Measuring the Total Cost of Ownership

By *Todd Duell*

Introduction

Measuring the total cost of ownership for a software project is never an easy task. There are many issues to consider before choosing the appropriate vendor and technology. (1) What are the licensing issues? Many times the licensing is shrouded in a multitude of options for the server licensing, the processor licensing, the client licensing, the third-party software and hardware licensing, and the application licensing. Coupling the licensing with an infinite variety of options for each license will certainly yield a confusing array of possibilities even for those that are experienced at evaluating technology. (2) Since no application will meet all of your needs "out-of-the-box", what is the cost of customization? You may be quoted an hourly rate or a project cost, but don't be fooled by that figure. IT projects are seldom finished on time or on budget. However, good IT projects have a predefined project management schedule, resource allocation, and an implementation plan before any customization or installation commences. (3) What is the long-term IT support required for the application? Are you required to hire an expensive database administrator to twiddle their thumbs for $150,000 year or can you off load the IT support to your workgroup experts or application service provider? (4) What is the upgrade policy?

Once you purchase and install the mission critical application, are you going to be left in the dust if you don't upgrade every 18 months? (5) Have you taken the time to measure the value of your IT project? Does it make sense for your organization? Have your compared more than one vendor and application? Is it going to provide you with an acceptable internal rate of return? Does it pass your net present value calculations to provide a positive return on investment? Is it going to provide you with a true competitive advantage or is it simply "cool" technology? Have you evaluated your vendor's financial status? This white paper addresses these types of issues with the goal of providing a complete competitive analysis of *Formulations Pro*.

Formulations Pro Licensing

Formulations Pro has two licensing options, the Workgroup License and the Enterprise License. The advantage for the Workgroup License is that it is designed for companies that have cash flow problems (i.e. small companies or companies that are still in the R & D phase) or are interested in reducing their cash flow exposure associated with the risk of implementing the software. The disadvantage for the Workgroup License is that the company will have to pay the Annual License fee for every year they continue to operate the software. This yields a break-even point shortly after the third year of ownership.

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The advantage of the Enterprise License is that it is designed for companies that do not have cash flow problems and wish to make a one-time purchase of the software without having to ever worry about annual licensing fees. The disadvantage is that the company will have to spend more money up front for the software. Thus, the cost of money (lost interest or other investment opportunities) needs to be taken into consideration when calculating your net present value and internal rate of return for the investment.

Two days of installation and training (plus costs if necessary) are included in the purchase price with either license. Both licenses are also an unlimited site license. Thus, you can install it at one site for an unlimited number of users. If you have more than one site that needs to install the software, discount pricing is available for the additional sites. There are no per user licensing fees. Thus, you do not have to purchase a license for each user of the software. However, the FileMaker Server application does limit the number of concurrent connections to 250 users. Thus, you can have an unlimited number of theoretical users with the ability to connect to the software. As long as no more than 250 are connected at one time. FileMaker Server Unlimited can be installed, at additional cost, to host unlimited users.

	New License	Upgrade License	Discount
Enterprise License	$139,995	$69,995	50%
Additional Sites	$69,995	$34,995	50%
Workgroup License	$39,995	$39,995	
Additional Sites	$39,995	$39,995	

FileMaker Server 12.0 Licensing

FileMaker Server 12.0 – an easy-to-use relational database server – is the best way to host your FileMaker Pro 12 solutions on Windows 2008 Server Mac OS X, or Mac OS X Server. This high-performance server engine supports up to 250 FileMaker Pro 12 guests simultaneously on multiple platforms with several protocol options and up to 125 hosted files. FileMaker Server 12 includes scheduled backups, and remote administration via a web browser to monitor server activity and to control guest and file connections. FileMaker Server 12 is designed for ease of use while supporting standard technologies such as LDAP and Windows authentication.

FileMaker Pro 12 Client Licensing

FileMaker Pro 12 is certified to work with Windows XP, Windows Vista, Windows 7, Windows 8,and Mac OS X (10.6.8 or later). FileMaker Pro 12 asserts its unique position in the workgroup by integrating with enterprise data sources (such as SQL Server and Oracle), and enhancing interaction with tools such as Excel, Microsoft Word, and Crystal Reports, while improving its legendary ease of use and versatility. The new and faster Instant Web Publishing provides a richer FileMaker Pro experience over the Web, allowing you to collect and share information even more easily than before. ***Formulations Pro*** requires one FileMaker Pro 12 client license to be installed on each computer that will access the application on the FileMaker Server.

Number of Seats	New License ea.	Upgrade License ea.
1-9	$299	$180
10-24	$285	$171
25-49	$263	$158
50-99	$241	$145
100-249	$219	$132

Third Party Hardware and Software Licensing

Formulations Pro uses several third party plug-ins and hardware to improve the capabilities of the application. Thus, enabling you to take advantage of information in ways that may not have been possible or cost effective before — that means increased productivity, accountability, and competitive advantage.

The xmCHART plug-in allows *Formulations Pro* to chart your data for statistical process control and forecasting. By utilizing this plug-in you will reduce your manufacturing errors, reduce time to market, and reduce your inventory costs. Additionally it will greatly improve communication throughout your organization as well as with your customers. A site license for the charting plug-in is included. That is a savings of $700.

Formulations Pro uses Code 39 fonts and bar code scanners for raw material, document, and labeling control. Extensive investigation and validation was performed to ensure that the ANSI standard fonts and scanners work in a true cross-platform environment. So whether you're using OS X, Windows, or both operating systems, you can be assured that *Formulations Pro* will provide you with error-free documentation and inventory control. Pricing for the scanners vary by the manufacturer and model. A site license for the Code 39 fonts is included. That is a savings of $1,400

Plug-ins	Site License
xmCHART	Included
Code 39 Fonts	Included
Scanners	$500-$4000 ea.

Network, Hardware, and Software Requirements

When evaluating new software, it should be compatible with your existing hardware specifications (i.e. servers and client computers). If the requirements of the new software do not match your existing hardware specifications or you don't have a network infrastructure (i.e. hubs, routers, switches, cabling, etc.), expect to make a significant investment in these systems before installing the new software. The speed of your hardware and network infrastructure will have a direct impact on the overall performance of the system.

Formulations Pro requires dedicated "server-class" hardware. *Formulations Pro* recommends a 2X6-Core 2.4 GHz Intel Xenon, 12 GB RAM, RAID 5 3x1 TB SATA OS X Server with unlimited clients. You may opt for a Windows based server of similar specifications. Windows 2008 Server and CALs may be required and are an additional cost.

There is nothing worse that immediately downgrading the performance of the new software because you skimped on the hardware and network infrastructure or decided to share a server with other applications. Think of it in terms of the cost of productivity. If your users constantly have to wait for the server to respond to input or process information, over time it will cost more money in lost time and user frustration than to have simply

purchased a dedicated server and appropriate client computers. There is also the issue of application stability to consider. Sharing the server with multiple mission critical applications will not only significantly reduce performance, but will increase your risk of system crashes and data corruption. A well-planned hardware and network infrastructure can save you a lot of time, money, and frustration.

For client-server systems such as FileMaker Server and FileMaker Pro, there are several key elements that can significantly improve the performance of the server and client computers without costing you a fortune. (1) For server hardware, the number one performance boost for your money will be to purchase the fastest hard drive available (SATA with less than 3ms access time). This is because FileMaker Server utilizes asynchronous I/O to simultaneously read and write to the hard disk. Next, purchase the fastest Ethernet card available for the transmission of data. Most modern servers now come with dual network cards to significantly increase the bandwidth capacity. (2) The second place to boost performance is in the server processor or CPU. Many of the tasks are now performed by the server rather than by the client. So spend money on the server CPU's before spending money on the fastest CPU for the client computers. FileMaker Server is also tuned to take advantage of multiple processors. (3) The third place to boost performance in with RAM. The server should have no less than 4 GB. Additional RAM for the client computers will also increase performance. (4) Lastly, follow the FileMaker Server manual for the optimization of the server application. It contains all the information you will need to know for optimizing the FileMaker Server software for your network and users. Despite the published minimum specifications for FileMaker Server and FileMaker Pro, the following specifications are highly recommended:

	Windows	OS X
Network Sharing	TCP/IP	TCP/IP
Server Processor	2X6-Core Intel Xenon	2X6-Core Intel Xenon
Server RAM	12 GB	12 GB
Server OS	Windows 2008 Server	OS X Server
Client OS	XP, Vista, 7, 8	OS X 10.6.8 or later
Client Processor	1 GHz	1 GHz
Client RAM	2 GB	2 GB

Customization Fees

Don't panic when you see the customization fees charged by your vendors. You should expect to pay anywhere from $165/hr to $265/hr plus costs for customization based on several factors. (1) Consultants typically make at least twice the industry standard rate for salaried employees because their fees pay for the indirect costs (overhead) of the company that they represent. The consultant does not actually receive $265/hr. (2) The consultant's experience and capabilities. This should weigh heavily on the rate that is charged for each consultant. You should not be expected to pay $265/hr hour for a rookie. Ask your vendor to provide a list of the quality and qualifications of each consultant before you agree to any rates. But keep in mind, you may very well spend less money with a $265/hr consultant than a $165/hr consultant because they can get the project done faster and better as a result of their capabilities and experience. (3) The complexity of the application that was used to build the solution. Systems that are built with Oracle or SQL will cost significantly more than systems that are built with FileMaker Pro. Why? Because the Oracle and SQL server and

client licensing are very expensive. This has nothing to do with the application being programmed to meet your requirements. You can have the best platform in the world, but a poorly written application will provide you little value. (4) The length of the project. If your vendor does not discount their fees for longer projects, you should be very cautious regarding their intentions to serve your company appropriately. They may be practicing market skimming pricing tactics that have nothing to do with developing long-term business relationships and commitments. This is indicative of vendors that charge excessive fees for their technology for one simple reason — because they can. (5) The intellectual property contained in the application and the enhanced difficulty for mass customization. Large integrated systems across multiple business disciplines and work groups are far more complex to approach for customization. What you may perceive as a small change may in fact require many hours of analysis and prototyping to ensure that the change won't crash the application or cause undetected data integrity problems. (6) Be prepared to pay for additional costs. These cost may include items such as airfare, lodging, car rental or other transportation, gas, mileage, parking and per diem expenses for out of town projects. You should expect to pay the hourly rates, costs, and fees on a regular interval such as your normal pay schedule. Any residual expenses should be immediately reconciled after the end of the project. Formulations Pro charges the following rates:

	Rate	Discount	Savings
Customization Fee (No MSA)	$265/hr.		
MSA Level 1, 160 Hours Min.	$200/hr.	25%	$16,395
MSA Level 2, 320 Hours Min.	$165/hr.	38%	$37,995
Per Diem (if appropriate)	$77/day		

Long Term Service and Licensing Fees

Long-term service fees for software applications can be as much as 20% of the cost of the application each year during the product life cycle. What is included in these services is a varied as the applications themselves. But be aware, for more expensive systems such as Oracle and SQL, this fee does not include the annual per-processor license fee for the server nor the cost of the database administrator that you will need to hire to provide on site application and server management. Tack on up to $40,000 per year, per processor, for an ORACLE server. That's $160,000 PER YEAR, payable to ORACLE, just for the Quad Code server! Tack on from $120,000 to $150,000 per year for the required database administrator position when you calculate your net present value and internal rate of return for the project. On the other hand, Formulations Pro uses FileMaker Server to eliminate the requirement for the annual per processor license fee and database administrator position. The cost of FileMaker Server is a one-time investment of only $1000! Thus, over the product life cycle, you can save as much as $,1,550,000 by utilizing FileMaker Server to off-loading the IT support to your work group expert.

Formulations Pro includes two days of installation, training, and or data entry (plus costs) with the purchase of ether license. If you purchase an Annual Maintenance and Help Desk contract, Formulations Pro will come out to your company

and re-optimize the system to improve performance, make basic customization changes (time permitting), and fix any Type II or Type III bugs. A Type II bug is defined as a problem that does not lead to system or application failure or a disruption in data integrity, but may have some effect on the application function or operation. A Type III bug is defined as a cosmetic problem that is merely an annoyance. Also included with the Annual Maintenance contract is a 10 pack of Help Desk calls. Help Desk is valid for phone or email technical support and does not include customization services.

If you need to customize your software Formulations Pro provides three levels of service. (1) If you need something done quickly, but don't want to commit to a Master Service Agreement (MSA) there are no discounts for the fees. If you know that you are going to need additional customization, training, field support, etc. you can opt for either the Level 1 or Level 2 MSA based on the projected minimum number of hours that you will use. (2) Level 1 is for a minimum of 160 hour. (3) Level 2 is for a minimum of 320 hours. The MSA contract is a pay-as-you-use service over a 1-year period of time. Any unused hours will be billed at the end of the contract period. Total savings for the Level 1 MSA is $21,995. Total Savings for Level 2 MSA is $42,795.

	Cost	Work Group	Enterprise
Installation & 2 Days Training	Included		
Annual Maintenance & Help Desk	$5995+ Costs	15%	4%
MSA Level 1	$26,400		
MSA Level 2	$48,000		

Upgrade Policy

Typical software upgrades will cost anywhere from 40% to 60% depending on the number of licenses that you own. Upgrades may not be backward compatible over more than one revision. Thus, you may not be able to skip versions in some cases. It is the owner's responsibility to maintain their system with the most current version of the software that is available from the vendor. This is true of all software applications.

Formulations Pro provides reasonable upgrade pricing and policies for both the Work Group and Enterprise license. Those that purchased a prorated Work Group license are eligible to upgrade to the Enterprise license on or before the end of the first license period. The cost is the difference between the Enterprise license and the prorated Work Group license. After the end of the first Annual license period, you are not eligible to upgrade your license. If you do not want to upgrade to the next *Formulations Pro* version, but would like to upgrade your FileMaker Server and FileMaker Pro client licenses to the next version, arrangements can be made to provide this conversion.

	FP 9 to FP 12	Discount
Enterprise to Enterprise	$69,995	50%
Work Group to Work Group	$39,995	
Work Group to Enterprise	Pro Rated Difference	
Upgrade Conversion	$265/Hr.	

Measuring Value

The use of a rating and weighting capability index is a business analysis technique designed to determine the fitness of suppliers, products, and/or services when absolute measurement is unavailable, non-obvious, or economically unsuitable. The analytical process is broken down into three sections. First, significant functional needs are specified. There are no steadfast rules that dictate what type of functions should be analyzed. This is determined by the scope of the analysis that needs to be measured. However, it is highly recommended to use a normal distribution of functions that are considered critical, value added, and recommended. The scope of this analysis is to consider 30 functions of cost, quality, support, and functional capabilities for *Formulations Pro*.

Second, a weight is given to each of the functions. Since critical functions may have disastrous effects if not analyzed thoroughly, they are given more weight than functions that are considered as recommended. There is no steadfast rule on the scale to be used for weighting. However, to make the distinction between the weighting more obvious, a smaller scale is recommended with a value of +3 given to critical functions, a value of +2 is given to value added functions, and a value of +1 is given to recommended functions.

Third, a rating is given to each of the functions. Again, since there is no rule regarding the scale of the rating, it is recommended to keep the value of the rating small to make differentiation easier. Each function is then given a score of +3 if it is considered capable of meeting all the functional needs, +2 if it meets the majority of the functional needs, a value of +1 if it meets a few of the functional needs, or a score of +0 if it is considered not capable or deficient.

To derive the score for each function, the weight is multiplied by the rating. The scores are then totaled and divided by the sum of the weights multiplied by the maximum possible rating. Then multiplied by 100% to covert the value to a percentage or Index Value:

$$Index\ Value = \sum Score/(\sum Weight \times Maximum\ Rating\ Value) \times 100\%$$

Normally an Index Value cut off number (such as 85%) is predetermined when selecting vendors and technologies. Those that do not fall above the minimum Index Value are eliminated, while those that pass go onto the next round of capability analysis. Thus, the vendor and technology with the highest Index Value will be considered the most capable. *Formulations Pro* achieved a **96%** Index Value when utilizing this performance measurement method. The data and results are listed below.

Critical Requirements	Weight	Rating	Score
Total cost of compared goods and services for the solution	3	3	9
Total cost for the server and client licensing	3	3	9
Project management and software engineering expertise as relate to the life sciences industry	3	3	9
Mass customization capabilities	3	3	9
Data Security	3	3	9
MRP/MRP II	3	3	9
Validation compliance and supporting documentation	3	3	9
Long term IT support costs	3	3	9
Hardware, network, and system requirements	3	3	9
Communication with other data systems	3	3	9
Value Added Requirements			
Technical service and support policy and capabilities	2	2	4
Field support policy and capabilities	2	2	4
Competitive analysis of long term capabilities and company vision	2	2	4
Cost of Customization	2	3	6
Ease of use and learning curve for the application	2	3	6
Electronic documents and signatures (21 CFR 11 compliance)	2	3	6
Productivity growth and scrap rate reduction potential	2	3	6
User training and manuals	2	3	6
Performance qualification: Speed	2	3	6
Performance qualification: Scalability	2	3	6
Performance qualification: Number of users	2	3	6
Upgrade costs and policies	2	3	6
Product demonstration works with existing processes and data requirements	2	3	6
Recommended Requirements			
Work group integration	1	3	3
Built in and customizable reporting features	1	3	3
Beta site development and/or references	1	2	2
Access to the code or escrow account	1	3	3
NPV/ROI/IRR meets finance and business requirements	1	3	3
Performance qualification: Cross platform	1	3	3
Performance qualification: Web Interface	1	2	2
Total	**189**		**181**
Capability Index	**96%**		

Discussion

+9 Total cost of compared goods and services: Formulations Pro provides the lowest total cost of ownership for the application at $29,995 for the Work Group License. Comparable solutions from other vendors range from $150,000 to $250,000.

+9 Total cost for the server and client licensing: FileMaker products are by far the lowest cost for licensing at $50,000 for the both the server and 250 users. Also of noticeable importance is that FileMaker products are licensed only one time, not per year.

Compared to $90,500 for SQL with licensing fees based on the number of processors and the number of client licenses (CALS) on the local computers. Compared to $1,680,000 for Oracle with licensing fees based on the number of processor cores and the number of client licenses on the local computers. According to IDC, the typical cost of software is only 20% of the long-term (3 years) total cost of ownership. Data supplied here was provided by FileMaker, Microsoft, ORACLE, and Nervewire.

	FileMaker	SQL	ORACLE
Server Licensing (2X Quad Core)	$1,000	$50,000	$80,000
Client Licensing (250 users)	$49,250	$40,500	$1,600,000
Ongoing Operations Support	$30,000	$511,928	$926,078
Design and Devlopment	$79,200	$158,381	$181,875
Additional Software Licensing	$0	$75,000	$225,000
Hardware	$5,000	$101,500	$221,500
Maintenance	$17,985	$64,500	$142,125
Training	$10,000	$12,627	$31,388
Total TCO 3 Years	**192,435**	**1,014,436**	**3,407,966**

+9 Project management and software engineering experience as related to the life sciences industry: The entire staff of Formulations Pro and Western Separations have significant experience in the life science industry. Every consultant has either a M.S., M.B.A., or Ph.D. in a related science and/or technology field. The Vice President in charge of project management and software engineering has an M.B.A. in Technology Management with a strong production and process development background. As well, he is a certified FileMaker Developer with 20 years of experience creating powerful custom and commercial applications.

+9 **Mass customization:** Formulations Pro understands the each business does something a little bit different to create competitive advantage. Thus, the software is built on the premise that mass customization is a requirement.

+9 **Data security:** Formulations Pro uses state-of-the-art 128-bit SSL data encryption with industry standard account name and password authentication to protect the data. There is also a log file that is used to monitor changes to the data that can be utilized to rollback data from any point in time.

+6 **MRP/MRP II:** Formulations Pro has MRP and MRP II capabilities built into the system that are also capable of integrating with enterprise financial systems that are ODBC or XML compliant.

+9 **Validation compliance and supporting documentation:** Formulations Pro provides a comprehensive validation support package. Their Success Factors implementation plan is geared toward FDA and ISO validation standards.

+9 **Long term IT support costs:** FileMaker Server and FileMaker Pro requires little or no IT support other than to monitor the server's usage and to make sure it is up and running. FileMaker is a very stable and easy to use application. Support could easily be off loaded to a work-group expert if IT resources are not available. No specialized database administrator or training is needed to operate the server application.

+9 **Hardware, network and system requirements:** FileMaker Server will run on all standard "server-class" hardware configured with Microsoft Server 2003 or Mac OS X Server. FileMaker is cross-platform compatible in a client-server network. It is certified to work on Windows XP, Windows Vista, and Mac OS X with standard TCP/IP protocols.

+9 **Communication with other corporate enterprise systems:** FileMaker Pro has built in ODBC capabilities to communicate with SQL and Oracle databases. Customization is required to enable the communication with other systems.

+4 **Technical service and support policy and capabilities:** Formulations Pro has comprehensive, flexible, and reasonable maintenance, help desk, and Master Service Agreement policies. The policies mirror industry standards with pricing more reasonable than other competitors because a "team" of consultants is not required to manage the account at significantly more expense. The small size of their company could be a factor in their ability to deliver support on time. However, they have been in business for more than 10 years, have a strong client base, and have a very stable product with virtually no updates or patches as a result of bugs. Therefore, their product is very stable and may not require significant support.

+4 **Field support policy and capability:** Formulations Pro has comprehensive, flexible, and reasonable policies. The policies mirror industry standards with pricing more reasonable than other competitors. However, the small size of their company could be a factor in their ability to

deliver support on time. They are partnered with Western Separations to provide field technical sales and support capabilities.

+4 Competitive analysis of long-term capabilities and company vision: Formulations Pro's mission statement is: to provide high quality integrated data management systems to the life sciences industry. To constantly innovate and add new products to meet customer demand, product life cycle, and changing market needs. Formulations Pro is a privately held company. Thus, financial information is not available for analysis. The initial acquisition of a Work Group license and a lesser customization scope for the first project can be used to mitigate the risk of approving a project of this size and cost with a smaller vendor.

+6 Cost of customization: Formulations Pro has tiered pricing for customization as well as a predefined project management plan. The pricing and project timeline is more reasonable than other competitors. According to research from IDC, the cost to customize FileMaker solutions is typically 1/10th the time and cost of SQL or ORACLE based systems.

+6 Ease of use and learning curve for the application: Training for a staff of 20 is easily completed in two days. It takes users less than two weeks to adjust to the system. The user interface is incredible easy to follow. Just point and click on what you want the system to do. Everything is either scripted or has pop-up menus to guide your data entry and search criteria. You can

export any data from the system without the need for third party tools such as Crystal Reports.

+6 Electronic documents and signatures compliance (21 CFR 11): Formulations Pro has spent a lot of time evaluating and researching 21 CFR 11 requirements. They even have a white paper that describes how the system is in compliance with this standard. The Formulations Pro system is designed to eliminate paper records if the users require operating in a paperless environment.

+6 Productivity growth and scrap rate reduction: Formulations Pro is specifically created for the life sciences industry. The application uses FIFO and expiration dating controls, coupled with MRP and bar codes to prevent deviations before they occur. Production workers can print approved documents whenever they need them. Thus, switching from paper to electronic records can eliminate several non-value added positions that are used to issue and review production documents. These positions can then be redirected to manufacturing for increased productivity growth.

+6 User training and manuals: Two days of user training are included in the purchase price of the software. The comprehensive power user training materials are also included in the purchase price of the software. Additional training can be purchased as part of the long-term support for the application. Formulations Pro also provides White Papers that describe the technology and business process behind the software application. This added educational benefit is absolutely invaluable for staff not trained and educated in integrated business management techniques.

+6 **Performance qualification (speed):** Performance of the system is directly related to the server, network, cabling, and client computers. Formulations Pro has been specifically designed to take advantage of a robust client-server network where millions of records need to be processed for production and analysis. The productivity of the software far outreaches comparable SQL and ORACLE systems that require a web-based front end.

+6 **Performance qualification (scalability):** FileMaker Server is limited to 250 concurrent users. Whereas SQL and Oracle based systems can have thousands of users. However, in most cases, the production, QA, and QC work-groups that will access the Formulations Pro software won't exceed 250 concurrent users. Therefore, the scalability of FileMaker Pro should be sufficient. Whereas, the scalability of SQL and Oracle based systems are an unnecessary cost for the perceived benefit. FileMaker Server supports 8 TB of data, which is the same capacity as SQL and ORACLE.

+6 **Performance qualification (number of users):** FileMaker Pro can be installed on every client machine. Thus, an unlimited number of users could have access to the Formulations Pro application. There is no client licensing restriction for Formulations Pro.

+6 **Upgrade price and policies:** Formulations Pro has comprehensive, flexible, and reasonable policies. The policies mirror industry standards with pricing more reasonable than other competitors.

+6 **Product demonstration works with existing data requirements:** Formulations Pro was designed specifically for the life sciences industry. The biggest component of the software is that it performs all the scientific calculations as part of the bill of materials. This will enable infinite scalability while preventing incorrect calculations. Thus saving a significant amount of money in scrap and deviations. Since the software is designed for mass customizations, adding data integration capabilities ensures that the software is capable of handling the data for all the required work groups.

+3 **Work group integration:** Formulations Pro is designed with all the functional groups that will use the system; Manufacturing, QA, QC, R & D, Receiving, Managers, Supervisors, Technicians, and Users. This allows anyone in the company to look at documents and find data. If you customize the system, new groups can be added with specific access privileges throughout the system.

+3 **Built in and customizable report features:** Formulations Pro has many built in reports that are designed for productivity growth and quick analysis of data. You can even export data to other application such as Excel for additional analysis or use Crystal Reports for drill down analysis using FileMaker's built in ODBC drivers. The Orders and Master Documents modules also contain exploded BOM capabilities to plan production actives with very little effort. Any additional reports require customization.

+2 Beta site development and/or references: Formulations Pro has been in the marketplace for more than 13 years. Formulations Pro has gained significant expertise through numerous installations and customization efforts. A beta release program is available to existing customers to try new software and provide feedback for requested features and functions. It is apparent that Formulations Pro pays close attention to their customers needs and applies new features and functions in a best-practices approach. New versions of the software are available from their web site for 30-day free trials. References are made by appointment only due to contractual obligations.

+3 Access to the code or escrow account: Formulations Pro does not give access to the code, citing trade secrets and intellectual property rights. However, an escrow account can be established to minimize your risk in the event that they go out of business. If the escrow account is activated, the master access password will be given to the owner of the application. A complete set of design standards and the Database Design Report that allows native FileMaker Pro system analysis also accompanies each purchase. This provides the opportunity to continue using and developing the software as your business needs, operating system, and FileMaker applications require you to upgrade your systems.

+3 Net Present Value (NPV), Return on Investment (ROI) and Internal Rate of Return (IRR) meet financial and business requirements: The NPV at $2,194,922 is well ahead of the 5% discount rate and is likely to provide a positive return on investment. The IRR is 196%, which should stack up well against other projects to place this at the top of the priority list. Finally, the ROI will take 6 months after the go live date. This is well ahead of the 5-year depreciation schedule for the software and equipment as well as the standard 18 to 24 month increasing returns market for software applications.

+3 Performance qualification (cross platform): FileMaker Pro is a cross platform system that can be run on Windows XP, Windows Vista and Mac OS. Formulations Pro has also developed their application to run native on these platforms.

+2 Performance qualification (web and iOS interface): FileMaker Server Advanced has a built in Instant Web Publishing technology that enable of data to be published to either the Internet or your Intranet. FileMaker Server Advanced is required (at an additional cost of $2000). Formulations Pro in not designed with a web interface because the web does not provide a robust interface as compared to a client-server network. The costs to develop for the web far exceed the benefit or break even point for this application. However, if a web interface is required, it can be part of a customization contract. Formulations Pro is fully compatible with FileMaker Go 12 for the iPad.

Mass Customization and Project Management

What is customization going to cost? This question isn't that easy to answer. It depends on the extent to which your company decides to customize the software, the number of people involved in the process, their availability and dedication to the project, your physical resources (i.e. meeting and training facilities), the amount of time it will take to program and revalidate the system, and the amount of data entry and conversion requirements.

The biggest issue to consider when selecting a vendor for customization is their experience with the software and their understanding of the critical elements of the project plan. Up front, they should be able to provide you with an implementation plan that includes the project management and resource requirements based on their experience with customizing the software. In many cases, the cost of customization can be as much, if not more than the software purchase price. But keep in mind that the cost of customization (all labor hours, costs, and expenses except data entry) can be immediately capitalized by your organization. Thus, the net cost will be less than the actual cost.

Formulations Pro has a formal customization plan that includes the project management of the customization process, the Formulations Pro Success Factors blue print document that is used to guide your company through the detailed design process in Phase I, and validation support documentation specifically tailored to FDA and ISO requirements. The customization process is broken down into three phases. Phase I starts with strategic planning. Your Formulations Pro consultant needs to know what resources are allocated to the project, the budget, and the time frame required. This will help them to make decisions when guiding the implementation team. Once this is established, the design specifications meetings can be started and the FileMaker software installed. Formulations Pro uses the Success Factors blue print document to create the design specification and document the process for validation purposes. At the end of Phase I, a formal proposal is made to your organization that details the specifications and estimated projected time and cost of Phase II. Phase I will take approximately eighteen days.


Phase II is the design phase. Formulations Pro uses the Success Factors document to guide their customization process. During this phase, less interaction is needed between the customer and the programmer(s). However, members of the implementation team will be required to periodically test prototypes of new functions and capabilities to ensure that the final product meets expectations. The length of this phase is largely a factor of the amount of customization required. At the end of this phase, a formal proposal is made to your organization that details the work that was completed as per the Success Factors blue print document. If the final product is accepted, the project will move into Phase III. Formulations Pro usually dedicates five weeks to this phase base on their experience with customizing the software.
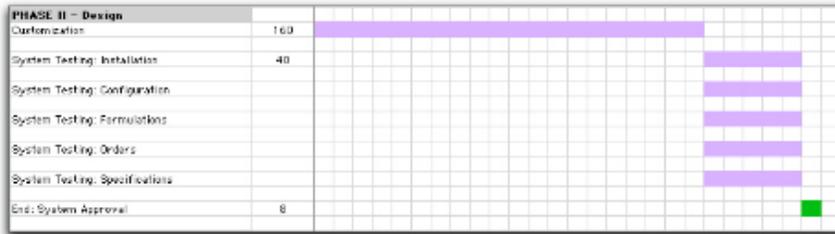
Phase III is the validation, data entry, and training phase. Formulations Pro uses a 100-step validation process to validate the code and ensure that the final product meets the specifications as outlined in the Success Factors blue print document. After Formulations Pro has validated the customized system, the implementation team will be required to test the system. Every aspect of the system will be tested until its fitness is approved for use at your facility. Once the system is approved, user's manuals and training materials are updated before the master data is loaded into the system and the end users receive their training. At this point, a go live period is initiated whereby the system runs side-by-side with the existing processes. At the end of the go live phase, the system is approved for use and considered "validated." Formulations Pro usually dedicates seven weeks to this phase of the project based on their experience.
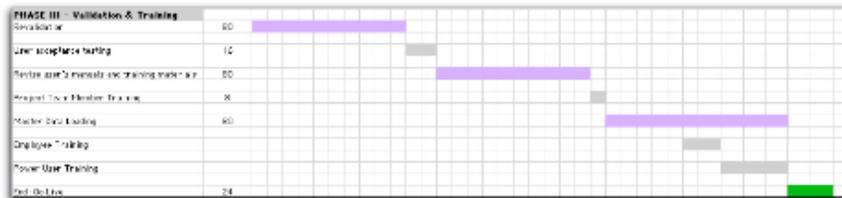
The human resources to carry out this project depend on the amount of customization that is performed, the number of groups that will be impacted by the software, and the number of meetings and training sessions that will need to be held throughout all three phases of customization. The typical groups that are involved in this process are: Finance and Accounting, Information Technology, Manufacturing, Process Development, the Project Manager, the Project Sponsor, Quality Assurance, Quality Control, Research and Development, Supply Chain, the Vice President of Operations, Product Planning, and Equipment Calibration and Maintenance. Conservative estimates indicate that approximately 1250 hours will be required from all of these groups to achieve the validated implementation goal. This is the equivalent of about 2.5 weeks of dedicated labor from each group involved in the process.

NPV, IRR, and ROI Calculations

All projects of this nature must pass the financial barriers of net present value (NPV), internal rate of return (IRR), and/or return on investment (ROI). NPV is used to evaluate an investment by calculating the present value of all after-tax total cash flows and then subtracting the original investment amount. The difference is the project's net present value. If it is positive for the discount rate used, the investment earns a rate of return higher than the discount rate and is often approved for investment. Most companies use a discount rate equal to the overall weighted cost of capital for the lowest desired return on investment.

IRR is the discount rate that makes the NPV of a project zero. It depends only on the cash flows of the investment, not on rates offered elsewhere. The IRR is a single number (percentage) that summarizes the merits of the investment. In many cases, it is used to rank multiple projects or products from best to worst.

ROI is the measure of how long it will take to repay the costs of the investment. Depending on the type of investment, many companies will require a minimum ROI for approval. For example software usually must provide a positive ROI before it needs to be upgraded.

All of these calculations are best performed using Excel. To provide an example using the ***Formulations Pro*** project, several assumptions must be made:

1. The Enterprise License is purchased.
2. Extensive customization according to the project management schedule is required.
3. Need to purchase 250 FileMaker Pro licenses.
4. Need to purchase 1 FileMaker Server license.
5. Need to purchase a dedicated server.
6. Need to plan for 5 years of service and support.
7. Depreciation of hardware and software is over 5 years.
7. Need to purchase the rights to an escrow account.
8. Need to plan for a 20% contingency fund after installation.
9. Scrap rate and inventory reduction will provide cash flows of $500,000 per year.
10. The equivalent of two positions can be reallocated as well as an overall increase in productivity growth will provide cash flows of $100,000 per year.
11. 1250 hours of labor will need to be allocated for the project.
12. The current discount rate for NPV is 5%.

Financial Analysis	Year 0	Year 1-5
Costs		
Application	$ (139,995)	
Consulting	$ (80,000)	
Server	$ (5,000)	
FileMaker Pro Server License	$ (1,000)	
FileMaker Pro Client Licenses (250)	$ (49,250)	
Labor (1000 hours @$20/hr)	$ (20,000)	
Service and support	$ (5,995)	$ (5,995)
Escrow account	$ (5,000)	
Contingency budet		$ (30,000)
Cash Flows		
Productivity growth		$ 100,000
Scrap reduction		$ 500,000
Depreciation		$ 39,049
Total	$ (306,240)	$ 603,054
NPV (Discount 5%)	$ 2,194,922	
IRR	196%	
ROI (months)	6	
% ROI	717%	

From this analysis, it is clear that the NPV at $2,194,922 is well ahead of the 5% discount rate and is likely to provide a positive return on investment. The IRR is 196%, which should stack up well against other projects to place this at the top of the priority list. Finally, the ROI will take 6 months after the go live date. This is well ahead of the 5-year depreciation schedule for the software and equipment as well as the standard 18 to 24 month increasing returns market for software applications.

Total Cost of Ownership Summary

As you can see from this lengthy analysis, the software and vendor meet all the criteria for selection. (1) The project exceeds expectations for NPV, IRR, and ROI. (2) The software vendor exceeds the capability index requirements for cost, quality, support, and function. (3) The vendor has strong project management skills to lead the implementation. (4) The software is capable of integrating with existing enterprise systems using ODBC. (5) The vendor has industry standard upgrade and service policies. (6) The total cost of ownership for the entire project is the lowest when compared to other vendors. (7) The base application, FileMaker Pro, is an open standard that allows for long-term application support and growth. (8) The vendor uses Beta software program to develop the software to ensure that it functions properly. (9) The vendor uses a thorough validation process to ensure that customized features function properly. Thus, investment in the *Formulations Pro* workflow tool to increase your productivity will be the right choice for a long-term technology commitment.

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Data from Microsoft, ORACLE, FileMaker, Nervewire, and Formulations Pro has been provided in this article to project a realistic total cost of ownership. Third part data was taken from publicly available sources and was deemed to be accurate at the time this article was written. We highly encourage you to perform your own vendor and financial analysis to independently verify these findings.