

**Board of Governors of the
Federal Reserve System:
Project Funding for Call-BHC
Fiscal Year 2002**



**Executive Decision Making
Discrete Resource Allocation**



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1. Table of Contents:

1. Table of Contents:	2
2. Introduction	3
3. Background	3
3. Goal	4
4. Objectives	4
a. Financial Industry Reform	5
b. Legislative Actions	5
c. Banking Modernization	5
d. Availability of Trained Staff	6
5. Alternatives	6
6. Priorities and Ratings	9
7. Solution and Analysis	11
8. Conclusion	13
9. Appendix A: References	13

2. Introduction

The Board of Governors of the Federal Reserve System has assigned the budget of \$1,012,575.00 for the Information Technology department for its projects in the Fiscal Year 2002. If the IT departments decides to run all the projects scheduled for the year they would require the budget of \$1,213,365.00. Thus, it is important for the department as well as the organization to select the projects from the year 2001 so that their contribution to the organizational vision is maximum.

We will use the Discrete Resources Allocation with Analytical Hierarchical Process (AHP). AHP approach was first used by Dr. Thomas Saaty. Later Dr. Ernest Forman of The George Washington University developed the software – Expert Choice with Dr. Saaty. Expert Choice allows the user to structure the problem into multi-layer hierarchy of objectives and alternatives. The pair-wise comparisons are done among alternatives and objectives to derive the priorities. For these comparisons the Intensities are defined for each objective. In Discrete Resource Allocation, the priorities for the alternatives are determined to allocate the resources. Then with the help of solver, the solution is determined that will yield the funded benefits to be as high as possible to reach the ultimate limit of 1. The total budget is determined for running all the alternatives as well and the results of this optimization are studied using the generated Pareto Chart.

Ms. Jill Cross is the in-charge for selecting the projects for the IT department of Federal Reserve System and co-author of this paper as well.

3. Background

The Board of Governors of the Federal Reserve System is organized functionally into seven divisions, each of which reports to one of the Governors. In this organization model, Information Technology (IT) is centralized into a separate division. The IT is a service division meaning that it provides services to other internal divisions of the Board rather than to any outside clients or organizations.

The IT division is funded primarily through a user charge back system. Services funded under the charge back system include mainframe and distributed machine costs, storage media, printing services, production control staff, programmer/analyst support, financial systems analysts, and project managers. A division requiring any of these services enters into a Service Level Agreement (SLA) in which the division “contracts” with IT for the desired service. The term of the contract is one fiscal year, which runs from January 1 through December 31.

For SLA’s covering labor, the smallest increment allowable is one day. Client divisions are charged at the rate of \$345.00 per day. The labor year is defined to be 215 days. Therefore, if a client contracts for 2.5 labor years in fiscal year 2001, they are requesting two full time analysts and an additional analyst available for six months (or for 12 months at half-time). The SLA in this case is for 2.5 labor years or 537.5 days. Under the user charge back system, the client must budget for a monthly cost of one-twelfth of the annual amount. Charges are based solely on the annual amount and are so do not vary from month to

month. This simplifies project accounting and allows the system to function without the requiring time-card tracking.

Under this billing scheme, the unit manager is responsible for ensuring that all client divisions receive the labor years for which they have contracted. Assigning projects and keeping the labor costs within the budget amount for each project becomes critical. In addition, the budget funding general includes both maintenance and development projects.

For fiscal year 2002, which begins January 1, 2002, the budget of the Call-BHC Systems section has been reduced meaning that not all projects requested by client divisions can be funded. Since some projects are mandated, such as collecting regulatory data from financial institutions, these projects must be funded. Remaining funds can then be allocated.

3. Goal

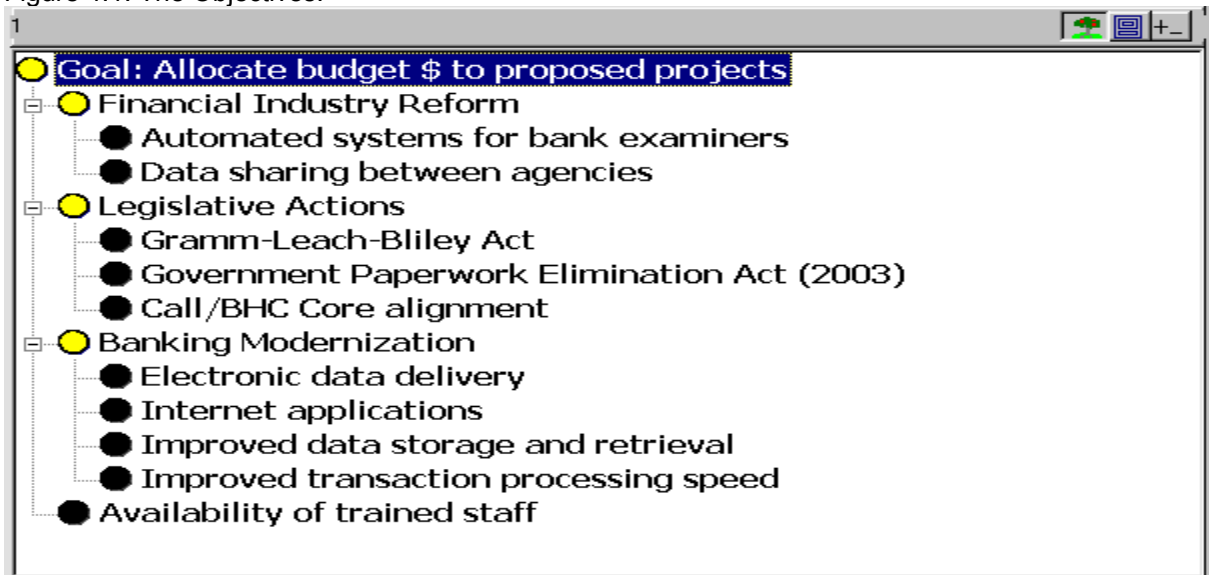
The goal of this project is to allocate funding for the fiscal year 2002 to the IT projects requested by the client divisions.

4. Objectives

For this project, the IT division strategic plan for 2001-2004 was used to create the objective hierarchy for the AHP model. Since the subject of the project is the budget for the Call-BHC section of the division, not all objectives in the strategic plan are applicable. Only the objectives that apply to the client projects requested for this section have been considered.

The primary objectives taken directly from the IT Strategic Plan, which apply to this Call-BHC section, are summarized below. Sub-objectives and their relative priorities are discussed along with each particular objective.

Figure 4.1: The Objectives.



a. Financial Industry Reform

Recently there have been substantial changes in the structure of entities within the banking industry. Consolidation and innovation within the industry is continuing resulting in a larger proportion of assets concentrated in fewer organizations. For the regulatory agencies to supervise these large, complex banking organizations additional tools and resources must be made available. New automated systems are required to assist bank examiners, the Reserve Banks, and other regulatory agencies in the assessment and identification of high-risk areas. In addition, a greater sharing of information among the agencies is required to eliminate redundant data collection and provide data for decision making in a more timely manner. These two sub-objectives are of equal priority to the Board in addressing the issue created by financial industry reforms.

b. Legislative Actions

Certain changes to the IT landscape at the Board are necessary in response to changes mandated by congress or by the FFIEC. During the 2002 fiscal year three legislative actions will impact the Call-BHC Systems unit. One congressional mandate, the Government Paperwork Elimination Act, is to be phased in over a period of years with the complete implementation scheduled for 2003. Since this project has a long horizon, it has a lower priority than the others. The Gramm-Leach-Bliley Act is a congressional action with significant impact on the banking industry and the organization of banking institutions. This legislature will necessitate a number of changes to two of the primary applications supported by the Call-BHC Systems unit and carries with it an immovable deadline. For this reason this sub-objective is of the highest priority. The remaining action, the Call/BHC Core Alignment, is an FFIEC approved modification to the format of the collection reports for both Bank Holding Company and Call. While this modification is fairly significant in scope, it is much more easily implemented since it is primarily a reformatting issue and is therefore slightly lower in priority.

c. Banking Modernization

The continued increase in electronically delivered financial services to both consumers and business is necessitating a fundamental shift in the banking industry. With the demand for quicker access to financial information and the execution time for financial transactions continues to shorten, the software and hardware infrastructure must continue to be upgraded to meet the time demands. Two sub-objectives, which address the need, are improvements in electronic data delivery and transaction processing speed. Accordingly, these two sub-objectives are of the highest priorities within this objective. In addition, modifying software applications to take advantage of improvements in data storage and retrieval technologies will address the need for quicker access, but to a lesser extent. The lowest priority is deliver of internet applications. While e-banking is a huge consideration for the individual banking institutions, demand by the public for access to regulatory data via an internet portal is currently being meet to an adequate extent. Therefore, this sub-objective has the lowest priority of the four.

d. Availability of Trained Staff

The Federal Reserve, like many other companies and government agencies, is faced with an increasing number of staff retirements as the baby boomers begin to reach retirement age in great numbers. As a result, many of the senior level staff necessary to implement the complex changes necessary will be leaving over the next two to five years. The technology boom of the past has encourage technical staff to change employment more frequently than every before resulting in a lack of staff with the ten plus years of Board experience desired in senior level staff. In addition, the technologies are changing so quickly that it is difficult to keep staff trained in the latest technologies.

These issues have made staff availability a critical factor when selecting projects for implementation. For this reason, availability of trained staff must be a considered in the decision making process.

5. Alternatives

The alternatives are the projects requested by clients. Since the total budget is less than the combined cost of all the projects requested, not all projects can be funded. The projects requested by the client along with the costs are as shown in Table 5.1 below. The projects that do not contribute to the objective are not rated and rating cell for those projects is kept blank in the data grid.

Figure 5.1: Data Grid with Objectives and Alternatives

Alternative	Total	Costs	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS		
			Financial Industry Reform Automate systems for bank examine	Financial Industry Reform Data sharing between agencies	Legislative Actions Gramm-L	Legislative Actions Govern Paperwork Eliminatio Act	Legislative Actions Call/BHC Core alignmer	Banking Moderniz Electroni	Banking Moderniz Internet	Banking Moderniz Improver data	Banking Moderniz Improver transacti processi	Availa of trainee		
Countrv Exposure	.023	20700			Somewha					Beneficia		Beneficia	Beneficia	On
FFIEC 019	.023	20700			Somewha					Beneficia		Beneficia	Beneficia	On
DFCR/LIRS	.014	13800								Somewha		Beneficia	Beneficia	On
Terms Of Credit	.014	21390								Somewha		Beneficia	Beneficia	On
Inter Series Edits	.008	36915									Somewha		Beneficia	On
FS Concentration	.013	8625								Somewha		Beneficia	Beneficia	Som
Quarterly Foreign	.014	46575								Beneficia		Beneficia	Beneficia	On
International	.014	20700								Beneficia		Beneficia	Beneficia	On
Treasurv Reports	.017	75900								Moderath		Beneficia	Beneficia	Som
Foreign Branch	.014	20700								Somewha		Beneficia	Beneficia	On
Mainframe Billing	.026	34500				Most								On
Web Facsimilies	.083	105915	Most			Most	Beneficia	Somewha	Most					Extens
Bank Holdins	.085	10350			Most		Most	Moderath				Beneficia	Beneficia	Transl
Archival	.121	105225	Somewha	Moderath	Most		Most	Most						On
Mainframe	.071	75900	Beneficia		Most							Moderath	Moderath	On
Web Index	.058	1725			Most					Most				On
Financial Data	.173	60375	Most	Most	Moderath		Most	Moderath	Moderath		Most	Most		Hire
Call & Income	.126	175755	Moderath	Beneficia	Moderath	Somewha	Most	Most			Moderath	Moderath		On
Call/Income	.083	36915	Somewha	Moderath	Beneficia		Moderath	Most			Somewha	Somewha		On
Poliev	.019	20700			Beneficia									On

Board of Governors of the Federal Reserve System
Project Funding for Call-BHC Fiscal Year 2002

Executive Decision Making

Table 5.1: Projects and their Costs.

Project	Year 2002	
	Labor (Working Days)	Cost (US Dollars)
Web Index	5	1,725.00
DFCR/LIRS	40	13,800.00
Terms Of Credit Card Purchases	62	21,390.00
Call/Income Subscription Services	107	36,915.00
Inter Series Edits	107	36,915.00
FS Concentration	25	8,625.00
Quarterly Foreign Branch	135	46,575.00
International Banking Act	60	20,700.00
Tresury Reports	220	75,900.00
Foreign Branch Reports	60	20,700.00
Bank Holding Company	30	10,350.00
Country Exposure	60	20,700.00
FFIEC 019	60	20,700.00
Policy Imp Adhoc	60	20,700.00
Archival Subscription (BHC)	305	105,225.00
Mainframe Facsimiles	220	75,900.00
Mainframe Billing	100	34,500.00
Financial Data Warehouse	175	60,375.00
Web Facsimiles	307	105,915.00
Call & Income	1379	475,755.00
Subtotal	3517	1,213,365.00
Approved Budget	2935	1,012,575.00

Of the projects requested, several will address congressional mandates and must be funded in the 2002 fiscal year. For these projects, the “Must” column in the resource allocation spreadsheet generated by Expert Choice, is set to a value of ‘1’ indicating the project must be funded. E.g. Call & Income is the project that must be funded. This is shown in Figure 5.2 below.

Figure 5.2: ‘Must’ Projects

Alternative	Benefits	Costs	DVS	F. Benefits	F. Costs	B/C	Musts	Musts	Notes
Country Exposure	0.023	20700		0.000	0.0	0.11111	0		1
FFIEC 019	0.023	20700		0.000	0.0	0.11111	0		1
DFCR/LIRS	0.014	13800		0.000	0.0	0.10145	0		1
Terms Of Credit Card Purchases	0.014	21390		0.000	0.0	0.06545	0		1
Inter Series Edits	0.008	36915		0.000	0.0	0.02167	0		1
FS Concentration	0.013	8625		0.000	0.0	0.15072	0		1
Quarterly Foreign Branch	0.014	46575		0.000	0.0	0.03006	0		1
International Banking Act	0.014	20700		0.000	0.0	0.06763	0		1
Tresury Reports	0.017	75900		0.000	0.0	0.02240	0		1
Foreign Branch Reports	0.014	20700		0.000	0.0	0.06763	0		1
Mainframe Billing	0.026	34500		0.000	0.0	0.07536	0		1
Web Facsimiles	0.083	105915		0.000	0.0	0.07836	0		1
Bank Holding Company Structure	0.085	10350		0.000	0.0	0.82126	0		1
Archival Subscription (BHC)	0.121	105225		0.000	0.0	0.11499	0		1
Mainframe Facsimiles	0.071	75900		0.000	0.0	0.09354	0		1
Web Index	0.058	1725		0.000	0.0	3.36232	0		1
Financial Data Warehouse	0.173	60375		0.000	0.0	0.28654	0		1
Call & Income	0.126	475755		0.000	0.0	0.02648	1		1
Call/Income Subscription Services	0.083	36915		0.000	0.0	0.22484	0		1
Policy Implementaion Adhoc	0.019	20700		0.000	0.0	0.09179	0		1
				0.000	0.0				

Board of Governors of the Federal Reserve System
Project Funding for Call-BHC Fiscal Year 2002

Executive Decision Making

In addition two of the projects are mutually exclusive. The Mainframe Facsimile project is a mainframe-based report facsimile system used by financial analysts at the twelve reserve banks to view financial data submitted by financial institutions. The data is presented with boilerplate text similar to that in the actual paper copy of the report, hence the term facsimile. These facsimiles must be updated in 2002 because of extensive changes to the boilerplate text, which will be implemented in March 2002. The web facsimile project is a request by clients to allow reserve bank analysts to view the facsimiles through a web browser. If the web-based facsimiles are implemented, they will include the new March 2002 format. In that case, it is not necessary to modify the mainframe-based facsimiles since that application will be de-supported in favor of the web-based application. The dependencies function in the Expert Choice resource allocation tool was used to indicate the mutually exclusive relationship between these two projects. This is shown in Figure 5.3 below.

Figure 5.3 – Specifying Mutually Exclusive Projects

	A9	A10	A17	A19	A11	A15	A16	A1	A18	A20	A4
Right Click: Cell to Enter Dependency	Treasury Reports	Foreign Branch Reports	Mainframe Billing	Web Facsimiles	Bank Holding Company Structure	Archival Subscription (BHC)	Mainframe Facsimiles	Web Index	Financial Data Warehouse	Call & Income	Call/Income Subscription Services
A3 Terms Of Credit Card Purchases											
A5 Inter Series Edits											
A6 FS Concentration											
A7 Quarterly Foreign Branch											
A8 International Banking Act											
A9 Treasury Reports											
A10 Foreign Branch Reports											
A17 Mainframe Billing											
A19 Web Facsimiles											
A11 Bank Holding Company Structure											
A15 Archival Subscription (BHC)											
A16 Mainframe Facsimiles											
A1 Web Index											
A18 Financial Data Warehouse											
A20 Call & Income											
A4 Call/Income Subscription Services											
A14 Policy Implementaion Adhoc											

6. Priorities and Ratings

It is important to derive the priorities based on objectives and alternatives so that the return on investment is higher. In other words, we need to determine which projects are more beneficial than others. In Expert Choice, we used ratings to keep the number of pair-wise comparisons as little as possible to save some time and avoid tediousness of the job while determining the priorities. For each objective except for Availability for trained staff, we created a ratio scale that is comprised of different intensities as follows: Most Beneficial, Moderately Beneficial, Beneficial, Somewhat Beneficial and No Benefits. For the objective Availability of trained staff, On Team, Some Training, Transfer, Extensive Training and Hire are the intensities created. See Figure 6.1 and 6.2

Figure 6.1: Intensities

Intensity Name	Priority
Most Beneficial	1.000
Moderately Beneficial	.627
Beneficial	.382
Somewhat Beneficial	.232
No Benefits	.148

Figure 6.2 Intensities

Intensity Name	Priority
On Team	1.000
Some Training	.648
Transfer	.349
Extensive Training	.250
Hire	.159

To determine the priorities between the intensities we use pair-wise comparisons between each intensity level for the given objective. See Figure 6.3 and 6.4.

Board of Governors of the Federal Reserve System
Project Funding for Call-BHC Fiscal Year 2002

Executive Decision Making

Figure 6.3: Pair-wise Comparisons between Intensities

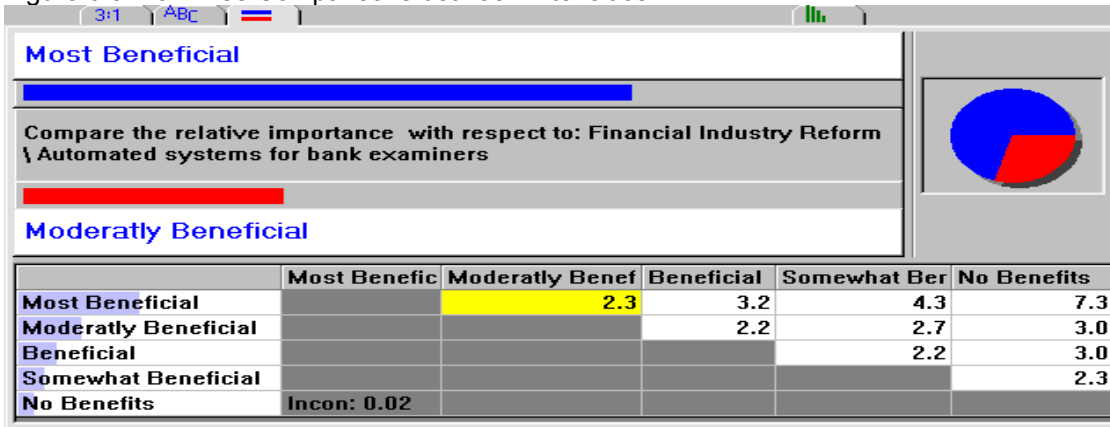
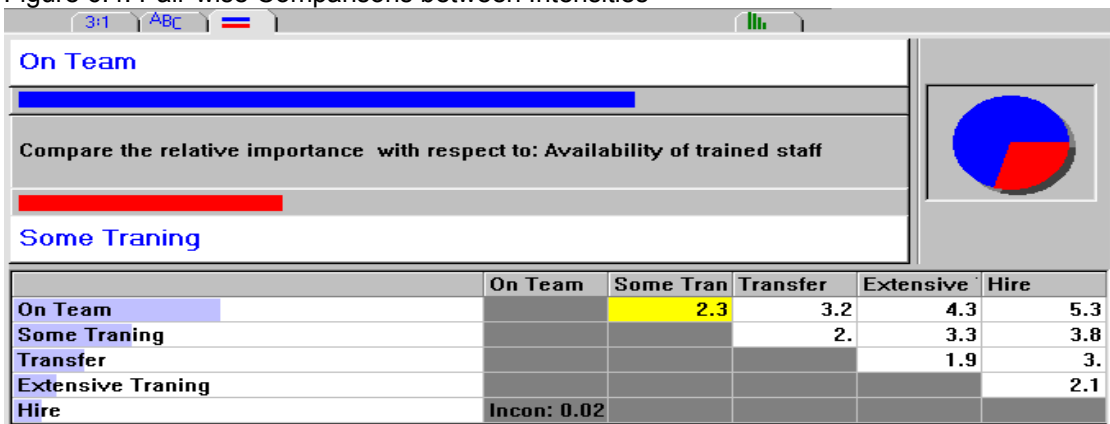


Figure 6.4: Pair-wise Comparisons between Intensities



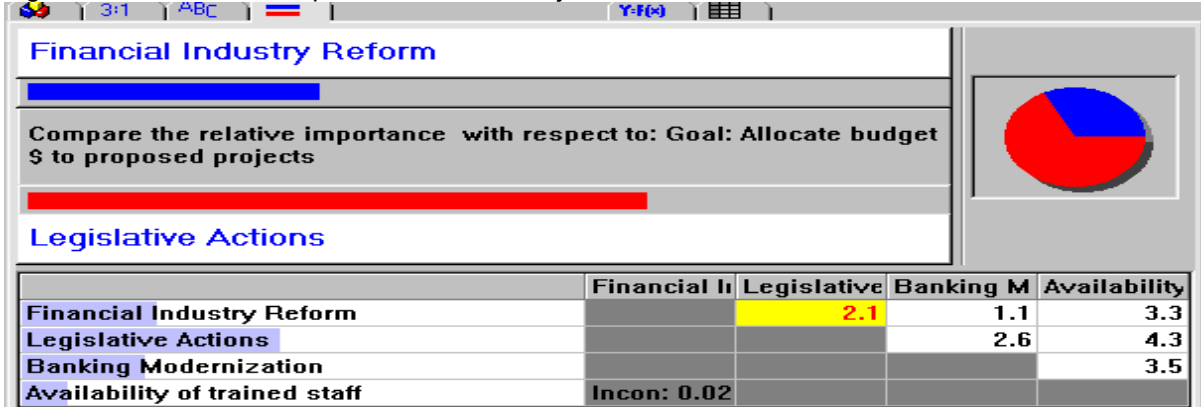
After defining the Intensities, each alternative was evaluated based on these intensities for each objective. Please see Figure 6.5. Notice that the projects i.e. alternatives for which the objective is not applicable are not judged for the given objective and hence the data grid cell is left blank.

Figure 6.5: Data Grid with Intensities.

Alternative	Total	Costs	RATINGS Financial Industry Reform Automate systems for bank examine	RATINGS Financial Industry Reform Data sharing between agencies	RATINGS Legislati Actions Gramm-L	RATINGS Legislati Actions Paperwo Eliminati Act	RATINGS Legislati Actions Call/BHC Core alignmer	RATINGS Banking Moderniz	RATINGS Banking Moderniz	RATINGS Banking Moderniz	RATINGS Banking Moderniz	RATINGS Availa of trainee
Country Exposure	.023	20700			Somewha			Beneficia		Beneficia	Beneficia	On
FFIEC 019	.023	20700			Somewha			Beneficia		Beneficia	Beneficia	On
DFCR/LIRS	.014	13800						Somewha		Beneficia	Beneficia	On
Terms Of Credit	.014	21390						Somewha		Beneficia	Beneficia	On
Inter Series Edits	.008	36915							Somewha		Beneficia	On
FS Concentration	.013	8625						Somewha		Beneficia	Beneficia	Som
Quarterly Foreign	.014	46575						Beneficia		Beneficia	Beneficia	On
International	.014	20700						Beneficia		Beneficia	Beneficia	On
Treasurv Reports	.017	75900						Woderath		Beneficia	Beneficia	Som
Foreign Branch	.014	20700						Somewha		Beneficia	Beneficia	On
Mainframe Billing	.026	34500				Most				Beneficia	Beneficia	On
Web Facsimilies	.083	105915	Most			Most	Beneficia	Somewha	Most			Extens
Bank Holding	.085	10350			Most	Most	Most	Woderath		Beneficia	Beneficia	Transf
Archival	.121	105225	Somewha	Woderath	Most	Most	Most	Most				On
Mainframe	.071	75900	Beneficia		Most					Woderath	Woderath	On
Web Index	.058	1725			Most				Most			On
Financial Data	.173	60375	Most	Most	Woderath	Woderath	Most	Woderath	Woderath	Most	Most	Hire
Call & Income	.126	175755	Woderath	Beneficia	Woderath	Somewha	Most	Most		Woderath	Woderath	On
Call/Income	.083	36915	Somewha	Woderath	Beneficia		Woderath	Most		Somewha	Somewha	On
Policyv	.019	20700			Beneficia							On

Pair-wise comparisons between the objectives are also done to determine the priorities between the objectives. See Figure 6.6.

Figure 6.6: Pair-wise Comparisons between objectives

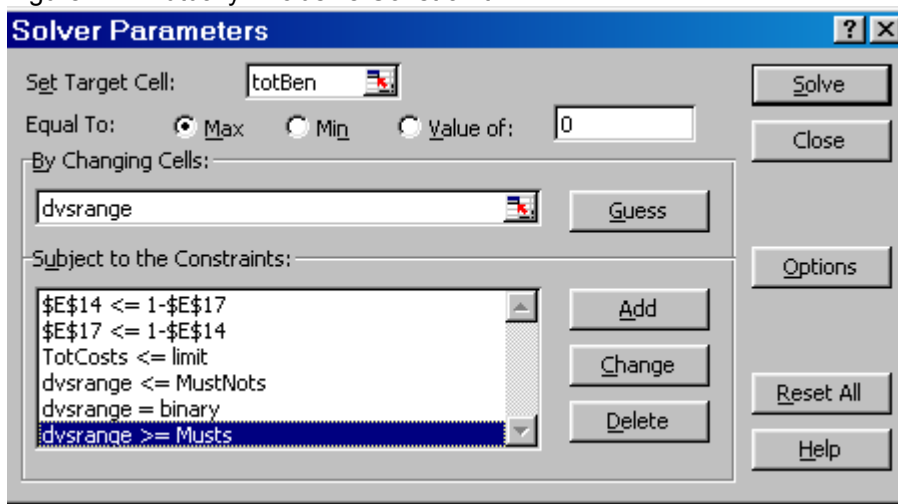


Completion of all the pair-wise comparisons of the objectives is important for proceeding further. So is completion of ratings for all the projects with respective to each objective. Once all the pair-wise comparisons and ratings are complete you could observe the priority determined for each alternative in the Totals column of the data grid. See Figure 6.5 above.

7. Solution and Analysis

For the solution we use Microsoft Excel Solver invoked by the Expert Choice Model. We add the constraints so that only one of the mutually exclusive projects gets the funding. I.e. either Web Facsimiles Mainframe Facsimiles is funded. See Figure 7.1

Figure 7.1: Mutually Exclusive Constraint.



We put the allotted money in the target cell, which has red background, and use the Discrete Resource Allocation followed by the Optimization for increasing budgets.

Board of Governors of the Federal Reserve System
Project Funding for Call-BHC Fiscal Year 2002

Executive Decision Making

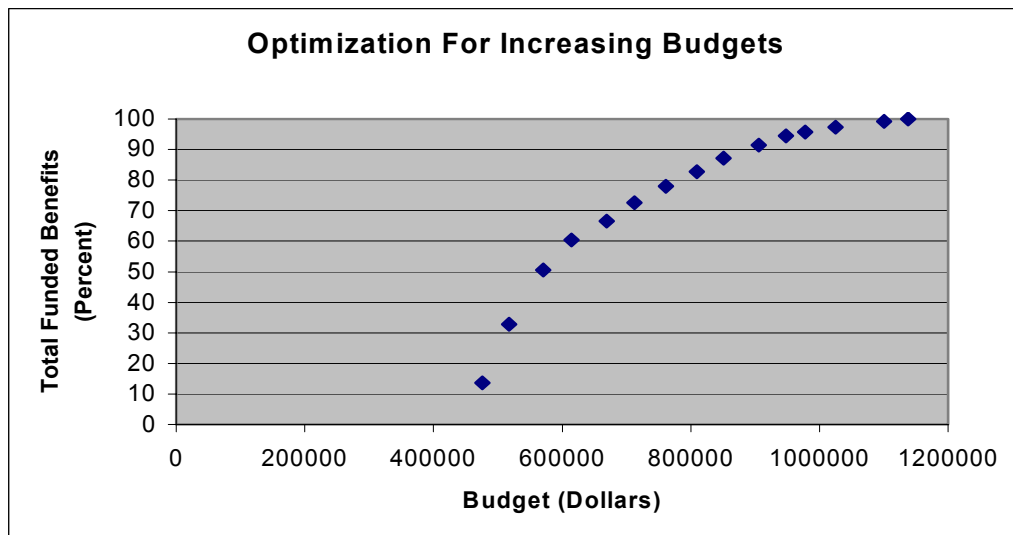
Figure 7.2: Solution

C:_Amruta's Course Work\MGT224\Project B\Final\Amruta_Jill_B_V2.AHP									
AID	Alternative	Distributive mode		DVS	F. Benefits	F. Costs	B/C	Musts	Musts Nots
		Benefits	Costs						
A12	Country Exposure	0.023	20700	1	0.023	20700.0	0.11111	0	1
A13	FFIEC 019	0.023	20700	1	0.023	20700.0	0.11111	0	1
A2	DfCR/LIRS	0.014	13800	1	0.014	13800.0	0.10145	0	1
A3	Terms Of Credit Card Purchases	0.014	21390	1	0.014	21390.0	0.06545	0	1
A5	Inter Series Edits	0.008	36915	0	0.000	0.0	0.02167	0	1
A6	FS Concentration	0.013	8625	1	0.013	8625.0	0.15072	0	1
A7	Quarterly Foreign Branch	0.014	46575	0	0.000	0.0	0.03006	0	1
A8	International Banking Act	0.014	20700	1	0.014	20700.0	0.06763	0	1
A9	Treasury Reports	0.017	75900	0	0.000	0.0	0.02240	0	1
A10	Foreign Branch Reports	0.014	20700	1	0.014	20700.0	0.06763	0	1
A17	Mainframe Billing	0.026	34500	1	0.026	34500.0	0.07536	0	1
A19	Web Facsimilies	0.083	105915	1	0.083	105915.0	0.07836	0	1
A11	Bank Holding Company Structure	0.085	10350	1	0.085	10350.0	0.82126	0	1
A15	Archival Subscription (BHC)	0.121	105225	1	0.121	105225.0	0.11499	0	1
A16	Mainframe Facsimilies	0.071	75900	0	0.000	0.0	0.09354	0	1
A1	Web Index	0.058	1725	1	0.058	1725.0	3.36232	0	1
A18	Financial Data Warehouse	0.173	60375	1	0.173	60375.0	0.28654	0	1
A20	Call & Income	0.126	475755	1	0.126	475755.0	0.02648	1	1
A4	Call/Income Subscription Services	0.083	36915	1	0.083	36915.0	0.22484	0	1
A14	Policy Implementaion Adhoc	0.019	20700	1	0.019	20700.0	0.09179	0	1
					0.889	978075.0			
						1012575.0			

Thus from the above figure, with in the given budget of \$1,012,575.00 most of the projects are funded with the 88.9% of Funded Benefits. Between Web Facsimilies and Mainframe Facsimilies the one with higher funded benefits i.e. Web Facsimilies is selected. Among the remaining projects except for Inter Series Edits Quarterly Foreign Branch and Treasury Reports all the other projects are funded. Out of budget of \$1,012,575.00 only \$978,075.00 are used creating surplus of \$34500.00.

For the increasing budgets optimization, please refer to the Figure 7.3. This Pareto Chart shows how the funded benefits increase to 100% when the budget is increased to \$1,123,365.00.

Figure 7.2: Optimization for Increasing Budgets



8. Conclusion

Thus using the AHP, Expert Choice and Microsoft Excel we have determined which projects should be funded for the Fiscal Year 2002 for the Information Technology Department of The Board of Governors of the Federal Reserve System.

With the given budget of \$1,012,575.00 all the projects except Inter Series Edits, Quarterly Foreign Branch, Treasury Reports and Mainframe Facsimiles all the projects are funded with funded benefits being 88.9% out of maximum of 100%. For this level of funded benefits however we require just \$978,075.00. Thus we have \$34500.00 surplus with in the given budget from the cost of work being done for the same level of funded benefits. From the optimization, it is evident that we would need \$1,213,365.00 to fund all the projects and how the benefits are distributed as the budget increases.

As an in-charge for selecting the projects for the IT department of Federal Reserve System Ms. Jill Cross who is also a co-author of this paper has selected the projects based on above solution and she has decided to peruse the clients of Federal Reserve System to approve her decision.

9. Appendix A: References

1. Decisions by Objectives – Dr. Forman
2. Strategic Plan, Division of Information Technology, The Board of Governors of the Federal Reserve System