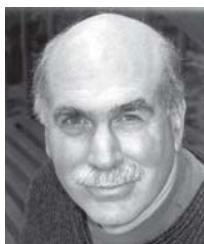# SymBanc™
A Simulator for Microfinance Institutions[1]

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Microfinance Institutions (MFIs) engage in a large number of small, cash transactions and rely on the constant flow of information to effectively manage their operations. As the number of MFIs increase and the scale of their operations expand, there is a growing need for managers and policy makers with the skills to operate and supervise these dynamic organizations. This presents a challenge because the best teacher of such skills is experience; yet experience can be an expensive teacher—a mistake in an MFI can directly affect thousands of lives. There is an alternative—to create a simulator that models the complex dynamics of an MFI and its environment for prospective managers and policy makers.

This is the purpose of SymBanc™, a system dynamics simulator that prospective managers can "play" to understand the interrelated nature of their decisions, the importance of having good information, and the common problems MFIs encounter as they grow. To play the game, prospective managers must make a set of initial strategic decisions regarding their target market and product offerings and, subsequently, a set of operational and financial decisions based on information that SymBanc's management information system generated.

The game is interactive in that every decision made by the manager affects the future trajectory of the MFI and the clients it serves: an initial decision to set a high interest rate may prevent rapid growth, or an overambitious branch expansion plan may run down the MFIs capital too quickly. A free version of SymBanc™, together with a user's manual, is available at http://www.ksg.harvard.edu/cbg/asia/symbanc.htm.

SymBanc™ was developed initially for the Financial Institutions for Private Enterprise Development (FIPED) Executive Program and for a degree program course on microfinance at Harvard University's Kennedy School of Government. FIPED is a 2-week program for professionals working in fields related to micro enterprise finance and commercial banking for small- and medium-sized businesses, and is designed to aid participants in the sustainable provision of financial services for micro, small, and medium enterprises (MSMEs). The course shows how to design appropriate financial

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instruments and adopt market-oriented management approaches to serve the needs of MSMEs. The program aims to offer financial institutions the management skills and operational tools necessary to operate in a market economy, while teaching participants how to introduce and implement strategies that will enable them to profitably finance the creation and growth of MSMEs. FIPED also gives senior government officials an understanding of the macro policies and enabling environment needed to support sustainable MSME finance. [2]

BACKGROUND

The field of system dynamics offers a set of tools for people working in a complex, dynamic environment, by providing them with a way to model the environment and understand the effects of their decisions on it. The field was developed at the Massachusetts Institute of Technology almost 50 years ago and has been applied to a wide range of management problems. Economic development has been one field with extensive applications (For example, see Saeed, 1994, 1998). Other fields with rich histories of applications include commodity markets, manufacturing supply chains, and health care delivery (Sterman, 2000).

Management simulators based on system dynamics models have helped many people get a real understanding of the need to manage systems in an integrated manner rather than as a set of separate pieces. Simulators have also helped those people learn how to think about strategies for systemic management by trying different approaches and seeing what works and what does not. In this manner, simulators provide "practice fields" for understanding management in ways that textbooks and case studies cannot. Simulators such as SymBanc™ have been used in diverse fields including health care and the newspaper industry (Hirsch and Immediato, 1998; Hirsch et al, 2003).

SymBanc™ is different from other simulation tools commonly used in microfinance such as Microfin. SymBanc™ and Microfin are complementary. SymBanc™ applies system dynamics modeling to microfinance, using the software application Vensim to highlight complex relationships in designing and operating an MFI. In contrast, Microfin is an Excel template designed to increase the sophistication and comprehensiveness of an MFI's business planning and financial modeling—the primary output of which is a 5-year financial projection. Microfin is most effective when real data are used and it is integrated into an organization's operations.

The "takeaways" from the two are also very different. As noted above, users of Microfin create detailed projection scenarios that can lead to better decisions within their organizations. SymBanc™ users go through a (realistic) simulation of what it is like to actually run an MFI. Class discussion and guidance from an instructor allow course participants to understand the process of managing an MFI and the signals to look out for and the pitfalls to avoid.

The model underlying SymBanc™ represents most of the functions of an MFI serving a population of two million in a region where two thirds of the people live in rural areas. Average annual per capita income in the region is $900 with significant inequality in distribution. The lowest quintile has an average income of $200 while the highest has an income of $2,700.

The MFI is able to offer trade or agricultural loans to existing and/or new enterprises and can elect to take savings deposits as one source of funds for lending. Users of the simulator start with a single branch and its staff. They choose the target population to serve; design the loan products offered; make decisions about staffing, expansion of the branch network, investments in information systems and other capital assets; and select external sources of funds for capital. Some MFI functions, such as lending to small and medium enterprises (SMEs) and consumer loans to civil servants and other salaried employees, are excluded in this version of the simulator. These features may be added later, as would the ability to lend for trade and agriculture simultaneously.

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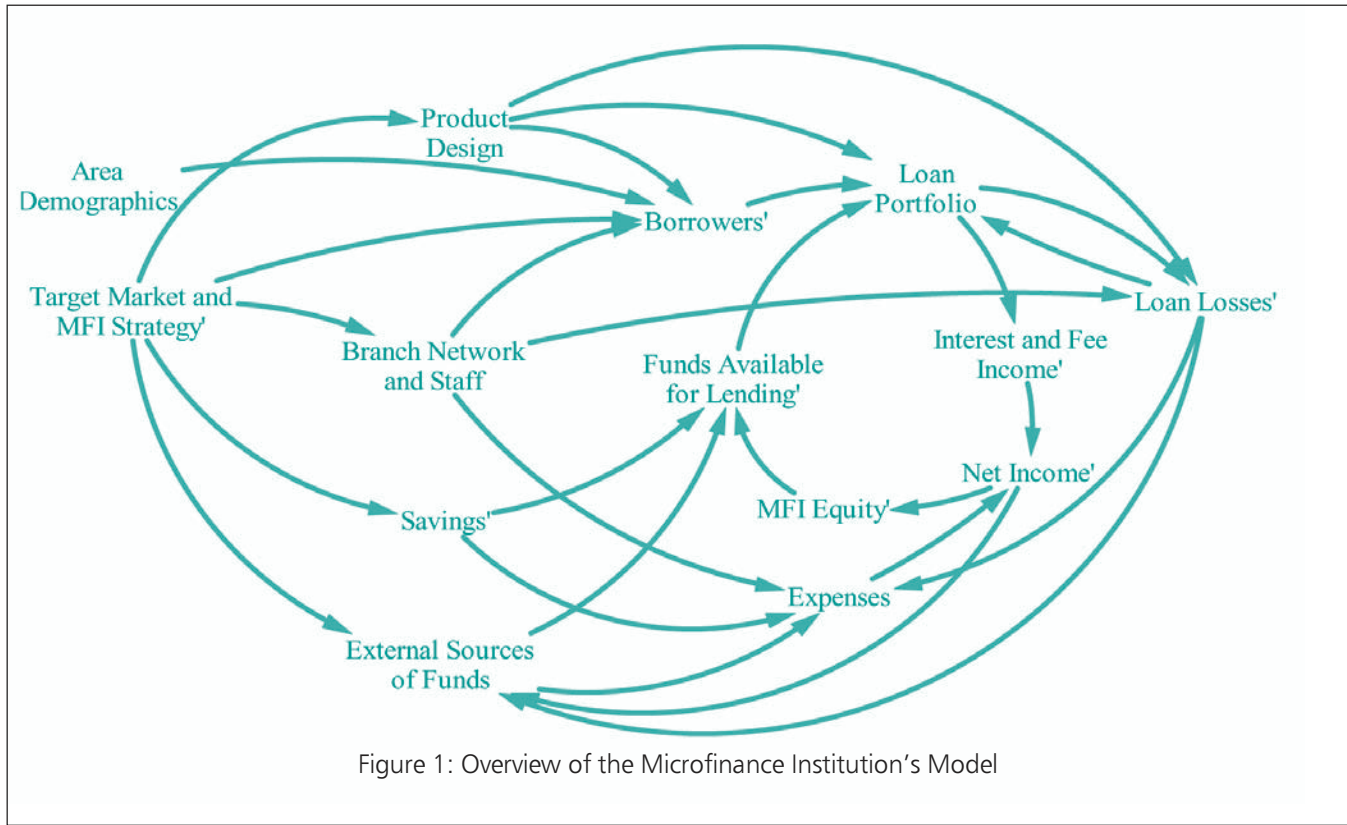
THE SIMULATION MODEL THAT POWERS SYMBANC™

Figure 1: Overview of the Microfinance Institution's Model

Figure 1 provides an overview of the model's structure. As shown in Figure 1, the number of borrowers attracted at each point in time is the result of:

- the MFI's strategy and how it defines its target market
- the area's demographics
- design of loan products (e.g., interest rate and payment terms; group, individual, or both) and their appeal to the target market
- numbers and experience of loan officers and staff and extent of the branch network.

The loan portfolio grows as new borrowers are attracted as long as enough funds are available from both internal (retained earnings and savings) and external sources (donors, commercial banks, and governmental revolving loan funds). The size of the loan portfolio over time depends on the number of borrowers, size of loans, distribution of borrowers across three stages in which loans grow by certain increments, and extent to which borrowers are able to repay their loans.

The model contains an elaborate set of factors that determines rates of delinquency and default, including:

- loan officer experience, incentives, and effort devoted to managing relationships with borrowers
- quality of the loan portfolio
- investment in information systems that can track delinquencies
- size of loans at each stage relative to average income of the target population

The model contains an elaborate set of factors that determines rates of delinquency and default

- conditions of loans such as collateral requirements, late payment penalties, and compulsory savings
- exogenous environmental factors such as crop failures and macroeconomic shocks.

The quality of the portfolio, in turn, depends on other factors such as the interest rate and size of loans. For example, borrowers seeking large loans and willing to pay high interest rates are assumed to be poor credit risks that commercial banks and other sources of credit turned down.

The size of the portfolio and design of loan products determine the revenue stream and, in turn, the MFI's net income. Expenses include the costs of staff and operating the branch network, loan losses, interest costs on funds borrowed from external sources, and interest paid on savings. Loan losses reflect the size and quality of the loan portfolio, investments in information systems, and attention of loan officers to preventing and managing delinquent loans. Net income over time determines the value of equity in the MFI and the willingness of external agencies to make funds available for lending.

The MFI's ability to attract funds from external sources depends on its profitability (greater than 2.5% of revenue), the equity it has accumulated (equal to 12% or more of loans outstanding), and the rate of loan defaults it experiences (limited to 4%). Elements of the MFI's strategy such as its decision to serve women exclusively or people in lower income groups will also give it greater access to donor funds with more favorable terms, as long as its loan default rate remains below 5%. The MFI can also raise additional equity after several years of operations if it is profitable and can limit its loan losses.

SYMBANC™'S USER INTERFACE AND HOW THE GAME IS PLAYED

Users take their MFI from start-up through 8-year simulations. They begin by choosing the characteristics of the target market that then remain the same for the remainder of the simulation. They also select an initial set of features for the loan products they offer and make other decisions regarding hiring and branch office expansion, whether to accept savings and what interest rates to offer, and how much to invest in things such as information systems. As users move through a simulation, they have access to a rich array of information about the MFI's borrower population and loan portfolio and its financial performance. Based on this information, they can alter their decisions as often as monthly, though they more typically might change things on a yearly basis. Simulations continue for the full 8-year period unless the MFI runs out of money.

The simulator's interface has one set of screens for inputting decisions and another set that displays results as a simulation proceeds. Figure 2, for example, shows the options users have available in designing their loan products. A wide array of parameters includes size and term of loans, interest rates, frequency of payment, and other features such as collateral requirements, compulsory savings, built-in penalties for late payment, and whether interest payments are calculated on a straight interest or declining balance basis. There are similar decision screens for defining the target market, hiring staff and expanding the size of the branch network, making information system investments, offering savings accounts, and selecting sources of external funding. Figure 3 shows a results screen with profit and loss information as both a financial statement and in graphical form. The results screens have sets of buttons at the bottom that allow users to "drill down" for more detail on the variables that drive MFI performance.

> They begin by choosing the characteristics of the target market that then remain the same for the remainder of the simulation

All decisions about product design have tradeoffs for the user. High interest rates, for example, bring greater revenues but may make the loans unattractive to everyone except those who are a poor credit risk and cannot obtain loans elsewhere. Large loans may also generate more income for the MFI but can be more difficult for the borrower to repay and lead to larger loan losses. (The screen displays the size of the monthly payments relative to average income of the target population.) Long terms may reduce the monthly payment but may make the loan's overall cost too high. Collateral requirements may reduce the likelihood
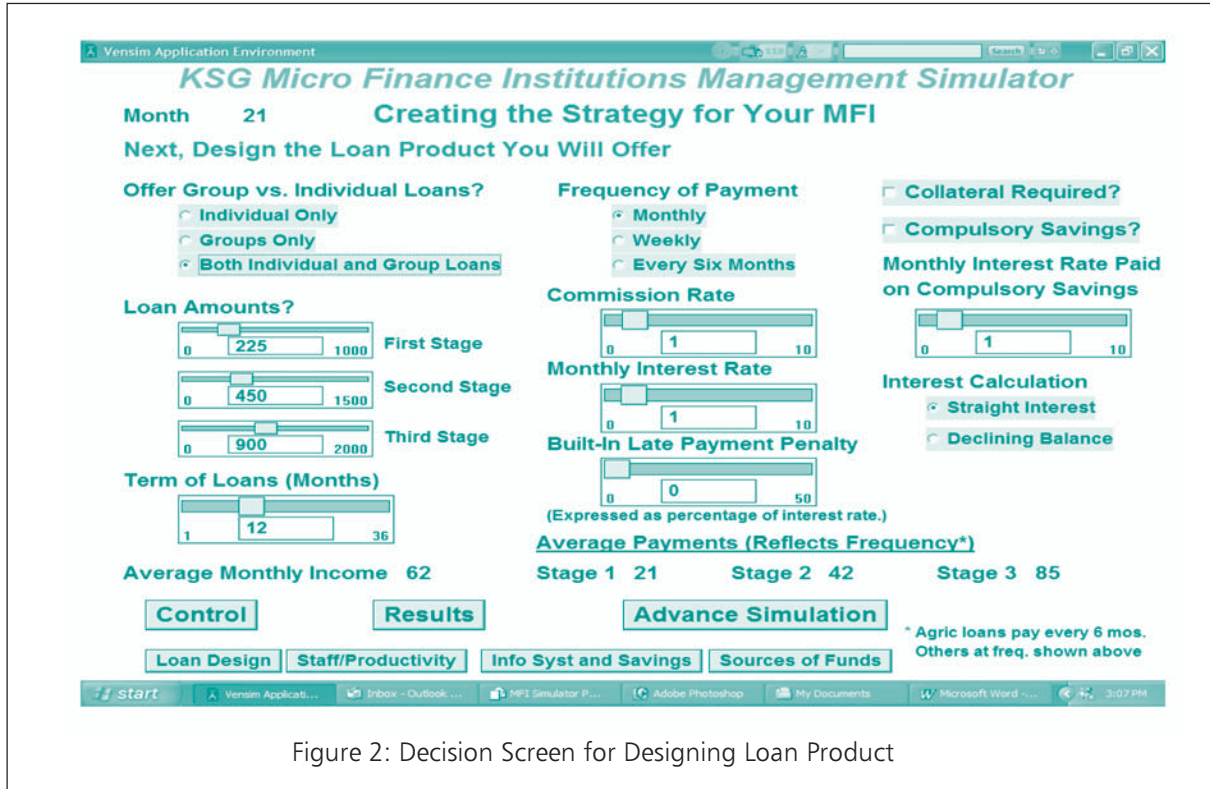
KSG Micro Finance Institutions Management Simulator

Month   21   **Creating the Strategy for Your MFI**

Next, Design the Loan Product You Will Offer

Offer Group vs. Individual Loans?
- Individual Only
- Groups Only
- Both Individual and Group Loans

Frequency of Payment
- Monthly
- Weekly
- Every Six Months

☐ **Collateral Required?**

☐ **Compulsory Savings?**

Loan Amounts?

0	225	1000	First Stage
0	450	1500	Second Stage
0	900	2000	Third Stage

Commission Rate

0 | 1 | 10

Monthly Interest Rate Paid on Compulsory Savings

0 | 1 | 10

Monthly Interest Rate

0 | 1 | 10

Interest Calculation
- Straight Interest
- Declining Balance

Term of Loans (Months)

1 | 12 | 36

Built-In Late Payment Penalty

0 | 0 | 50

(Expressed as percentage of interest rate.)

Average Payments (Reflects Frequency*)

Average Monthly Income 62   Stage 1 21   Stage 2 42   Stage 3 85

| Control | | Results | | Advance Simulation |

* Agric loans pay every 6 mos.
Others at freq. shown above

| Loan Design | Staff/Productivity | Info Syst and Savings | Sources of Funds |

start | Vensim Applicati... | Inbox - Outlook ... | MFI Simulator P... | Adobe Photoshop | My Documents | Microsoft Word -... | 3:07 PM

Figure 2: Decision Screen for Designing Loan Product

KSG Micro Finance Institutions Management Simulator

Month   21   **Tracking MFI Performance** | Load/Unload Runs |

Profit and Loss Statement

Revenues

Loan Interest	1012
Commissions and Other Fees	112
Interest on Invested Funds	0
Total	**1124**

Expenses

Salaries	831
Non-Salary Overhead	415
Loan Losses	62
Interest Paid to Funders	530
Interest Credited to Savings	0
Total	**1838**

Revenue and Expense

2,000
1,500
1,000
500
0

0 12 24 36 48 60 72 84 96
Time (Month)

Revenue : test
Expense : test

Net Income   -714

| Balance Sheet |

| Decisions | Stop | Advance Simulation | Control |

| Revenue | Applicants and Borrowers | Expense and Staffing | Loan Loss | Savings and Funding |

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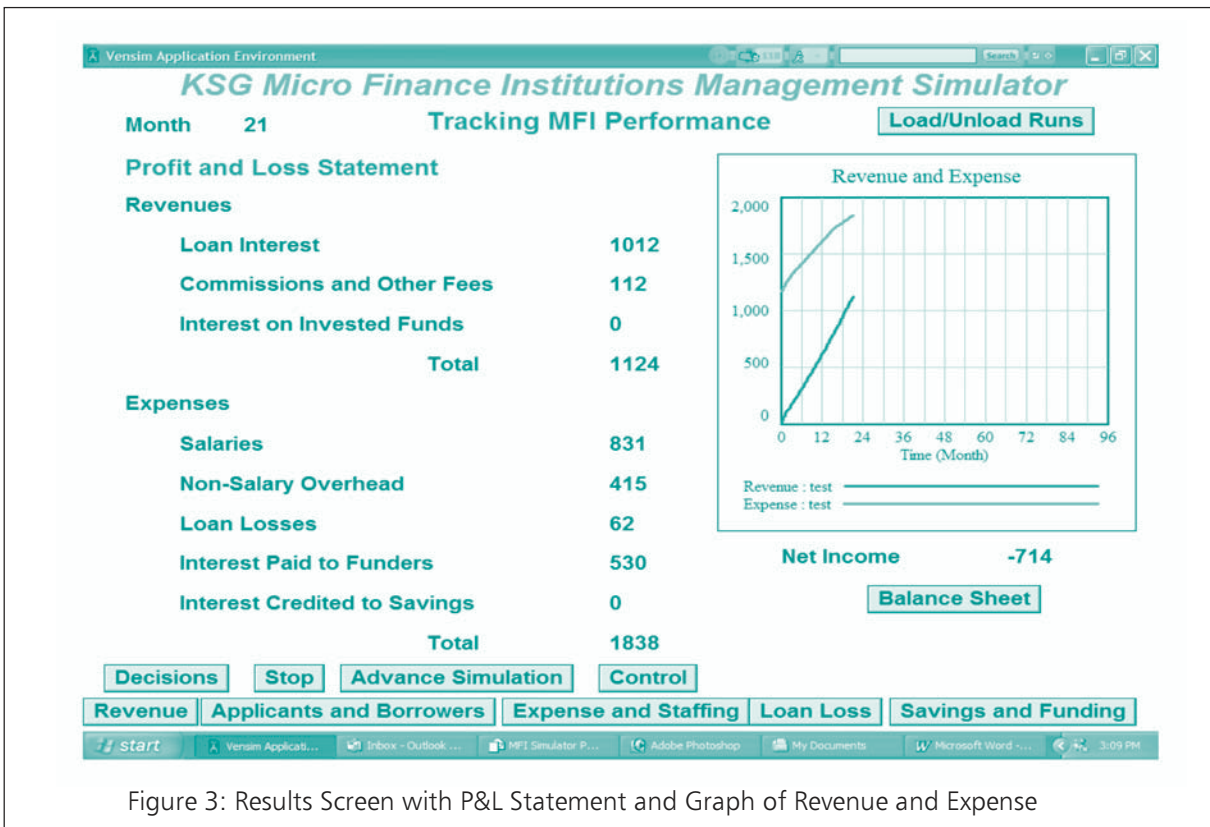
Figure 3: Results Screen with P&L Statement and Graph of Revenue and Expense

Users may take a number of simulations for them to figure out the right set of loan characteristics for the target population they have selected

of default but make the loans less attractive to potential borrowers as well as create an additional administrative burden for loan officers. Users may take a number of simulations for them to figure out the right set of loan characteristics for the target population they have selected.

The simulator also has several built-in scenarios to test the mettle of its users. The user (or instructor) can select one or more scenarios that include a limitation on available funds or various combinations of economic shocks that affect borrowers' ability to repay.

LESSONS STUDENTS LEARN FROM SYMBANC™
The lessons students can learn from SymBanc™ are summarized as follows:

- There are characteristic ways of failing such as growth outrunning capital and pursuing high volume at the expense of profit and building equity.
- There is no single right answer; instead, there are multiple ways to succeed depending on objectives.
- Strategies do require internal consistency—the right combinations of target market, product design, staffing and branch expansion, and funding sources.

- Good strategies under some circumstances may not survive economic shocks.

Table (Overview of Results on p. 14) shows some typical strategies users might follow with SymBanc™ and the results they would observe.

EXPERIENCE WITH SYMBANC™ AND FUTURE DEVELOPMENT
Participants of the FIPED course described earlier used the simulator in several exercises and generally found it to be a helpful aid for thinking about MFI strategy and exploring the strategic options open to MFIs. Use of the simulator by course participants, mostly career people already working in or with MFIs, also provided ideas on how to improve it for future use.

Initial feedback has already led to several improvements, including:

- improvements in the interface that give users more information to support decision making and make the simulator more straightforward to use
- a capability that enables users to output detailed results to an Excel spreadsheet

OVERVIEW OF RESULTS

STRATEGY	IMPLEMENTATION	RESULTS
A. Common Mistakes an MFI Might Make		
1. Low Income, More Donor Money	Target low-income population to get more donor money, but insist that borrowers take large loans to grow portfolio rapidly.	Attracts only a limited number of borrowers and experiences high default rate among those who do borrow; runs out of cash after 60 months.
2. Low Price, High Volume	Grow borrower population rapidly by charging low interest rate and going after entire market, not just low-income borrowers.	Attracts a greater number of borrowers, but cannot meet donors' profitability standard because of low interest rate.
3. High Growth	Charge competitive rate to grow gradually; build on initial success by drawing additional funds from donors and pursuing rapid branch expansion.	Rapid growth in borrowers, low default rate, and high profitability produce early break-even. But accelerated branch expansion keeps MFI from building equity required by donors and results in the MFI's running out of cash.
B. Growth Strategy That Works, but is Vulnerable		
4. Medium Growth	Same strategy as in 3, but delay branch expansion until equity meets donors' requirements.	Delaying branch expansion slows early growth in borrowers but permits MFI to build equity, meet capital adequacy standard, and draw on additional donor funds.
5. Medium Growth with Crisis	Same strategy as in 4, but simulated economic shocks cause new applications to drop and default rates to increase.	Economic shocks produce high default rate that makes additional donor funds unavailable; MFI runs out of cash.
C. Different Ways to Succeed		
6. Modest Growth, High Profit	Limited branch expansion allows less reliance on external funding.	Limited branch network attracts fewer borrowers, but enables MFI to be highly profitable and build greater equity.
7. Lower Income Sustainable	Focus on lower-income population with products (smaller loan sizes, longer terms, and higher interest rates) that help ensure repayment and higher profitability.	Properly designed products enable focus on lower-income groups to be profitable, even with slower growth than in medium growth strategy (4).
8. Lower Income Sustainable Strategy with Crisis	Same strategy as in 7, with simulated economic shocks.	Well-designed products for lower-income group enable MFI to survive economic shocks and become profitable again afterwards.

SymBanc™ continues to be a work in progress. Future versions of the simulator will include financial products such as line of credit lending to SMEs and consumer loans to civil servants and other salaried employees

• recalibration of some aspects of the model after exercise results revealed some behavior that was potentially unrealistic[3]

• adjustments to certain parameters such as productivity of loan officers and savings account productivity by branches.

Copies of the simulator have also been shared with the staffs of several international development agencies that are evaluating it.

SymBanc™ continues to be a work in progress. Future versions of the simulator will include financial products such as line of credit lending to SMEs and consumer loans to civil servants and other salaried employees. Future versions will also allow the simulated MFI to offer trade and farm loans simultaneously rather than separately as they are now. Additional planned enhancements include:

• expanded set of loan features and enabling loans at different stages to have different characteristics
• adding other types of savings products such as credit union style accounts
• the ability to serve urban or rural markets separately or together
• options to consider different forms of organization and governance
• a number of enhancements to the interface including the possibility of displaying results on maps to indicate performance by subregions
• a greater variety of market and regulatory environments
• more elaborate reflection of the country's macroeconomic

environment and its effects on the MFI and its customers
• scripted scenarios including those that start with an existing MFI (rather than a start-up situation) moving from a subsidized to self-sustaining operation
• Multiuser version for network and internet use
• eventually creating a hybrid model in which certain agent-based features are added to reflect behavior of individual applicants and borrowers.

ENDNOTES

[1] SymBanc™ was financed with a grant from the Harvard University Provost's Fund for Instructional Technology, established to encourage innovation in teaching through the creative application of information technology.

[2] For more information on FIPED, see http://ksgexecprogram.harvard.edu/ProgramList.aspx.

[3] Examples of unrealistic behavior included profitable operation with high cost loans that potential borrowers would normally reject in the real world.

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