to the rest of the firm and external parties. The reason is that the team that cleanses and enriches the data is now even further removed from the group that acquires the data. For example, not knowing the intricacies of data acquisition, the data cleansing team would not be able to optimize the use of alternative data sources to fill in a data gap. Further, not having a daily role in data acquisition reduces the ability of the cleansing team to assess whether data is actually missing and an estimate will have to be made, or whether it is a systems connection problem that once fixed, the actual data would be available. In any event, the actual data set would be preferred over estimated data. Having the cleansing and acquisition team separated increases the occurrences of estimated data sets. For accuracy, Approach One receives a rating of -1.

There will be a small increase in efficiency if Approach One is chosen. Both the internal and external data acquisitions are closely related. For example, the download of portfolio market values (internal) relies on external data like stock prices and split information. Since internal data acquisition is currently processed by the BFG, bringing in the external data acquisition as well will increase coordination between the two acquisition processes and increase efficiency. For efficiency, Approach One receives a rating of +1.

Implementing Approach One will increase fairness in the reference data management process. By centralizing both the internal and external data acquisition processes, each affiliate investment managers will be served in a fairer manner. Since this is a charge-back system, the data acquisition team is accountable and responsible to each affiliate manager equally. Thus, processes will be done in a first-come-first-served approach that does not discriminate whether data is used by CCI, IM or other affiliates. For fairness, Approach One receives a rating of +2.
There is a positive influence in adaptability for Approach One. Since the data acquisition team is free from undue influence of any one particular affiliate, it can develop and steer this part of the reference data management process that will benefit the company as a whole, and not just from the CCLIM mindset. Having a dedicated data acquisition team also provides expertise and resources to explore new technologies being used, search for more meaningful data-sets, as well as respond to multiple requests from multiple managers. For adaptability, Approach One receives a rating of +2.

There is an advantage for pooling the data acquisition process to be shared across affiliates especially in terms of bulk pricing, and simpler systems maintenance and contract administration. Benefits here however can generally be replicated by outsourcing this function. Thus, for competitive advantage, Approach One receives a rating of 0.

7.2.2 Characteristics Ratings for Approach Two

There is a significant increase in terms of privacy for Approach Two. Since cleansing and enriching is done by a centralized group, much of the affiliate managers’ portfolio data will be shielded from each other. CCLIM for example will not have access to the detailed portfolio holding and transactional data of other managers. The significant increase comes from the fact that CCLIM currently, and likely in the future, maintains the portfolio level database for all other affiliates. There will be some privacy issues however since the ex-post analytical calculations are still performed by CCLIM. For privacy, Approach Two receives a rating of +3.

Accuracy will increase dramatically as well for Approach Two. Not only is the data acquisition function performed by the same group, now so is the data cleansing. As mentioned above, the accuracy suffers as a result of lack of knowledge and experience for daily interactions.
Housing data checking and acquisition under one umbrella allows for expertise in both areas to work together increasing the accuracy of data. For accuracy, Approach Two receives a rating of +3.

Efficiency is also improved for Approach Two. Having the two phases of reference data management performed in one group will allow for cleansing and acquisition to be done simultaneously, thus increasing efficiency. For efficiency, Approach Two receives a rating of +2.

Fairness is also improved for Approach Two. Fairness is already improved by Phase One, but Phase Two increased the coverage of the reference data that is calculated or processed in a fair manner. Since data enriching is less automated and requires the human care more so than data acquisition alone, CCL will get even further away from having data personnel influenced by any particular affiliate manager. For fairness, Approach Two receives a rating of +3.

The reference data management structure will be even more adaptable since the rules and granularity of data cleansing can now be incorporated to reflect the requirements of all affiliate investment managers. For example, industry sectors can be calculated according to the GICS sector classifications required by one manager, while using the FTSE sector classification for another. Previously, one sector would be preferred and used by CCLIM. For adaptability, Approach Two receives a rating of +3.

Centralizing data cleansing and enriching will be more difficult to replicate, as they require interactions between the data, administration, information systems, and other teams that reside under CCLFG. Lessons learned from these interactions are not readily acquirable by competing firms as raw data can be. Thus, for strategic advantage, Approach Two receives a rating of +2.
7.2.3 Characteristics Ratings for Approach Three

By taking virtually all of the reference data management function to IRG, the privacy issues could be virtually eliminated. Now, all of the portfolio data is shielded from each affiliate investment managers. At this point, data from the Golden Copy could be distributed in a controlled and restricted manner previously not available. For privacy, Approach Three receives a rating of +5.

Accuracy will be much improved over the previous two approaches and current structure. Having daily interactions of data from acquisition to cleansing, and finally to analytical calculations builds data expertise very quickly. For example, stocks that are not part of the investable universe of CCLIM are normally not checked by the current data team. With Approach Three, discrepancies found by the analytical process can be communicated immediately to the cleansing process, and if needed, communicated to the acquisition a process. Data would be even more accurate if the three processes were performed by one person. For accuracy, Approach Three receives a rating of +5.

Besides increased coordination and communication between the data acquisition, cleansing, and calculation processes, the type of work involved and level of automation would be fairly similar to Approach Two. For efficiency, Approach Three receives a rating of +2.

Approach Three would be fairest among the first three approaches and over the current structure. Essentially, Approach Three implies that all the processes that leads to the production of the Golden Copy would benefit from fairness in priority of processes resulting from a centralized data maintenance structure. For fairness, Approach Three receives a rating of +5.

Having a centralized data management structure can maximize adaptability. Not only is there now a dedicated resource for building and enhancing data, the development roadmap would be influenced from all affiliate managers. Dedicated resources from the central level allow for
development and implementations to absorb new asset classes, or even new affiliate investment managers, in a much focused manner. With less influence from any particular affiliate manager, the data management structure could be developed more consistent with the other applications or platforms of the CCL parent-affiliate structure. For adaptability, Approach Three receives a rating of +5.

Centralizing the entire commoditized reference data management function will further allow CCLFG to build upon the knowledge base acquired from the learning curve and experience in serving the multiple affiliates. In addition, the systems and techniques created for the customized ex-post calculations can be shared across all multiple affiliates that would be even more difficult to replicate. Thus, for competitive advantage, Approach Three receives a rating of +4.

7.2.4 Characteristics Ratings for Approach Four

In the outsourcing approach, privacy is very high especially for the full-service model. Since data is stored offsite access is done through a secured channel and customized according to the needs of each affiliate manager. For privacy, Approach Four receives a rating of +5.

Accuracy is expected to be fairly high since, after-all, the service provider is a firm full of data experts with data verification done round the clock to serve global markets. This is true for external data, however, since portfolio level data is unique for different investment managers. There is no incremental benefit in terms of accuracy and Approach Four receives a rating of +4.

Efficiency is expected to drop with Approach Four since data is stored offsite. From a technical stand point, although the Internet is fast, transferring data would be faster through networks within a physical location. Nightly data transfers will take longer with data service providers. Also, changes throughout the day may be limited to the service provider’s ability to
receive in the middle of the day. For example, trade corrections may have to wait till the end of the business day to be sent. This would be a considerable drawback since the current system allows for data linkage and uploads anytime. From a business process point of view, change requests would be much more inefficient since CCL will be dealing with an outside company. Communication errors can be more frequent, and the channels can be more layered in the service provider structure than it is in CCL. Thus, everything would appear to be moving at a slower speed. For efficiency, Approach Four receives a rating of -3.

Fairness in process would be the same as in Approach Three. All affiliate investment managers are treated equally and pay as much as they use the service. Thus, all requests and queries would be processed with the same priority. For fairness, Approach Four receives a rating of +5.

Adaptability may be quite an issue for the fourth approach. CCL’s affiliate investment managers have very unique requirements and are used to fast response times in implementing changes in data structures, calculation methods, etcetera. For example, certain portfolios may require a creation of a synthetic swap to simulate a particular exposure and have the security behave in a methodological way. A reference dataset requires a structure that allows performance and market values could be calculated in similar ways for this synthetic security as other regular securities. To effectively adapt to having this security as part of the database, the systems analysts need to have a thorough understanding of financial markets as well as what CCL is trying to accomplish specifically. Adding to the complexity of inter-company communication of complex topics, changes would probably not be made unless it is ensured that this will not affect the data systems and structures of other clients of the service vendor. Thus, for adaptability, Approach Four receives a rating of -3.
Outsourcing will provide no particular competitive advantage to CCL as this function could easily be bought by any other investment managers as well. In fact, outsourcing can actually hurt CCL as compared to the current process since there is more business risk involved and change requests could take longer, or even not possible, since CCL will be dealing with an external party. Thus, for competitive advantage, Approach Four receives a rating of -2.

7.2.5 Ratings on Contextual Factors

The first approach does not necessarily add any value to the firm given CCL’s size. Part of the idea of the firm size is that small firms can benefit by outsourcing some of repetitive, non-competitive advantage processes thus focusing on activities of the core business. Since CCLIM is essentially a medium sized organization, the data acquisition function is such a small part of the
firm that outsourcing this to IRG will have a minimum impact, hence a rating of 0 is received for Approach One. Having CCLFG handle the operations and non-investment management related functions is the model of the company structure. Thus, centralizing the data acquisition function represents a step closer to allow for IRG to serve all affiliates equally and in an accountable manner. For overall fit with CCL's business strategy, Approach One receives a rating of 1. Approach One represents a slight improvement in risk management given a dedicated team be held responsible and accountable for all the raw data used by all affiliate investment managers. For risk management, Approach One receives a rating of 1.

Approach Two is viewed as similar to the first approach in terms of the contextual factors. Since it is an extension of the first, each contextual factor receives an additional point in the ratings. Table 7.2 shows the summary of the final ratings of the contextual factors to the approach rating exercise.

Table 7.2 Contextual Factor Scores for Approaches to Reference Data Management

<table>
<thead>
<tr>
<th>Contextual Factors</th>
<th>Approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Two</td>
</tr>
<tr>
<td>Firm Size</td>
<td>0</td>
</tr>
<tr>
<td>Business Strategy</td>
<td>1</td>
</tr>
<tr>
<td>Risk Management</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Albert Yong

Approach Three receives the full three points for fit in terms of firm size. The production of the ex-post analytics is time consuming and represents a significant portion of what CCLIM does. Thus, taking all three phases out of CCLIM will have an extra added value to the organization by converting investment managers from producers to user of data. Approach Three also receives full ratings in terms of fitting with the CCL business strategy. The reason for this is this approach represents the full centralization of the production and management of the Golden Copy reference data management. Data can thus be distributed throughout the CCL organization.
and a charge-back system can be implemented immediately. Risk management is seen to have the same effect as Approach Two. Although there is now more coverage in terms of functions performed by a dedicated team, there is a possibility of a breakdown somewhere when dealing with complex analytics in Approach Three. Historically, this task is done by the investment managers at CCLIM. Investment managers there are very intelligent and have the proper training and experience to do these calculations efficiently and effectively. As such, there will be a slight disadvantage of having non-investment professionals in IRG perform ex-post calculation compared to before. For risk management, Approach Three receives a rating of 2.

For Approach Four, CCL is a company of approximately 500 employees with approximately 80 employees in CCLFG. Large firm such as this has the capacity to continue managing the reference data production. Outsourcing to a third-party service provider does not necessary add any value to for the firm. For firm size, Approach Four receives a rating of 0. Outsourcing is similar to having a central structure managing the reference data, thus Approach Four get full rating for this context. For risk management, the benefits of outsourcing are not as strong. In terms of process methodology, systems development, and other operational issues, CCL would tend to lose the control to the vendor. As mentioned before, CCL has been on the forefront of innovation in terms of systems and techniques towards all of its day-to-day operations from portfolio administration to accounting and client solution. Thus, in relying on an external service provider, innovation would over time revert to industry standard versus being something always one step ahead of competitors. As result, risk management receives a rating of 0 for Approach Four.

7.2.6 Characteristics and Contextual Factors Combined

Table 7.3 shows the sum all the ratings for each approach to reference data management
Table 7.3 Sum of Ratings For Approaches to Reference Data Management

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Contextual factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>5</td>
</tr>
<tr>
<td>Two</td>
<td>16</td>
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<tr>
<td>Three</td>
<td>26</td>
</tr>
<tr>
<td>Four</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Albert Yong

Figure 7.2 shows the above table in a graphical format.

As discussed before, this is an exercise to compare the strengths among the four approaches to reference data management. The chart and table above, suggest that Approach Three is most suitable for CCL to adopt. Approach Three has the highest ratings in terms of the characteristics offered, 26, and the highest in terms of overall fit given CCL’s structure and strategy, 8.
Given strong ratings for both characteristics of a good reference data management model and overall fit to CCL’s contextual factors, it is recommended that the Investment Resource Group absorb the entire reference data management function. Centralizing this function to the CCLFG level will ensure privacy, accuracy, efficiency, fairness, and adaptability of the production of the Golden Copy reference data for the company as a whole. Further, this model is much more consistent with the CCL parent-affiliate model, at the same time provides a platform for strong data risk management processes over the current structure.

As Connor, Clark & Lunn grow as a firm, both organically and through acquisitions, CCLFG has to stand ready to absorb new products and investment types into its operations, serving the multiple affiliates. Once a process has been commoditized, it could be essentially passed along CCLFG for daily maintenance. In this case, the process of data acquisition as well as cleansing is fairly straightforward and processed according to tested and ‘experienced’ business rules and procedures. IRG should be able to absorb the function with ease. Phase Three is more involved in the sense that calculations are more complex and rules applied are not always as straightforward. There may be some short-term growing pains that IRG will go through when setting up this process initially, however, as qualified personnel and data experts are brought into the team, the overall synergy and structure created would be much better suited to support CCL’s business structure and support for growth in the future.
APPENDICES

Appendix A – Sample Data Series Acquired by an Investment Management Firm

Source: Connor, Clark & Lunn
## Appendix B – Sample Data Provided in Periodic Client Reports

<table>
<thead>
<tr>
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<th>2007 Annualized</th>
<th>Annual Ending December 31</th>
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<td>QTR YTD</td>
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<tr>
<td>Total Portfolio</td>
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<td>X X X X</td>
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<tr>
<td>Benchmark</td>
<td>X X X X X X X X X X</td>
<td>X X X X</td>
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<tr>
<td>Added Value</td>
<td>X X X X X X X X X X</td>
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Source: Adopted from Connor, Clark & Lunn

### Portfolio at Mar 3007

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<th>Overweights</th>
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</thead>
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<tr>
<td>Energy</td>
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<td>X X X X X</td>
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<tr>
<td>Materials</td>
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<td>X X X X X</td>
</tr>
<tr>
<td>Industrials</td>
<td>X</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Consumer Discretionary</td>
<td>X</td>
<td>X X X X X</td>
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<tr>
<td>Information Technology</td>
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</tr>
<tr>
<td>Economy Sensitive Group</td>
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<td>X X X X X</td>
</tr>
<tr>
<td>Consumer Staples</td>
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<tr>
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<tr>
<td>Financials</td>
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<td>X X X X X</td>
</tr>
<tr>
<td>Telecommunication Services</td>
<td>X</td>
<td>X X X X X</td>
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<tr>
<td>Utilities</td>
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<td>X X X X X</td>
</tr>
<tr>
<td>Interest Sensitive Group</td>
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<td>X X X X X</td>
</tr>
<tr>
<td>Cash</td>
<td>X</td>
<td>X X X X X</td>
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</table>

Source: Adopted from Connor, Clark & Lunn

### Sector Exposures

Source: Adapted from Connor, Clark & Lunn

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Appendix C – Sample Data Provided in Sales Pitches

<table>
<thead>
<tr>
<th>Risk Metrics</th>
<th>Fund X</th>
<th>Fund Y</th>
<th>Added Value</th>
<th>Fund X</th>
<th>Fund Y</th>
<th>Added Value</th>
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<td>Volatility</td>
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<td>Drawdown</td>
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<td>X</td>
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<td>X</td>
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</table>

<table>
<thead>
<tr>
<th>Added Value</th>
<th>Fund X</th>
<th>Fund Y</th>
<th>Added Value</th>
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</thead>
<tbody>
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<td>X</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Benchmark Returns</th>
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<th>Fund Y</th>
<th>Added Value</th>
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<tbody>
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<td>X</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

| Source: Adapted from Connor, Clark & Lum }

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## Appendix D – Sample Data Provided in Compliance and Risk Reports

<table>
<thead>
<tr>
<th>Category</th>
<th>Guidelines</th>
<th>Yes/No*</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Investments comply with Schedule III of Federal PIPSA, 1935, IC, PIPSA, and Identities Act</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Maximum of 7% of total portfolio invested in any one firm in government issuer’s securities</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Client permits exceeding this limit for Schedule III banks. Report any instances.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>No investing in any limited partnership interests</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>No part of the fund loaned to any person or organization, except as outlined in Section 1 of the SIIA*</td>
<td>X</td>
</tr>
<tr>
<td>Derivative</td>
<td>Used for hedging of specific financial risks such as repurchasing indices and stop-loss limits for lowering investments. Fund’s investment exposure not to exceed 20% of its (fund’s) market-value</td>
<td>X</td>
</tr>
<tr>
<td>Asset Mix</td>
<td>Invested funds minimum and maximum must not be for each class of securities (as per Section D of SIIA).</td>
<td>X</td>
</tr>
<tr>
<td>Short-Term Securities</td>
<td>Based at least 6, for short-term</td>
<td>X</td>
</tr>
<tr>
<td>Bonds</td>
<td>Rated at least BBB, maximum of 20% rated less than A, average portfolio rated A or higher</td>
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</tr>
<tr>
<td>Voting Rights</td>
<td>Exercised in best interest of the Plan and its beneficiaries</td>
<td>X</td>
</tr>
</tbody>
</table>

*Duration must be duration of ICOM Long-Short Index plus or minus 20%.

Source: Adopted from Connor, Clark & Lunn

### Compliance Requirement

**Investment Guidelines (Section 5):**
- No margin purchases or short sales
- No investments in competitors (or securities not approved for pending fund holding)
- Investments in securities of Quebecor World and affiliates less than 5%
- Derivatives subject to Risk Control Limits in Appendix E
- Securities lending subject to Risk Control Limits in Appendix E

**Risk Control Limits:**
- No more than 25% of portfolio market value for any group of 10 issuers
- No industry sector greater than its weighting in the MSCI EAFE index plus 15%
- No country sector greater than its weighting in the MSCI EAFE index plus 15% except for France (15%), Germany (15%), United Kingdom (15%) and Japan (25%)
- No more than 5% of portfolio market value for each country in the MSCI EAFE index and 20% in aggregate
- All stocks trade on a recognized exchange
- No more than 10% of portfolio market value of companies with market capitalization of less than CAD$500 million
- Foreign currency exposure is hedged using only the Euro, Japanese Yen, U.K. Pound and Australian Dollar
- Investment in a currency is no more than its EAFE index weighting except for the Euro
- No more than 15% of a single security on behalf of all of manager’s clients

Source: Adopted from Connor, Clark & Lunn
REFERENCES


