



Data Management Solution: Build vs. Buy

A Raima Inc. Business Whitepaper

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Abstract

This article explores "Build vs. Buy", a key decision for determining the best strategy for meeting your product's embedded data management needs.

This article is relative to the following versions of RDM:

- ✓ RDM Embedded: All
- ✓ RDM Server: All

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Introduction

A key decision when determining the best strategy for meeting your product's embedded data management needs is the age old "Build versus Buy" question. In order to make an intelligent decision your organization will need to perform a careful analysis of the many requirements of your application. Some things to consider include: functional needs, expertise, quality, market timing, support and maintenance, product life, and cost.

Functional Needs

For any application the database management requirements can often times consist of a long list of functional needs. For most single-tier solutions the minimum requirements are as follows:

- ✓ Disk Input/Output—allows for persistent storage and retrieval, with opportunity for optimized lookups and safe writing.
- ✓ Indexing—allowing applications to efficiently access data based on defined characteristics.
- ✓ Record Management—record organization, addressing, allocation and deletion algorithms.
- ✓ OS/Target Platform support—functionality associated with using the targeted platform's resources through supported primitives.

For multi-tier solutions, the functionality requirements would also include those of the single-tier, plus multi-user (management of controlled access to data by multiple users and prevention of deadlock) and client/server (supports distributed processing, scalability and fault tolerance) controls.

Beyond these basic features, your application may require advanced functionality, such as:

- ✓ Database mirroring/replication—allows storage of, and access to, more than one copy of the database.
- ✓ Transaction Management—functionality that assures ACID (atomicity, consistency, isolation, and durability).
- ✓ Data Field Management—management of the content and placement of fields within a record in support of high-level, controlled data access and memory/disk space usage.
- ✓ Dynamic DDL—an extension of Record Management providing the ability for run-time, dynamic, modification of the database structure and schema.
- ✓ Application to DBMS Interface(s)—processing layer addressing industry standard implementations like ODBC, JDBC, ADO, etc., or native/proprietary methods.

The basis for any good decision is a thorough understanding of your products requirements, both for today and the future. Equipped with this information you can make a reasonable estimate of the resources required to develop a database solution.

To illustrate this point, consider a single-tier solution, with ACID and industry standard interface needs. The resulting estimates to build (requirements, design, develop, document, test, QA, management) are in the following table:

TABLE 1

DBMS Feature Development	Work Effort (Man Weeks)
Record management	15
Database Definition Language	15
Transaction Processing	80
Multi User Support	N/A
Additional Platform Support	N/A
In Memory Storage	N/A
On Disk Storage	10
Indexing	15
SQL	250
Total Man Weeks Required	385

Now let's look at the resources required to support a multi-tier solution with equivalent functionality as the previous single tier solution. The revised estimates are located in the following table:

TABLE 2

DBMS Feature Development	Work Effort (Man Weeks)
Record management	15
Database Definition Language	15
Transaction Processing	80
Multi User Support	50
Additional Platform Support	N/A
In Memory Storage	N/A
On Disk Storage	10
Indexing	15
SQL	250
Total Man Weeks Required	435

Finally, let’s look at the effect on the total number of resources required when we add in the requirement for in memory storage and an additional platform.

TABLE 3

DBMS Feature Development	Work Effort (Man Weeks)
Record management	15
Database Definition Language	15
Transaction Processing	80
Multi User Support	50
Additional Platform Support	6
In Memory Storage	15
On Disk Storage	10
Indexing	15
SQL	250
Total Man Weeks Required	456

Expertise

Now that you know what you need, can your organization build it, or is it best to buy? Even though “database management” is an academic topic for many computer scientists and software engineers, implementing these features correctly, and efficiently, takes expertise well beyond that taught in the universities. Often multiple product releases or subcontracting are required to “build” the complete and necessary solution.

Quality

Quality results take focus, time and money. Focus on the; processes, methods, techniques, and requirements. Time is needed for; auditing, reviewing, measuring, and testing. And of course money: to pay for all the appropriate resources and tools. If you build your own solution, do you have the focus, time and money to achieve quality? Remember, several commercial solutions have been in the market place for 20 years: that equates to long-term focus, lots of time, and lots of money.

Market Timing

“Time-to-market” is a big part of the consideration to build or buy. Competition is everywhere, like-products are quickly evolving, and you need to get your product out. What is the impact of developing your in-house solution as it relates to market timing? You know how long your in-house development will take. Is this acceptable or should you shorten your development time by making a buy decision? What is your competition doing while you are designing your own database?

Support and Maintenance

Often in an analysis of build versus buy, the impact of the support and maintenance effort is not comprehended. Some amount of engineering and management time will be spent performing issue investigation, debug, reproduction of errors, interaction with users, and eventual correction of a defect or implementation of an enhancement. The more complex the solution, the greater the support costs.

In addition, the support effort will be highest in the early years of the general availability of your product. Without any enhancements to the original product, the support effort will lessen as the years go by. However, if enhancements are added, the support effort may not decrease.

A good estimate of person power needed to support and maintain (implement enhancements) the data management portion of your product is 2 persons for the first year, followed by 1.5 the second, and 1 for the remaining product life.

Product Life

The product life, or the number of years that your product will be a viable offer to the market, helps determine the long term effort and costs associated with either a “home grown” or commercially purchased solution. For example, if the product life is estimated at 5 years, a “build” solution will require at a minimum support and maintenance for that duration. A “buy” solution would require paying support and maintenance fees for the life of the product.

Cost

The hard costs to “build” can now be calculated by using the estimates to develop the needed functionality plus the support/maintenance. The following assumptions are made to fulfill the cost calculation: a \$100 burdened cost per software engineer and \$50 burden costs per support engineer. A five year product life cycle is assumed with support requirements averaging 1.3 person years per year (2 person years the first year, 1.5 the second and 1 for the remaining years). With these assumptions, the hard cost to “build” the single-tier example would be:

TABLE 4 – PROJECT TOTAL COSTS (SINGLE-TIER)

Tasks/Deliverable	Total Costs	Description
DBMS Development	\$1,540,000	Requirements, Design, Code, Test, QA
DBMS Support & Maintenance (avg./year)	\$208,000	Help Desk, Problem Debug and Correction

TABLE 5 – PROJECT COST BREAKDOWN (SINGLE-TIER)

Project Cost Breakdown	1	2	3	4	5
Cost to Build a DBMS (in Man Weeks)	77	77	77	77	77
Costs to Build a DBMS in \$US	\$308,000	\$308,000	\$308,000	\$308,000	\$308,000
Head count to Maintain & Support	2.00	1.50	1.00	1.00	1.00
Cost to Maintain & Support in \$US	\$208,000	\$156,000	\$104,000	\$104,000	\$104,000
Total Annual Cost in \$US	\$516,000	\$464,000	\$412,000	\$412,000	\$412,000

These are conservative hard cost numbers and do not take into account the inevitable additional soft costs that take their toll on the income statement’s bottom line. These are things like the negative effects of poor quality, lack of expertise, and missed windows of market opportunities poor.

Let’s take a look at the results when we use the same assumptions as above to calculate the hard cost to “build” the multi-tier example:

TABLE 6 – PROJECT TOTAL COSTS (MULTI-TIER)

Project Total Costs	Total Costs	Description
DBMS Development	\$1,740,000	Requirements, Design, Code, Test, QA
DBMS Support & Maintenance (avg./year)	\$208,000	Help Desk, Problem Debug and Correction

TABLE 7 – PROJECT COST BREAKDOWN (MULTI-TIER)

Project Cost Breakdown	1	2	3	4	5
Cost to Build a DBMS (in Man Weeks)	87	87	87	87	87
Costs to Build a DBMS in \$US	\$348,000	\$348,000	\$348,000	\$348,000	\$348,000
Head count to Maintain & Support	2.00	1.50	1.00	1.00	1.00
Cost to Maintain & Support in \$US	\$208,000	\$156,000	\$104,000	\$104,000	\$104,000
Total Annual Cost in \$US	\$556,000	\$504,000	\$452,000	\$452,000	\$452,000

The addition of any advance features in your data management solution would significantly increase the cost to build your own solution. Finally let’s see what happens to the costs when we add in memory support and an additional platform support (operating system):

TABLE 8 – PROJECT TOTAL COSTS (ADVANCED FEATURES)

Project Total Costs	Total Costs	Description
DBMS Development	\$1,824,000	Requirements, Design, Code, Test, QA
DBMS Support & Maintenance (avg/year)	\$208,000	Help Desk, Problem Debug and Correction

TABLE 9 – PROJECT COST BREAKDOWN (ADVANCED FEATURES)

Project Cost Breakdown	1	2	3	4	5
Cost to Build a DBMS (in Man Weeks)	91.2	91.2	91.2	91.2	91.2
Costs to Build a DBMS in \$US	\$364,800	\$364,800	\$364,800	\$364,800	\$364,800
Head count to Maintain & Support	2.00	1.50	1.00	1.00	1.00
Cost to Maintain & Support in \$US	\$208,000	\$156,000	\$104,000	\$104,000	\$104,000
Total Annual Cost in \$US	\$572,800	\$520,800	\$468,800	\$468,800	\$468,800

Conclusion

More embedded systems developers are looking to minimize their risk and total costs by choosing to buy commercially off the shelf (COTS). Several embedded database solutions are available today so why not try evaluating them to see if it will fill your project's requirements. Also, make sure that the embedded database vendor has the expertise and positive track record of quality that you demand. Raima has created a cost calculator which you can adjust the assumptions to better match your project's requirements. Contact our Sales Team at sales@raima.com and they will walk you through a detailed analysis of your unique requirements. We will show you how to increase your bottom line by reducing your development costs.

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