PROSPECTS FOR A REFORMED VOTER REGISTRATION SYSTEM IN YEMEN

International Foundation for Election Systems

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Table of Contents

1 - Executive Summary

This report presents the findings of a technical diagnosis mission conducted by the "International Foundation for Elections Systems" (IFES) of the voter registration system of Yemen.

The mission was carried out over a two-week period of time, from 26 June through 7 July 2001, by a team comprised of Michael Yard, IFES Computerized Voter Registries Expert and Antonio Spinelli, IFES/Yemen Project Manager. During this period, the IFES team met with a number of senior officials of the Yemeni Supreme Elections Committee (SEC), political parties leaders, senior Government officials, members of Parliament, officials from the Central Statistical Organization (CSO) and from the Civil Registry Department of the Ministry of Interior, members of Yemeni civic society organizations and representatives of the international community involved in promoting the development and strengthening of Yemen's democratic process.

The main objectives of this voter registration diagnosis are:

- To provide an evaluation of the current voter registration process as conducted by the SEC in the past elections.
- To develop a realistic set of options for the creation of a new accurate register of voters that would include all eligible voters for the next Parliamentary and Local elections scheduled for April 2003.
- To evaluate these options and the possibility to deliver an accurate voters' list in the given timeframe.
- Finally, to offer recommendations for possible improvements and feasible alternatives as to which option presents the most realistic, sustainable and cost-effective solution for Yemen.

It is hoped that the IFES assessment, the recommendations and the suggested improvements to the voter registration system herein contained can serve as a starting point for the SEC to move towards the accomplishment of an efficient voter registration process to be implemented for the 2003 elections.

Background

The initial registration of voters in Yemen was conducted in 1992, creating a voters roll of 2.7 million out of an estimated 6.9 million eligible voters. The list was updated in 1996, when 1.9 million new voters were added, an increase of 58%. This registration was plagued by problems and irregularities, due to a great extent to a reduction in the number of registration centers from the 2,000 centers used in 1992 down to 301 centers in 1996. In 1999, the list was again updated, adding approximately another 1 million voters, bringing the total to 5.6 million. During these exercises, the registration was always done under severe time constraints, which resulted in many inaccuracies in data entry. There have also been many claims of duplicate registrations, both accidental and intentional.

Problems

The process of registration has had the following problems:

- The procedure for compiling, posting and correcting the preliminary voter register is complex, laborious and error-prone.
- There is no unique identifier to aid in identifying duplicate registrations, and no adequate legal procedure for administrative decision to remove them once they are identified.
- There have been a number of alterations of the register aimed at cleaning up the lists, but without any audit trail to show what changes were made, and under what authority.

- Statistical analysis of the register has shown wide discrepancies between the demographic makeup of registered voters as compared to the general population reflected in the Central Statistical Organization.
- It is possible for voters to choose between three possible voting domiciles, without any documentary evidence required to substantiate eligibility in the chosen domicile.
- The election law is currently being rewritten, with wide-ranging implications in requirements for the voter registration process.
- The percentage of voters reflected on the voters' list is very low, representing just over 50% of the eligible electorate.
- Applicable laws require re-drawing of the electoral boundaries prior to the 2003 Parliamentary and Local elections. The current register does not provide a basis for drawing these boundaries, nor the means of assigning electors to the appropriate constituencies.
- The technology used to enter data and to track changes was inadequate, further compounding the inaccuracies introduced by the registration process.

Options

Yemen has three options for transforming the current voter register into one that meets both the expectations of the political parties and the voters, and objective international standards:

- Revision of the existing voter register.
- Using the Civil Registry Project as the basis for a new voter registry.
- Conducting a new voter registration exercise.

Recommendation

After a careful evaluation of the options, it is the opinion of the assessment team that the Supreme Election Commission of Yemen ought to conduct a new voter registration exercise. The current register is so defective and elicits so little confidence from the stakeholders in the electoral process as to make any attempt to clean it a futile process. The Civil Registry Project, while holding great promise for the long-term, is in its infancy and requires such significant nation-wide expansion of telecommunication infrastructure that it ought to be considered experimental at this stage. Reliance on this project as the basis for a voter registration would put the conduct of 2003 parliamentary and local elections at risk.

The assessment team has a number of recommendations for the conduct of a new registration exercise. During the registration, a voter ID card bearing a unique voter identification number should be issued as proof of registration. The unique identifier can be used to facilitate future updates to the register and also ease the possible future integration of the voter register with the civil registry. The SEC should establish an adequate number of registration centers, roughly 2,000, ideally using the locations of previous polling stations. Data entry should be done using Optical Mark Recognition (OMR), a technology that has proven highly successful in a number of voter registrations around the world, and one that is much more accurate than manual keyboard entry of data. The body of this assessment report contains a number of additional specific suggestions concerning legal, procedural, political, technological, and public information issues, conducive to a successful voter registration exercise.

This voter registration assessment is part of IFES ongoing election assistance program in Yemen. The program is funded by a grant from the **United States Agency for International Development (USAID)**.

2 - Acknowledgments

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SUPREME ELECTIONS COMMITTEE:

- Mr. Khaled Abdulaziz, Chairman of the Supreme Elections Committee
- Mr. Mansoor Saif, Commissioner - Chairman of the International Relations Department
- Mr. Ahmed Haidera, Commissioner - Chairman of the SEC Administrative Department
- Mr. Ali Saidi, Commissioner - Chairman of the SEC Legal Department
- Dr. Abdulwahab Al-Qadasi, Director General of the SEC International Relations Department
- Brigadier Ali Salah, Director General - Head of the SEC Operations Room Mr. Sultan SEC
- Eng. Salah Al-Saidi, Deputy Director General of the SEC International Relations Department
- Mr. Wajdi Al-Saqqaf – Information Technology Department of the SEC
- Mr. Mohammed Hassan, Director General of the Computer Section of the SEC
- Mr. Hussein Saidi, Deputy Director of Technical Department of the SEC
- Mr. Ahmed Bagalagil, SEC Advisor on Legal Affairs
- Mr. Naser Al-Shelali, Computer Section of the SEC
- Mr. Soheil, Al-Qahm, Director General – Information Technology Department of the SEC
- Ms. Ahlam Al-Ba'adani, Data Entry Department of the SEC

POLITICAL PARTIES:

- Sheik Sultan Al-Barakani, MP - Head of General People Congress (GPC) party Bloc in Parliament
- Dr. Mohammed Al-Qubaty, Chairman of the Political and Foreign Relations Department of GPC Party
- Mr. Sheikan Hibshi, head of the Technical Office of Islah Party
- Mr. Mohammed Naji Allaw, MP - Islah Party
- Mr. Abdul Ghani Al-Qader, General Secretary of the Public Bureau of the Socialist Party
- Mr. Ali Saif Hassan, Member of the Central Committee of the Nasserite Party

INTERNATIONAL DIPLOMATIC COMMUNITY:

- Mr. Steven Walker, Chief Political Officer, U.S. Embassy Sana'a
- Mr. Charles Heatly, Political Secretary - British Embassy
- Mrs. Djoeke Koekkoek, First Secretary of the Royal Netherlands Embassy
- Mr. Can Oztas, Political Officer of the Turkish Embassy
- Mr. Matthias Kiesler, Deputy Head of Mission, Embassy of Germany
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CIVIC SOCIETY ORGANIZATIONS:

- Mr. Abdul Majid Al-Fahed, Director of the Civic Democratic Foundation (CDF)
- Mr. Ahmed Al-Soufi, Director of Yemeni Institute for the Development of Democracy (YIDD)

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NATIONAL DEMOCRATIC INSTITUTE:

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OTHERS:

- Mr. Joe Baxter, IFES Senior Election Advisor and Project Manager of IFES/Nigeria
- Mrs. Hanan Al-Medhwahi, Project Assistant - IFES/Yemen

3 - IFES Role in Yemen

The voter registration diagnosis mission and this resulting report are part of an ongoing collaboration between the SEC and IFES, to strengthen the Supreme Elections Committee as an institution and to support the electoral process in Yemen.

IFES is a non-profit, non-Governmental organization based in Washington, DC specializing in technical election assistance in emerging democracies. IFES was established in 1987 and since then it has expanded its activities in more than 100 countries worldwide. The Foundation currently maintains 25 field offices in the former Soviet Union, Asia, Latin America, Africa, and the Middle East.

IFES programs in Yemen began in 1993. In that year, IFES conducted a pre-election assessment of the preparations for the 1993 Parliamentary elections, and provided assistance to the SEC in pollworker training for these elections. In 1996-97, IFES conducted an assessment mission to examine the legal, administrative and organizational framework for the April 1997 Parliamentary elections. In cooperation with the SEC, IFES developed a cascade training system to prepare Yemen's 39,000 pollworkers. This involved training of core trainers, preparing training manuals and election day checklists for every polling station.

In March 1999, IFES and the newly appointed SEC, with funding from the UNDP Mission in Sana'a and support from the Canadian, British and Japanese governments, convened a high-level *Colloquium on the Development of Election Administration in Yemen*. The colloquium made a number of recommendations for improving the election administration in Yemen.

Following the colloquium, IFES conducted a comprehensive institutional assessment of the SEC's legal, administrative and organizational framework, and issued the *Management Study Report*. The study provided options to the SEC on how to improve its organizational framework and recommendations to help it become a permanent, professional election management institution.

In September 1999, after having established a field office in Sana'a and upon the SEC's acceptance of the management study, IFES helped the SEC implement the recommendations contained therein. IFES organized a series of training courses aimed at developing the professional competence of SEC mid-level and senior level staff. The courses covered a wide variety of subjects, including: general election administration (electoral planning, logistics, voter education, voter registration, etc.); project administration (budgeting, procurement, and financial reporting); public outreach (communication with NGOs and political parties); information technology (database and operating systems); management programs aimed at developing and strengthening managerial capacity of SEC directors general and their immediate senior managers; and English language training courses for the SEC staff.

In April 2000, IFES brought together the SEC members, department managers, local and central government officials in an *Executive Appraisal Seminar* to facilitate internal brainstorming and the identification of areas of concern in anticipation of the local council and parliamentary elections of February 2001. In 2000, IFES conducted three international study tours to India, Hungary and the U.S. These tours exposed SEC commissioners and directors general to the electoral systems and commissions of other countries.

In the course of the recent constitutional referendum and local council elections of February 2001, IFES assisted the SEC voter education efforts by designing and producing posters clarifying the steps in the voting process to voters, as well as charts and training aids that were employed by the SEC for its national pollworker training program.

In July 2001, at a time when the proposed amendments to the *General Elections & Referendum Law* were made public, IFES completed a technical assessment study on the amendments and on the existing elections law, providing comments

and suggestions on how to improve a wide range of legal provisions and technical procedures. The assessment was presented to Prime Minister Abdulqadir Ba-Jammal, as well as to the main political parties, senior government officials, members of parliament, NGO representatives and to international community representatives. It is currently being used by the "Election Law Working Group", specifically established to work on reforming the *General Elections & Referendum Law*.

4 - Basic Principles of a Voter Registration System

Why Register Voters?

When describing and evaluating alternative options for a voter registration system, the first step is to understand the purpose of creating a register of voters. "Voter registration" is a process which allows individuals to demonstrate their democratic right to vote and which ties these individuals to specific polling stations, where on election day this right will be exercised. The ability to exercise this democratic right to vote is based on the creation of a national register of voters (or voters' list) in which each eligible individual is registered to vote. Therefore, voter registration as a means of legitimizing qualified voters to vote is a fundamental component of an election.

The production and maintenance of the voter register is the ultimate goal of a registration process and also represents the most important task for an electoral authority. It is, in fact, the first important test of the administration of an election, where means and resources can be extensively tested, shortfalls can be identified and corrected, and gaps gradually filled. Voter registration and the maintenance of the voter register require more time and resources than any other activity undertaken by an election commission. Problems in the administration of the voter registration process or in the maintenance of the voter register directly impact all other aspects of election process.

Characteristics of an Effective Voter Registration System

Although no voter registration system is perfect, there are important characteristics to measure the effectiveness of a specific voter registration system. Therefore, in determining the system to be used for registering the eligible electorate in Yemen, the following fundamental criteria should be taken into careful consideration:

- ✓ FAIRNESS: That the system protects the voters' rights to enroll and vote, ensuring fairness and transparency of provisions (voter qualifications, residence requirements, means to lodge appeals and to challenge rejections, etc.) to avoid the exclusion of eligible voters from the voters' list.
- ✓ CONVENIENCE: That it facilitates the inclusion of all eligible voters in the voter register, making the process of registration convenient, affordable and equally accessible to all social strata of the population.
- ✓ TRANSPARENCY: That the appropriate safeguards for transparency are established through a fair and open process, involving all possible stakeholders and that it promotes transparency by ensuring civil society and political party participation and input in voter registration plans.
- ✓ CONSISTENCY: That the system is consistent with all provisions, regulations and steps of the electoral system and of the relevant legislation.
- ✓ ACCURACY OF DATA: That the voter register is accurate to the extent that the data provided by the voter is recorded accurately to enable the voter to be properly identified at the polling station. Misspelled names, wrong birth dates or gender, wrong addresses, and deceased citizens on the roll separately or together can cast doubt on the credibility of a registration system.
- ✓ CURRENCY OF DATA: That the time between registration and the date of the election is kept to the minimum, so that the information contained in the voter register is as up-to-date as possible.
- ✓ COMPLETENESS: That it includes all eligible voters, all groups population strata that may be more difficult to register because of their social, geographical, or economic characteristics.
- ✓ SECURITY: That the system is provided with adequate security features to prevent possible electoral fraud, irregularities, and unauthorized data manipulation. There system should contain the means to both resist changes to information from unauthorized individuals and to accurate track who, when, and where any changes to the database are made. Security and audit ability are both important in measuring the effectiveness of registration systems.

- ✓ FEASIBILITY & RESPONSIVENESS TO LOCAL CONDITIONS: That the system best responds to its needs, that is realistic and affordable in the context in which such a system must be used, developed and maintained. That the system has sufficient flexibility to enable it to function in different environments and circumstances (for example: rural/urban, male/female, literate/illiterate) and in the administrative framework that has to support it, taking into account the administrative capacity and infrastructures at central and district levels.
- ✓ SUSTAINABILITY: That the system is designed to be a sustainable foundation for future elections.
- ✓ TIMELY IMPLEMENTATION: That the system is provided with an adequate timeframe for an effective planning and timely implementation of all its phases. Voter registration is a fundamental component of an election and, as such, requires accurate planning and an adequate period of time for effective implementation. Compressing the completion of many aspects of the voter register into a limited period of time increases the likelihood of failure and fraud.

5 – The Current System for Voter Registration in Yemen

In order to understand how Yemen's voter registration system operates, a review of its legal basis is required. In conducting the assessment, the IFES team looked at the legislative framework of the Yemeni voter registration system as outlined in the *General Elections & Referendum Law*, and at a variety of other documents and reports concerning the registration process.

The team reviewed the structure and operations of the current voter registration system with SEC election officials from different departments; particular emphasis was given to how the actual process has been carried out. This assessment report is also based on the review of the recently proposed amendments to the *General Elections & Referendum Law.* (See the section "The Proposed Amendments to the General Elections Law" in this report.) The amendments, which were the subject of contentious discussions between the government, opposition parties and civic society organizations at the time the IFES assessment mission took place, are still not adopted into law.

Background of the Voter Registration Process

The system for the registration of voters in Yemen was initially established in 1992 to create a first voter register for the parliamentary elections of 1993. During that registration exercise, the SEC registered 2.7 million voters out of an estimated 6.9 million electorate.

The first update of the 1993 hand-written voter register was conducted three years later in mid-1996, in preparation for the 1997 parliamentary elections. The process was originally scheduled to last one month, but due to technical problems and low turnout it then became necessary to extend it for an additional month. According to the official figures during that registration exercise, 1.9 million new voters were registered, bringing the total number of registered voters to 4.6 million voters (an increase of 58% over 1993).

The 1996 registration process was marred. First, instead of having 2,000 registration centers as was the case in 1993, only 301 centers were established in 1996 at a rate of one center per electoral district. Second, the SEC made no provisions for cameras at the centers. At the same time voters were requested to bring two photos, which was problematic because of the lack of photographic studios in rural areas and the prohibitive cost of the photos for a wide segment of the population.

The voter register was once again updated in 1999, in connection with the country's first presidential election, reaching a total number of 5.6 million voters of approximately 8 million eligible voters. This population estimate was made in the general census of 1994. It should be noted that in 1999, as in 1996, inefficient voter registration procedures and the inaccuracy of the resulting voter register were a major point of contention between the SEC and the political parties.

Regrettably, the 2001 Local Elections & Referendum were held under incredible time constraints, making it impossible to accomplish the necessary update of the 1999 voter register. The elections were conducted based on the outdated 1999 voter register. This resulted in the disenfranchisement of a significant percentage of eligible electorate, including all voters who had been omitted in previous registration exercises and those voters who had attained voting age since 1999.

Legal Basis for Voter Registration

In reviewing the legal basis for the voter registration process, the team noticed some discrepancies between how the process is outlined in the elections law and how it is implemented.

The relevant Articles/Sections of the "General Elections & Referendum Law" referring to actual voter registration include:

Article	*Language*
Article (2) d	Voting domicile: The usual place of residence of a person or the place where this person has his/her main business or the place of residence of his/her family, even if the said person does not live in such a place.
Article (2) l	Electoral final register: The officially announced lists of eligible voters. These lists are final and irrevocable.
Article (3)	All citizens who have attained (18) complete calendar years are entitled to vote, except naturalized persons who have not completed the cool-off period required by Law following naturalization
Article (4) a	All voters shall exercise their voting rights in the constituency where they have their domicile address. If a person has more than one domicile address, s/he shall be required to decide the domicile where s/he wishes to vote. In any event, no person may be allowed to register in more than one electoral center. A voter may only be allowed to exercise his/her right to vote in the electoral center in which s/he is registered.
Article (4) b	A voter shall have the right to change his/her domicile address and opt for another one within his/her constituency all in accordance with applicable by-laws. No change of domicile address shall be allowed after the electoral final register is officially announced.
Article (7) a	Each constituency shall have a permanent voter register.
Article (7) b	Sub-committees shall be required to submit to the Main Committee the register of all eligible voters in each constituency to be incorporated in the permanent voter register of the said constituency. Register shall be duly signed by the head and members of each committee.
Article (8)	The voter register in each constituency shall include detailed listing of all citizens within each constituency, who on January 1st of each year, would have become lawfully eligible to exercise their voting rights and to have a domicile address.
Article (9)	By-laws shall specify voter registration procedures and the relevant forms. Elections officials may not be allowed to ignore and/or deny registration to any eligible voter unless such an act is legally justifiable.
Article (10)	Voter Registration Committees shall be responsible for verifying the identity of each voter to ensure that he/she has attained the legal age. This may be ascertained by means of: 1. An identity card or any other official document serving the same purpose 2. Testimony of two qualified witnesses in the event that no official document is available for such purposes[1].
Article (11) a	Periodic reviewing and updating of the voter register shall be carried out every two years. This process shall last for 30 days. Periodic reviewing should be made to ensure that the names of all citizens who are eligible to vote are included. In any event, no changes to the voter register shall be made after the official announcement of the general elections.
Article (11) b	Any periodic reviewing of voter register shall aim at: 1. Adding the names of persons who have become eligible for voting in accordance with the Law; 2. Adding the names of persons who were wrongfully omitted from previous register; 3. Deleting names of the deceased; 4. Deleting the names of persons who have lost their right to vote. Such deletions may have to be explained and justified; 5. Deleting all names that may have been wrongfully inserted. Such omissions may have to be explained and justified; 6. Deleting the names of persons who have changed their domicile addresses and adding new registrations to the voter register at constituency level.
Article (12) a	Official copies of voter register for each constituency endorsed by the Head of the Main Committee shall be posted in designated areas for five (5) days from the day marking the end of the periodic reviewing process of voter register. Political parties and organizations shall have the right to request copies of voter register within the time limit allocated for such requests.

[1] The provision of having two witnesses testifying for a voter with no official documents was abolished during the last Local elections and constitutional referendum, although on election day there was widespread confusion on this procedure in the polling stations.

Article	*Language*
Article (12) b	Each citizen residing in any constituency is entitled to request the Main Committee to enter his/her name in the voter register, had that been wrongfully omitted or deleted. Each registered voter shall have the right to demand the insertion of any name which may have been wrongfully omitted or the deletion of any name which may have been wrongfully inserted. In such instances, applications should be presented to the offices of the committee in charge of reviewing voter registration lists within (15) days from the day marking the official publication of the voter register. Each application shall be recorded against a receipt in a special register marking the filing date for each request and/or application. Each voter shall be entitled to examine such register.
Article (13) a	Applications for addition and deletion (referred to in the Article cited above) shall be dealt with the following day. Final decisions shall be reached within (5) days from the day following the deadline for filing such applications and/or requests. The Reviewing Committee of Voter Register may have an audience with the applicant and the other person involved in each case and may undertake all investigations and enquiries which are deemed appropriate by the said Committee.
Article (13) b	Decisions taken by the Committee cited above shall be posted in designated areas as detailed in Article (12) hereof and for five consecutive days from the date such decisions are being announced
Article (14) a	Each eligible voter from any constituency shall be entitled to contest and appeal the decisions taken by the Reviewing Committee of Voter Register. Such contests and/or appeals may be presented before a Court of First Instance with subject-matter jurisdiction within (5) days following the announcement of the Reviewing Committee's decisions. In any event, each case shall be decided upon by Court independently. The Court may up-hold the contest by ordering amendment of voter register either by addition or deletion of names or it may otherwise overturn such contests. Courts shall start dealing with contests one day following the beginning of the review and appeal period. The court's verdicts shall be announced within (15) days from the deadline for appeals and/or contests to be filed. A copy of court verdicts shall be forwarded to the Main Committee and to concerned contestant(s). The Main Committee shall be required to post all court verdicts in the designated areas specified in Article (12) of this Law. Court verdicts shall be posted for (5) consecutive days following the announcement of court rulings.
Article (14) b	Every eligible voter as well as the representative of the Public Prosecutor's Office in any constituency shall be entitled to contest the rulings of the Court of First Instance by filing an appeal to any judge appointed by the Head of the Court of Appeals in any Governorate within (10) days following the deadline for such appeals to be filed. If need arises, several judges may be delegated to look into such appeals in various constituencies. Court rulings in such instances shall be final and irrevocable and shall be announced within (20) days from the deadline for such appeals to be filed. Court rulings shall be forwarded to each individual contestant and to the concerned Supervisory Committee which in turn shall be required to furnish the Main Committee with copies of these rulings no later than (24) hours following their receipt.
Article (15) a	The Main Committee shall be required to affect changes in the voter register according to final and irrevocable court rulings. No changes shall be allowed in voter register following the call for electorate to vote. Once such a call is issued voter register shall be deemed final.
Article (15) b	Voters' final register is indisputable. No person shall be allowed to vote in any general election and/or referendum unless that person's name is duly entered in voters' final register.
Article (15) c	In exceptional circumstances where elections and/or referendum are called upon in short notice, the final voters' register used in any recent election shall be deemed appropriate and binding for election and referendum purposes.
Article (16)	Five copies of voter register shall be issued for each constituency. Each copy shall be duly signed by the Head of the Main Committee and two other committee members. A copy of voter register shall be deposited with the following bodies: (a) the designated Elections Committee at the constituency level; (b) the Supreme Elections Committee; (c) the Parliament's Secretariat; (d) the Supreme Court; (e) the Supreme Committee's Chapter at the Governorate level.
Article (17) a	Each citizen whose name is entered in voter register shall be given a temporary certificate to that effect. Such a certificate shall be replaced by a permanent Voter Registration Card once his/her registration becomes final.
Article (17) b	The Voter Registration Card is a personal document to be used exclusively for elections and referendum purposes and may not be used by any other person except the holder.
Article (17) c	The Voter Registration Card of any person may be nullified by a court order if such a person becomes ineligible for voting. Duplicate copies of court orders to that effect shall be reported to the Supreme Committee.
Article (17) d	Every eligible voter shall have the right to request a replacement card if his/her registration card is lost and/or destroyed. Such requests shall be directed to the appropriate committee no later than a week

Article	Language
	before the balloting date. Replacement cards shall be issued on the condition that the applicant's name is duly entered in the voter final register. By-laws shall specify detailed procedures in connection with these matters.
Article (26)	The Supreme Committee shall appoint supervisory committees for each Governorate. Each of these committees shall have its seat in each Governorate's capital and shall be responsible for overseeing the work of voter registration committees and other committees in charge of administering elections and referendum.

How does the Current Voter Registration System Work?

Under the current voter registration system the creation and updating of the voter register is implemented in various steps:

- STEP 1: FORMATION OF THE ELECTION COMMITTEES

  The *General Elections & Referendum Law* assigns to the SEC the responsibility for administering, organizing, coordinating and supervising the elections. The SEC is charged of appointing the following subordinate levels of election committees:

  1. The Supervisory Committees (established at governorate level);
  2. The Main Committees (at the constituency level);
  3. The Branch Committees (at election centers[2]); and
  4. The Ballot Box Committees (at the registration/polling station level).

- STEP 2: REGISTRATION OF VOTERS

  Once the SEC has established its subordinate level committees, the voter registration process begins. The elections law provides for voter registration to occur every two years, in January of the election year, for a period of 30 days; a period that was often extended. Voters establish their eligibility by presenting one of the official identity documents valid for the purpose of registration. According to the elections law, voters can "choose" the electoral constituency where they wish to register to vote, without being legally required to prove their residence in the chosen constituency. The law stipulates that the voter could register either in the constituency of current residence, place of origin, or place of work.

  During the registration period, voters are entered into a preliminary register on a daily basis. Upon registration, the voter receives acknowledgment from the registration official. In 1993, voters received their registration cards immediately. In 1996 and 1999, voters received official receipts of registration.

- STEP 3: EXHIBITION OF THE REGISTER TO PUBLIC

  Soon after the conclusion of the official registration period, the preliminary voter register is posted for public scrutiny for a 5-day exhibition period (this period has at times been extended to 10 days). During this time, voters are allowed to inspect the preliminary register and submit appeals for correction, inclusion or other changes.

- STEP 4: REVISION OF THE PRELIMINARY VOTER REGISTER

  At the end of the public exhibition period, and after the appeals have been adjudicated, the preliminary register is updated at the registration center according to the appeals received from the voters. Once such revision process is complete, the original voter register is manually reproduced in 3 additional copies[3]:

[2] One election center comprises several Polling Stations.

1. One copy is delivered to the Supreme Elections Committee in Sana'a.
2. One copy for the Supervisory Committees at governorate levels.
3. One copy for the Main Committees at the constituency level.
4. The last copy (presumably the original) is kept with the Branch Committee at the election center.

- STEP 5: CREATION OF THE FINAL VOTER REGISTER

  The information contained in the copy of the voter register received by the SEC is entered into a central database, thereby developing a computerized national voter register. Prior to the elections, a final register of voters is printed by the SEC and sent to all polling stations to be used on election day.

The Proposed Amendments to the General Elections Law

The timing of IFES' voter registration assessment mission in Yemen was critical. In fact, the mission coincided with the official introduction by the government of Yemen of a package of proposed amendments to the *General Elections & Referendum Law*. While the proposed amendments are still being debated, it is important to examine key changes that may affect voter registration and the future administration of elections as a whole. Highlights of the changes include:

- APPOINTMENT OF SEC MEMBERS

  In the current law, initial selection for the members of the SEC is made by parliament when it proposes the names of 15 candidates, seven of whom are then approved by the president of the republic. According to Article (19) of the proposed amendments, this selection/appointment process would be reversed. The president would propose the list of 15 candidates leaving the final selection to the authority of the parliament.

  Once the seven members are confirmed by parliament, the president is then empowered to appoint two additional members. Therefore, the new SEC would be composed of 9 members in total. Finally, the proposed law also authorizes the president to select and appoint the SEC chairman out of the nine members.

- COMPOSITION OF THE NEW SEC

  The SEC would undergo major changes in its composition, since the amended elections law would strictly require SEC members not to have political and/or party affiliations. It is therefore largely expected that an entirely new SEC will be appointed at the expiration of the 4-year mandate of the current one (in November 2001).

- TERM OF OFFICE OF THE NEW SEC

  Another change would result in the extension of the term of office of the new SEC. It would be extended from 4 to 6 years, to reflect the extension of the mandate of the parliament, in accordance with the ratifications following the recent constitutional referendum held in February 2001.

- DISMISSAL OF SEC MEMBERS

  The amended elections law would empower the president of the republic to "directly appoint a replacement for a Supreme Elections Committee member if a seat becomes vacant, or if substitution is deemed essential."

- CIVIL REGISTRY AND NEW NATIONAL ID

  In its package of proposed amendments to the elections law, the government of Yemen has outlined an ambitious project that would gradually lead to the establishment of a civil registry system as the basis for a new register of voters for the 2003 parliamentary and local council elections. This combined civil/voter registry

[3] There are discrepancies in the number of copies of the voter register between what is stipulated by Article (16) of the elections law (5 copies) and the process as described by the SEC (4 copies, including the original.) Additionally, according to the elections law, copies of the voter register have also to be delivered to the Secretariat of Parliament and to the Supreme Court.

system would aim at issuing a new national ID to the entire Yemeni population/electorate by April 2003. Citizens who apply and obtain the new national ID would be automatically enrolled into the register of voters. It is important to note that in the new draft of the elections law, the provision of issuing a voter card to the electorate has been abolished.

- PERIODIC REVIEW

  The amended elections law would prescribe that "periodic reviewing and up-dating of the voter register shall be carried out in January of every year."

6 - Problems with the Current Voter Registration System

Both the voter registration system and the resulting register of voters have suffered serious and cumulative shortcomings in the course of various elections held in Yemen from 1993 - when the current register was originally created - to the recent Local elections and the constitutional referendum held in early 2001. During these years, several attempts to solve the various problems and inadequacies of the existing register have been carried out by the SEC, which is statutorily responsible for the registration of voters. The implementation of those attempts to update the register was carried out by the Central Statistical Organization (CSO), which has the responsibility to undertake the data entry on behalf of the SEC.

The software used for entering the voters' personal details into the database incorrectly allowed incomplete data entries, and did not enable an immediate verification of voters who had been entered more than once. Multiple attempts at bringing the register up to date did not lead to a permanent and accountable solution to the problem. On the contrary, they seem to have compounded the problem and further eroded confidence in the present register. What had initially meant to correct register deficiencies did in fact result in confused procedures and perceptions of data manipulation. In addition, the fact that the correction procedures were conducted behind closed doors, in a non-transparent process, led to a widespread public doubts on the accuracy and legitimacy of the "corrected" voter register.

The flaws of the voter register have legal, procedural and technological dimensions.

Legal and Procedural Issues

- GAPS IN THE COMPILATION OF THE PRELIMINARY REGISTER

  The procedure for compiling, posting and correcting the preliminary voter register is complex, laborious and error prone. This is likely one of the primary causes for the errors and inaccuracies contained in the existing voter register. As explained in the previous section of this report, the preliminary voter register is compiled by hand at the registration centers. At the end of the official registration period, the hand-written preliminary voter register is posted, and voters are given the opportunity to inspect it and submit necessary changes and corrections. Once the corrections are made, again by hand, the revised register is manually reproduced in multiple, supposedly identical, copies. One of these copies is delivered to SEC headquarters in Sana'a, where the data is manually entered into a central computerized database.

  This system is cumbersome. It involves too many manual transfers of the data, therefore increasing the likelihood of erroneous or incomplete entries. To date, voters do not have the opportunity to see and verify the data as it was entered into the computerized database.

- DUPLICATE REGISTRATIONS

  Political parties in the opposition and other stakeholders have often alleged widespread inaccuracies of voter registrations and the presence of duplicate and alien registrations in the existing voter register is a significant issue. The extent of the problem varies widely, ranging from a few thousand to over a million

duplicate registrations. All stakeholders, however, agree that a permanent solution to this problem must be urgently found ahead of the 2003 elections.

The current procedures for eliminating duplicates require submission of names during a period of claims and objections. This is a reasonable requirement for ensuring that no one can be removed from the voter register without due process. However, this procedure is ineffective and inadequate for cleaning up a register that undoubtedly contains a high number of duplicates.

To complicate matters further, there are no defined legal procedures for removing a duplicate entry once it is detected in the computerized database. No standard process has been developed for addressing a case whereby two entries with exactly the same data are detected (e.g. when a person has irrefutably registered more than once). It is unclear if one or both entries would be removed and which of the entries ought to be eliminated first.

- RANDOM ALTERATIONS OF THE VOTER REGISTER

  The existing voter register has been subject to several modifications aimed at eliminating duplicate names, invalid or incomplete entries. Reports from civic society organizations and political parties that monitored recent elections suggest that arbitrary alterations, which have raised the number of registered voters by several thousand entries, were conducted without officially opening the register to public scrutiny as required by law. IFES found no one who could explain the legal basis for those updates.

- OTHER INACCURACIES IN THE VOTER REGISTER

  Sample comparisons between the existing voter register and the data available at the Central Statistical Organization were studied by a local NGO. The findings show that in three governorates the male voter registration figures exceeded the total population of eligible voters. This discrepancy could be partly due to the provision in the *General Elections & Referendum Law* that permits voters to choose where to register among three possible voting domiciles, without having to prove their residence in the chosen constituency. This way, voters are given the opportunity to register in more than one center. At the same time, previous registrations were neither deleted nor detected by the computerized database, resulting in an inflation of voter registration figures.

- VOTING DOMICILE AND PROOF OF RESIDENCY

  The definition of "voting domicile" in the *General Elections & Referendum Law* is too broad and open to interpretation. In the current system, a voter has the discretion to choose among three different voting domiciles:

  (1) The usual place of residence;
  (2) The place of work; or,
  (3) The place where the voter's family lives, even if the said person does not effectively live there.

  The prospect of multiple registrations raises serious concerns about both unintentional and fraudulent data manipulation. The law does not require voters to produce any proof of residency or employment in the voter's registration constituency. There are no safeguards to prevent someone from registering in one or more centers beyond the person's verbal claim of residency. Under this provision, a voter can conceivably register at various locations. As a result, the integrity and accuracy of the voter register is easily eroded.

  While the assessment team understands the argument for permitting voters to register at the place of their choice, the legal provision can have a detrimental impact on the quality of a new voter register and on the

credibility of a reformed voter registration system [4]. Reforms to the voter registration system must take into account the advantages and disadvantages of such arrangements. Safeguards need then to be put in place to ensure the integrity of the system.

- LACK OF SEC CONTROL OVER THE ELECTION BUDGET

  Despite the *General Elections & Referendum Law* provision that the SEC "shall be financially and administratively independent," the SEC has not so far taken direct control over the election budget. The SEC has a central budget account controlled by the president of the republic. The financial procedures demanded by this arrangement are cumbersome, causing procedural delays and lack of planning. Procedures for compiling the voter register, registering candidates, producing ballots, and distributing election materials have all been impacted by this delay in releasing the necessary funds.

- LIMITED VOTER TURNOUT AND AWARENESS

  Citizen participation in registration and actual voter turnout are low. As an example, in 1997, out of an estimated electorate of 7 million voters, 4.6 million voters were registered and only 2.8 million voted. The low percentage of participation in the latest voter registration is attributed to inadequate public information, poor understanding among Yemeni citizens of the significance of registering to vote, an insufficient number of registration centers, the requirement for voters to bring two photos at their own cost, and – in some cases – low confidence in the electoral process. There appears to be a general consensus among all the political parties that immediate and comprehensive action will have to be taken by the SEC and political parties to increase voter turnout.

- INACCURATE ELECTORAL BOUNDARIES

  Yemen's voter registration system suffers from outdated demarcation of the electoral boundaries. The current demarcation of the boundaries of the 301 parliamentary constituencies is outdated and does not reflect, with accuracy, demographic trends of the past eight years. In 2003, both the parliamentary and local elections are to be held simultaneously requiring a clear definition of the administrative and parliamentary boundaries. The Government of Yemen is looking into the possibility of redrawing the country's administrative boundaries so that they match with those of the 301 parliamentary constituencies.

Technology Issues

- FAULTY PROCEDURES FOR DATA ENTRY

  The existing voter register was produced under extreme time constraints. As pointed out earlier in the report, it is probable that many errors were made by registration workers in the course of successive manual data collections. In addition, the practice has been that hand-written registration forms received by the SEC are commissioned to outside agencies for data entry. The fact that data entry clerks were paid based upon the number of registration forms processed, gave priority to processing the highest number of forms in the shortest amount of time, with little or no regard to accuracy.

- LACK OF SYSTEM ACCOUNTABILITY

  The voter registration database has no audit trail capability for tracking changes made to the information contained in the system. A transaction log is an important component of database security. The database administrator should have the ability to account for every change made in the database, showing who made the change, when it was made, and under what authority it was made.

[4] The "voting domicile" and the "proof of residency" issues must be addressed regardless what type of voter registration reform will be adopted for the 2003 elections.

7 - Analysis of Voter Registration Alternatives for Yemen

While free and fair elections do not necessarily ensure democracy, an accurate voter register plays a critical role in conferring legitimacy on the outcome of an election. Therefore, with a poor voter registration initiative, the process may lack the legitimacy and integrity that democratic elections are designed to confer on Governments. In Yemen, there appears to be common agreement between the SEC, the CSO, the Parliament, the political parties, the civic society organizations and the international donor community about the urgent need to establish a new and accurate register of voters for the next Parliamentary and Local elections. It is also widely recognized that most of the serious problems faced during the recent elections were due to the incorrect and outdated information contained in the existing voter register.

While in the long run there are a number of options available for establishing an effective and permanent system of voter registration in Yemen, the available time to adopt, plan, and implement a realistic voter registration solution for the April 2003 elections is extremely limited. **The assessment team recommends that absolute priority be given to the adoption of a realistic voter registration system for the creation of an accurate and comprehensive register of voters for the 2003 elections.** With this recommendation in mind, we describe in this section of the report three possible alternatives for a reformed voter registration system in Yemen, as well as an evaluation of their feasibility and an estimate of their costs.

Based on a careful evaluation of how well each of the three possible choices could meet the general criteria for an effective voter registration system (as previously examined in this report), the following three options were considered:

OPTION 1: REVISION OF THE EXISTING VOTER REGISTER
OPTION 2: USING THE CIVIL REGISTRY PROJECT AS BASIS FOR A NEW VOTER REGISTRY
OPTION 3: NEW VOTER REGISTRATION EXERCISE - ISSUANCE OF A NATIONAL VOTERS' CARD

OPTION 1: Revision of the Existing Voter Register

In theory, the current system of voter registration should work. Its legal basis is sound and contains the basic principles for the enrollment of all eligible citizens in the national register of voters. However, it is in practice that the system fails, for a variety of reasons and factors that have been mentioned earlier in this document (Section "6 - Problems with the Current Voter Registration System").

Option 1 of this assessment draws upon the basic principle that time and costs of a comprehensive revision and updating of the existing voter register would be significantly lower than those associated with the implementation of the other two options, a civil registry project or a new voter registration exercise. In fact, the process of revision and updating of a voter register is usually a fairly straightforward and simple exercise. The revision of a voter register is not a complete re-registration of the electorate. It is conducted to:

- Add to an existing list those who did not previously register.
- Include those who have attained voting age since the last registration.
- Include and remove those who have changed their voting domicile.
- Remove from the register unqualified (e.g. duplications) and deceased voters.
- Correct or update erroneous or incomplete information.

In ideal circumstances, this option should be implemented by a combination of different, but equally important, components, including the following activities:

- CONDUCT A PUBLIC REVISION OF THE EXISTING REGISTER

  The revision is generally conducted by printing and posting the existing voter register at the registration centers for an appropriate period of time, during which citizens are requested to: (a) inspect the register and check their names and other details; and (b) submit to registration workers requests for inclusion (if they have been omitted), for corrections (if the information in the register is erroneous or incomplete), or for deletion (if a voter in question is deceased – although this has to be supported by proper documentation – e.g. a certificate of death).

- PROMOTE AN ACTIVE CIVIC PARTICIPATION

  To be truly effective, such process of revision and updating heavily relies on an active participation by the population during the open review period for the register. In the Yemeni context, with a reluctant electorate, the revision process must be supported by a vigorous and encompassing public information campaign to encourage people to check their names on the register, and to make them fully aware as to the importance of this process. Such public information campaign should focus on two tiers of voter register reform: (a) voter registration as a part of a democratic and transparent election process and the citizen's role in that process; and (b) the voter as participant in reform of the voter register – and more specifically in the process of checking names on the register when it is posted. Plain-language voter education posters should be produced and be placed in all government buildings and other prominent locations (both in urban and rural areas) encouraging the Yemeni people to check the voter register and ensure that their name is there and is correct. These posters would remain in place for several months.

- IMPROVE THE CURRENT VOTER REGISTRATION SYSTEM AND PROCEDURES

  An important component of this option would be the introduction of necessary procedural amendments to improve the inadequacies of the current voter registration system, in order to prevent the same shortfalls from reoccurring in the future.

The current voter register could be revised by taking the following steps:

1. Plan the revision process well in advance and in detail, including the materials needed and a logistics plan for their delivery and collection to/from the registration centers.
2. Clearly identify the registration centers where the revision process will take place and assess the suitability of these locations (e.g. central locations of easy accessibility, etc.).
3. Make the process of inspecting the register convenient to voters by establishing a sufficient number of registration centers and ensure that the register is displayed for public inspection for an adequate period of time.
4. Put greater emphasis upon creating a well-defined set of procedures to be followed in the registration centers and to ensure that the established procedures are adhered to in a uniform manner throughout the country.
5. Institute a comprehensive training program for registration officials to guarantee full understanding and compliance with all established procedures.
6. Establish clear and plain-language forms to be handled by registration workers and to be used by voters for requesting corrections to the voter register (these include: forms to apply for new registration, forms to request corrections, to object unqualified voters who should not be in the register, or to report a deceased voter).
7. Increase the efforts to appoint locally recruited registration workers, with the objective to have representation of multiple political parties at every registration center.
8. Introduce in the elections law the requirement for voters to present identification documents that clearly and indisputably establish their identity and voting domicile.
9. Upgrade the current computerized database in order to increase the security of the system, its ability to detect multiple entries, and to significantly enhance the accuracy of data entry.
10. Define clear procedures for removal of duplicate entries once these are detected in the database.

Advantages of Option 1

- The multiple-step approach that this option entails, may allow a marginal reduction of the number of duplicate registrations in the existing voter register to a level that could lessen - to a certain extent - their impact on the proper administration of the elections.
- The main source of information - the existing register whether accurate or not - is ready to use and therefore its revision process could start in a relatively short period of time. Such reduced timeframe would make this option realistic – at least in terms of time – for the 2003 elections.
- Another important advantage of a revision of the existing voter register is certainly the limited cost and the relatively reduced effort that this process would require.
- This option could be implemented without introducing major changes in the elections law.

Disadvantages of Option 1

- The SEC and the CSO have already carried out previous attempts to solve the various problems of the voter register. All these attempts were unsuccessful, mainly because they have been difficult – if not impossible - to archive for systematic review and audit.
- A revision process of the existing register, while potentially effective in correcting some errors (misspelled names, incomplete data, omitted voters, etc.), will achieve limited results in discovering duplicate registration entries.
- Reports from civic society organizations suggest that arbitrary alterations of the number of several thousand registered voters were conducted without having officially opened the register to public inspection. Such irregularities make the existing voter register an untrustworthy source of data.
- The existing register is plagued with errors and the data is considered to be so inaccurate and outdated that any attempt of revision is likely to achieve “cosmetic” results. The most serious risk for this option is that – at the end

of the revision effort – the resulting voter register could still contain significant inaccuracies and this might call into question the legitimacy of the elections.

- Another risk to be considered is that a small percentage of voters may turn out to check their names. A revision of the voter register is a much less appealing exercise to voters than participating in a politically contested election, so it is likely that in the Yemeni context, few voters will go through the "trouble" of voluntarily visiting the registration stations to inspect the voter register.
- Because of the existing inaccuracies, the voter register does not have the confidence of the political parties, domestic NGOs and the Yemeni electorate. It is likely that any attempt to revise the existing information will not be an acceptable solution for the various stakeholders.

Costs of this Option

Compared to other systems, the cost of a revision and updating of the existing voter register is fairly low. Similarly, a slight improvement of the current voter registration system by the adoption of new standard procedures would require a limited investment. The cost of printing training materials and implementing a training program would be around US $000,000. The public information campaign would include the production of voter education posters, public service announcements (PSAs), stickers, billboards, and pamphlets. This would amount approximately to US $000,000.

The IT component – to upgrade the current computerized database of the SEC – would cost approximately US $89,100 of direct inputs.

ITEM	COST
Database Server (see specs in Section 12)	$ 44,550
Estimated Yemen Cost (US cost plus 25%)	$ 29,550
Microsoft SQL Server	$ 5,000
Database Consulting - 12 days (plus travel)	$ 10,000

Conclusion

Although this option appears to be cost-effective and easier to implement, it does not appear to be a feasible approach since it would neither provide an effective and permanent solution to the problem nor develop a credible voter register for the 2003 elections.

OPTION 2: Using the Civil Registry Project as Basis for a New Voter Registry

One of the main points in the proposed amendments to the "General Elections & Referendum Law" is the task assigned to the Department of the Civil Registry of the Ministry of Interior (DCR) to produce the new register of voters for the 2003 Parliamentary and Local Council elections. In conducting the voter registration diagnosis mission, the IFES team visited the Department of the Civil Registry. The team was given an impressive tour of the premises and was taken through each stage of the civil registration process.

The Civil Registry pilot project aims at providing every Yemeni citizen (who has attained the age of 18 or older) with a new national ID, which has high security features and a 10-year validity. According to the information gathered during the team's visit to the Civil Registry, the new ID card would gradually become necessary for a wide variety of purposes and necessary services (such as: elections, pension, driving permits, medical treatment, banking operations, etc.).

As far as voter registration is concerned, the government is planning to use the new database, which will be established by the Civil Registry, as the basis for creating an entirely new voter register for the 2003 elections. The Civil Registry pilot project started in mid-2000, initially with the establishment of one center located at the headquarters of the DCR, in the capital Sana'a. To date, the project has been expanded to the three Governorates of Sana'a, Aden and Hadhramout, whose centers and databases have all been connected by an advanced computer networking system.

The new national ID is being issued at the Department of the Civil Registry with the employment of a highly sophisticated technology solution. In addition to computers and digital cameras, the system employs the most popular "cutting-edge" technology solution for preventing duplicate registrations, the Automated Fingerprint Identification Systems (AFIS). The software digitizes the fingerprints of each registered citizen and compares them with those already present in the database. A duplicate entry is then detected by the system. A detailed overview of AFIS and other biometric systems is given later in this report.

The new national ID presents remarkable high-security features, two fingerprints, a bar-coded stripe, two holograms, a photo of the holder, the address, birth date, the parent's name and, very importantly, a unique national ID number for every citizen. This unique national number is composed by eleven digits, as shown in the diagram below:

0	1	2	3	1	2	3	4	5	6	7

- The first two digits indicate the **Governorate (01)**;
- The third digit indicates the **village (2)**;
- The forth one indicates the **holder's gender (3);** and
- The remaining **seven** digits indicate the **holder's personal code**.

Advantages of Option 2

- The main advantage of the Civil Registry project is that it would provide at the same time a new identity document for all Yemeni citizens and an accurate, secure and maintainable voter registration database for the SEC.

- It would also avoid the duplication of efforts, costs and resources of running a new voter registration campaign along with a long-term civil registration exercise.
- This option would provide – in the long run – a permanent solution to the voter registration problems that have been affecting the credibility of more than one election in Yemen.
- The current system is highly secure since it is designed to detect any attempt at multiple registration, theoretically, ensuring that each person can only register (and vote) once nationwide.
- Because of the legal requirement for every citizen of Yemen to register with the Civil Registry, upon the successful completion of the civil registration exercise, every eligible voter should have a national photo ID card that would be the sole requirement for qualifying to vote.
- By using the Civil Registry as the basis for a voter registry, a unique identification number for each citizen would allow an easy sharing of data between the Civil Registry, the voter registry and other governmental institutions.
- The Civil Registry system would greatly simplify the process of removing the deceased from the voter register. At the time of death, a death certificate is issued by the Department of the Civil Registry, therefore guaranteeing that every deceased person is removed from the voter registry. A monthly or quarterly list of deceased could be sent in electronic format from the Department of Civil Registry to the SEC, providing a legal and efficient method for purging the deceased from the voter register.

Disadvantages of Option 2

- The Civil Registry system is complex and highly costly. Its implementation in the low technology environment of Yemen poses unknown problems.
- The Civil Registry relies heavily upon the use of sophisticated and costly technology requiring the citizen to come to a centralized computer system, rather than allowing voter registration to be conducted at a location convenient to voters (e.g. village level). The last voter registration exercise encountered a great deal of domestic and international criticism because it was conducted at the constituency level, providing only 301 registration sites, as opposed to the 2,025 voter registration centers used in 1993.
- The highly sophisticated technology employed by the Civil Registry project implies that every registration center in the country will have to be provided with digital camera equipment, computers and AFIS scanners. In its current implementation, the Civil Registration process also requires that every registration site be networked back to the central database to allow the fingerprints to be compared with those of all other registrants. Aside from the high costs of this equipment, these devices will have to be powered. It is unlikely that in the near future either the necessary power source (regular electricity or generators) or the networking infrastructure will be available at the registration centers.
- It will be virtually impossible to issue the new national ID's to the entire electorate of Yemen in time for the 2003 elections. According to the most optimistic projections of the Director of the Civil Registry Department, if they had full cooperation of the SEC and a significant increase in funding (from the Government and the international donors), by April 2003, the Civil registry Department might hope to register between 40 and 50% of the population.
- The implementation of the Civil Registry project, as envisioned in the proposed amendments of the "General Elections & Referendum Law", presents several technical inconsistencies. In fact, according to the new law, it appears that in the 2003 elections voters will be allowed to vote with either the new ID card or any other official identity document already in their possession. Therefore, if the new register of voters will be created on the basis of the issuance of the new national ID, it is not clear how those voters wishing to vote with an old document will be included in the new register.
- Having the new national ID- a cost certainly beyond the economic means of a wide segment of the Yemeni population- it is expected that few will make the effort to apply for the new card, if they have to pay for it. After all, participation in the democratic process is a constitutional right and the Government of Yemen should take all reasonable steps to ensure the highest participation (e.g. by eliminating this cost and issuing the new ID card for free).

- Until now a large percentage of the Yemeni population does not possess any type of national ID card. It is unclear how the Civil Registry project could issue the new national ID to an extremely reluctant target by 2003. Additionally, if voters will be able to vote with either the new or any old ID, the number of citizens that will apply for the new national ID will be further reduced, if they can use a document that they already have.
- The new ID cards are issued at a central location with no relevance to the voting domicile. If by 2003 the expansion of the Civil Registry system will be limited to the 20 governorates, it will be a major task to assign each registered voter to his/ her own specific constituency/polling station.
- This option relies upon an effective coordination and a clear separation of responsibilities between the activities and programs of the SEC and those of the Civil Registry Department.

Costs of this Option

It is impossible to give more than a rough approximation of the cost of expanding the Civil Registry project without knowing the details of the licensing agreement between PrinTrac software and the government of Yemen. However, the following chart shows the lowest conceivable cost for hardware and software only, based upon licensing cost for a standalone database engine. This estimate does not include the cost of building a data network to connect the different locations, although it must be noted that the current communication capabilities are inadequate to support such a network.

1. EXPANSION OF CIVIL REGISTRY PROJECT TO 310 CONSTITUENCIES.

	Cost	*Quantity*	*Total*
Basic database server	$ 6,875	310	$ 2,131,250
Software	$ 5,000	310	$ 1,550,000
Total			**$ 3,681,250**

2. EXPANSION OF CIVIL REGISTRY TO 2,025 POLLING STATIONS

	Cost	*Quantity*	*Total*
Basic database server	$ 6,875	2,025	$ 13,921,875
Software	$ 5,000	2,025	$ 10,125,000
Total			**$ 24,046,875**

Conclusion

A number of factors suggest that the Civil Registry option - although the most desirable and definitive solution in the long run - offers no viable and immediate solutions to address the present voter registration problems in time for the next elections in 2003.

The Civil Registry exercise is still in its infancy, since - as of July 2001 – it has only four registration sites opened, with a total of 10,000 persons registered. Given the present infrastructures of Yemen, its population's distribution, the remoteness of some areas, the limited financial means available and the extensive human and material resources required by this ambitious option, it is not practical to expect that by 2003 the Civil Registry project will be able to expand itself to even the 301 constituencies level. As long as the goal of this exercise is limited to creating a central registry for purposes of citizen identification, the cost of failure is relatively small. The IFES team believes that the risks and obstacles involved in using the Civil Registry project as a basis for a voter registry do not make this a feasible approach at this time. The possibility of extending it in a full scale to the rest of the country for the 2003 elections is not realistic. Stretc.hing this system to create a register of voters for the next elections would provide a considerable pressure for its rushed expansion to the rest of the country, involving potential and unknown risks that would greatly increase the likelihood of failure of this experiment.

At this stage, the Civil Registry exercise must still be considered as experimental, it has not proven itself sufficiently to justify these added risks. However, it would be strongly advisable to continue its incremental expansion, considering at the same time the adoption of an alternative solution that would realistically address the critical and immediate voter registration needs for the 2003 elections in Yemen.

A practical alternative could be the implementation of a new voter registration campaign for the 2003 elections, designed to be compatible for future integration with the system and database of the Civil Registry.

OPTION 3: New Voter Registration Exercise - Issuance of a National Voters' Card

The third and last option of this assessment report consists in conducting a completely new voter registration exercise to register all eligible citizens, whereby a voter card will be issued to voters as proof of registration. A fresh registration exercise is usually adopted in developing countries to conduct a complete voter registration of the electorate for the first national elections. The voter register would then require only periodic updates. This option necessitates a new self-initiated registration, whereby voters voluntarily enroll themselves in registration centers established all around the country.

The following is a step-by-step, brief explanation of how the new system could work:

Step	*Description*
STEP 1:	Voter registration centers are established at the local administrative districts.
STEP 2:	In order to be registered, applicants must present one of the identity documents valid for the purpose of voting and evidence of residence within the boundaries of their electoral districts. A computer-readable application form is completed, the applicant's thumbprint is taken; the form is signed by the applicant.
STEP 3:	A photograph of the applicant is taken and attached to the completed registration form. A voter registration card, carrying a unique serial number corresponding to the completed application form, is completed, stamped, laminated and issued to the applicant.
STEP 4:	The registered voter leaves the station and the registration process continues on a daily basis.
STEP 5:	The completed forms are collected periodically from the branch committee and delivered to the main committee, which in turn hands them over to the supervisory committee (at the governorate level).
STEP 6:	At the end of the registration process the forms are scanned, at the governorate office, into a regional computerized database and preliminary voter registers are created. Electronic copies of the preliminary voter registers are printed and each returned to the appropriate branch committee, through the subordinate-level commissions. In addition, the preliminary voter registers are also made available to the political parties who request them (possibly on a CD-Rom).
STEP 7:	The computer-generated preliminary voters' lists are displayed to the public at the registration center.
STEP 8:	The public exhibition period allows voters to check on the preliminary lists to verify that names and other details are correctly recorded. During this period, voters may file (1) **Appeals,** if they have registered but discovered that their names or other details were incorrect or incomplete; (2) **Claims,** if they have registered, but cannot find their names in the voters' list; (3) **Objections** to names of unqualified persons who have been included in the register.
STEP 9:	At the conclusion of the public exhibition period, all appeals, objections and claims are delivered to the supervisory committee in the governorate, via the upper-level committees.
STEP 10:	The updated voter registration information is scanned into the database[5] at governorate level on the basis of the appeals, objections and claims. A final voter register is created.
STEP 11:	The regional database of each governorate is networked with the national voter registration database of the SEC, which contains the voter registration data for the entire country.
STEP: 12	As prescribed by the election law, each governorate prints copies of the final voter register, which are then sent to the respective polling stations. Final lists are made available to individual voters, political parties, and civil society organizations.

It is critical to any voter registration process that proper consideration is given to all planning aspects and actual phases of the exercise, from the identification of the registration centers to the printing of the final register. Below is a summary of key recommendations, suggestions and alternatives that could make this process more efficient:

[5] Alternative technology systems for data entry are examined at the end of this report.

- A sufficient number of registration centers must be established throughout the country, possibly in the same locations where previous elections/voter registration exercises have been conducted.
- Ideally, each database at the governorate level (20) should be networked with the national voter registration database at the SEC, in such a way that all information in the governorates and in the central database is matched.
- A cost-effective alternative to a decentralized system of a national database that is networked with 20 regional databases at governorate level, could consist of a centralized system of a national database and scanners at SEC headquarters. In this system, registration forms collected from the 20 governorates are sent to Sana'a to be centrally scanned.
- In both cases of a central or decentralized database, it would be optimal to coordinate with the civil registry project so that the new voter registration system and database are built in advance to be compatible with the system employed by the civil registry project. The voter registration card could feature a unique identification number assigned to each registered voter with the same 11-digit system used by the civil registry project.
- The registration forms will be computer readable. They should be designed for easy scanning into the database. Each registration form should have a unique serial number that can be assigned to each registered voter for future reference. The forms must be designed in a user-friendly fashion so that voters and registration workers complete them with the maximum accuracy. To ensure this aspect, registration forms should be tested on target groups in the course of their design. An adequate training program on how to complete the forms must be given to all registration workers.
- The incorporation of a photograph of the voter in the register is highly recommended in order to prevent fraud.
- Certain steps should be taken to increase the transparency and security of the registration process at the registration centers. Daily procedures involving all registration officials and observers need to be conducted. These include the detection of any irregularities or challenges, and daily count of used and unused registration forms. It is important that all forms and other documents are accounted for, placed in secure containers, and seal signed by all individuals present.
- While the election law outlines the general framework of voter registration process, it does not provide for a full description of several important procedures. It is strongly advisable to adopt a set of voter registration regulations to guide the process by defining all its procedures and steps in detail. In addition, special procedures need to be established for extraordinary cases of voter registration. These include: military camps, citizens living abroad, voters requesting to change registration from one constituency to another.
- The SEC should seriously consider relying on locally recruited registration workers and facilitating the presence of multiple political parties at every registration center. Political party representatives must be allowed to be present at the registration centers and to monitor the whole registration process.
- The SEC should ensure the constructive engagement of all political participants in the voter registration process and encourage their accountability through the development of a code of conduct.
- CD Rom copies of the provisional and final register should be made available to all political parties, civic society organizations, interested citizens, and other stakeholders who may request them. This would greatly increase the transparency of the process.
- The voter registration card should include several identity and security features, such as signatures and fingerprints, in order to provide greater assurance that the voter is the person he or she claims to be. The voter registration card could be marked (or pierced) once the voter obtains the ballot paper, thereby preventing multiple voting.
- This option, like the other two examined by this report, relies heavily on the development and implementation of voter education programs to increase the level of awareness among voters, particularly, women, illiterate voters, youth, and rural residents. Special voter education programs need to be planned for implementation at the local level, with the support of village leaders, local council members, and respected community representatives.
- It will also be necessary to conduct a cascade-training program for registration workers to fully prepare them to carry out their job efficiently, and to ensure a professional and uniform application of the rules and

regulations governing voter registration. In addition, the team recommends the implementation of a training program for observers from political parties and civil society organizations. The training would aim at explaining the voter registration system and procedures as well as effective monitoring. Training courses, both for registration workers and for observers should be supplemented with the production of training manuals for voter registration that are written in a plain language.

- Special measures should be taken to improve and facilitate coordination and communication between the different levels of commissions, especially between supervisory and branch Committees.

Advantages of Option 3

- The new voter registration exercise will result in consistent and accurate information in the new voter register. A well designed and implemented collection of data will result in a high quality registration database, laying down the framework of an accurate voter register as the basis of a centralized and computerized SEC database for the parliamentary and local elections in 2003.
- In comparison to the new national ID, the voter card will be issued to voters without any charge.
- If well executed, this system and the resulting register of voters could gain the confidence of the public and political parties.
- Because the information is taken directly from the source, which is the voter, self-initiated registration is the best way to capture all information needed for a voter registration system.
- The system, as designed in this proposal, will eliminate the laborious and error-prone procedures of manually reproducing several copies of the same voter register. By scanning information on the registration forms directly into the database the margin of error will be drastically reduced.

Disadvantages of Option 3

- Voter registration is, by far, the longest, most complex, expensive, time consuming and difficult phase of an election system. Designing, planning and implementing a new registration would take several months and it would require the mobilization of considerable financial and human resources.
- A self-initiated registration system relies on people. To be effective it has to be supported by a serious voter education effort. Should this component reach limited results, it would yield low voter registration turnout.
- One important downside of this option is that the issuance of a photo voter card to every eligible citizen will be expensive. The voter card is temporary[6] until a new national identification card is developed for all Yemeni citizens.
- If the proposed amendments to the *General Elections & Referendum Law* are passed, the provision for issuing a voter card to the electorate will be abolished. Therefore, Option 3 would be difficult to implement under the amended elections law.
- The need to conduct a new voter registration exercise when a voter register already exists, albeit flawed, would be doubted.
- The new system, as the one previously analyzed, requires a consolidated infrastructure to be implemented successfully and timely. Required is also a monitoring system that ensures consistency of administration and application of procedures.
- Like the other two options, this alternative strategy relies on the professionalism of the registration workers who must be sufficiently trained and committed to perform their duties in an unbiased manner.

[6] In reality, it is not said that the voter card will necessarily become obsolete with the full adoption of the new national ID card. The two cards could be complementary and used for different purposes. Mexico, for instance, has a Civil (Federal) Registry of Voters that provides citizens both with a national ID card and a voter card. The two cards are used for different purposes and are equally indispensable: the first one is used for general identification purposes, the second one exclusively to vote.

Costs of this Option

1. Cost estimate for a decentralized database system, allowing scanning in 20 governorates with data linked to a central database at the SEC, would require a central database server and 4 developer workstations at SEC headquarters. Twenty scanners, each with a workstation, will also be needed at each governorate.

	Each	Quantity	Total
Database Server at SEC			
Estimated Yemen Cost (US cost plus 25%)	$ 29,550	1	$ 29,550
Microsoft SQL Server (25 user license)	$ 5,000	1	$ 5,000
Developer Workstations	$ 2,400	4	$ 9,600
Scanning Centers			
Scanners (est. based on DRS CD800)	$ 32,000	20	$ 640,000
Mini database servers	$ 4,600	5	$ 23,000
Forms printing (estimated 8 million forms)	$ 0.10	8,000,000	$ 800,000
Vendor support (per week)	$ 15,000	12	$ 180,000
Total Cost of Direct Inputs			$1,687,150

2. Cost estimate of centralized database system, requiring a central database server, 5 scanners with workstations, and 4 developer workstations at SEC.

	Each	Quantity	Total
Database Server at SEC			
Estimated Yemen Cost (US cost plus 25%)	$29,550	1	$29,550
Microsoft SQL Server (25 user license)	$5,000	1	$5,000
Developer Workstations	$2,400	4	$9,600
Scanning Centers			
Scanners (est. based on DRS CD800)	$32,000	5	$160,000
Scanning Workstations	$2,400	5	$12,000
Forms printing (estimated 8 million forms)	$0.10	8,000,000	$800,000
Vendor support (per week)	$15,000	12	$180,000
Total Cost of Direct Inputs			$1,207,150

Conclusion

The assessment team believes that this would be the best option for a reformed voter registration system in Yemen.

8 - Recommendations

The choice of the third option, presented in this report as the most appropriate for Yemen, is based upon four key factors:

- The available time to create a credible register for the next elections.
- The costs of such exercise and the other resources needed.
- Its feasibility under the current political environment and with the existing infrastructures.
- The context in which such a system must be used, developed and maintained.

Taking these four factors into consideration, the team recommends the new voter registration exercise (Option 3) as the best option for creating a credible voter register for the 2003 parliamentary and local council elections.

In the last decade, Yemen has taken important steps in establishing, consolidating and expanding its electoral system. Obviously, the electoral system has now reached a stage where it needs to be refined and corrected through an evolutionary and realistic process. It is now absolutely necessary for Yemen to develop a voter registration system that is accurate, easy to maintain and, therefore sustainable beyond one or two cycles of elections. It is also necessary that the new voter register gains the confidence of all the stakeholders involved in the country's democratic process.

Possible Outcome of this Assessment

Should the recommendations of this voter registration assessment be accepted, IFES could provide technical assistance to the SEC in developing a comprehensive project for the re-registration of the Yemeni electorate in view of the 2003 elections. IFES would work with the SEC to develop an implementation strategy based on the voter registration process described in Option 3 of this report. The strategy would define the system and its procedures in detail, provide a timeline setting priorities and deadlines for key project components. IFES would also work with the SEC to detail all the necessary equipment, materials, and resources, as well the costs of each component.

A comprehensive new registration exercise of the entire Yemeni electorate would require millions of dollars in project funding, certainly beyond the means of any single donor. IFES could undertake a broad-based coordination effort to bring together donors and implementation partners to support the necessary reforms. The total cost of the voter registration proposal could be distributed among the following categories:

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Technical Area to be Supported	*Description*
Voter registration forms	Paper and printing
Voter cards	Paper, printing, laminating equipment and materials
Cameras and films	Cameras and films for more than 2,000 registration centers
General registration materials	Registration kits, security bags and seals, containers, stationery, etc.
IT Equipment	Hardware and software for computer databases, scanners, computer network, training for database clerks, etc.
Training Programs	National (cascade) training program for Voter Registration Workers, including the production of training manuals and other training materials.
Training for Political Party/NGO Observers	Same as above.

Technical Area to be Supported	*Description*
Voter Education Campaign Promoting Voter Registration	Production of voter education posters, stickers, billboards, pamphlets, etc. Broadcasting of public service announcements (PSAs).
Other potential costs to be identified in the final voter registration project design	-

9 - Technology Solutions for a Reformed Voter Registration System

This section of the assessment report focuses upon a number of improved technologies alternatives that in the past decade have arisen to deal with the problem of how to accurately capture large amounts of data in a short time. There are three options that are commonly used to address this problem.

- IMAGE DATA ENTRY

  Typists enter data from an on-screen image of a scanned form. This process has the advantage that it does not require specially designed forms, but offers substantial speed increases over manual data entry from paper forms.

- OPTICAL MARK RECOGNITION (OMR)

  It requires specially coded forms. Registrars complete the forms by writing in information, then shading bubbles corresponding to alphabetical or numerical characters. OMR solutions require some training for persons completing the forms, and limit the amount of data that can be collected on any form, but offer the highest speed and greatest accuracy.

- INTELLIGENT CHARACTER RECOGNITION (ICR)

  It uses sophisticated handwriting recognition technology to translate hand-filled forms into data. The best results are achieved with specially designed forms. The advantage of ICR compared to OMR is that a much greater amount of data can be gathered on a single form; the disadvantage is that the interpretation process is many times slower, and more data entry staff are required to correct errors.

What is the Best Data Entry Solution for Yemen?

Section “10 - Data Entry Technology Options” of this report gives a detailed overview of data entry technologies including Visual Data Entry, Optical Mark Recognition, and Intelligent Character Recognition.

Each of these technologies can significantly reduce the requirement for data entry operators while dramatically improving accuracy. The choice of which is most appropriate is determined by analyzing the number of forms to be entered, the amount of data on each form, and the timeframe in which the data must be entered.

The requirements for voter registration in Yemen are that 5 million registration forms must be entered in a fairly short timeframe, but each form contains only a small amount of data. **This is an ideal situation for using Optical Mark Recognition (OMR).**

The advantages of an OMR solution are:

- Forms can be filled out and coded at the registration center without any special requirements for each registration center.
- Form processing speed is approximately 5,000 forms per hour for each scanner. Given downtime for loading batches of forms, and worker breaks, actual throughput should approach 30,000 to 35,000 forms per day for a single OMR scanner.
- OMR data entry solutions have typically produced the highest accuracy rates, surpassing both Visual Data Entry and Intelligent Character Recognition. Data validation rules can be programmed into the scanner to reject any form that does not meet the criteria. For example, upper and lower age limits can be entered so that the scanner automatically rejects forms where age is less than 18, or higher than 105, or where age is not entered. In order to achieve very high accuracy rates on text fields such

as names, the scanner can be programmed to check each name against a database of known names, and to require operator intervention if an unknown name appears.

For planning purposes, if we assume 5 million voters must be entered into the database over a 10-week period, we have the following scenario:

Number of forms to process	5,000,000
Forms per scanner per day	30,000
Scanner / days required	167
Number of days	50
Scanners required	4

This would require approximately 15 workers. Working two shifts per day could reduce the number of scanners required. Note that because of the critical nature of the schedule, it would be advisable to have one additional scanner for redundancy.

Preventing Duplicate Registrations

The most popular "cutting edge" technology solutions for preventing duplicate registrations depend upon biometric identification systems, particularly Automated Fingerprint Identification Systems (AFIS). A detailed overview of biometric systems is given in section "11 - Biometric Identification Systems" of this report.

In Yemen, an AFIS system is already being used by the Department of the Civil Registry, which has the task of registering every citizen of Yemen. If the Civil Registry exercise is successful, the new database and the national ID card should be used as the basis for voter registration.

Unfortunately, the risks and obstacles to using the Civil Registry as a basis for a Voter Registry do not make this a feasible approach at this time. In reality, it does not appear that there is a feasible approach that will eliminate duplicates from the voter register by 2003. However, by taking a multiple-step approach, the SEC should be able to reduce the number of duplicate registrations to a level that would have minimal impact on the elections. The multiple-step approach includes the following:

- Eliminate the "multiple constituency" option for registration. This option, while providing to the voter the convenience of registering and voting at the location of his/her residence, workplace, or family village, also opens the door to easy multiple registration. If a voter is required to register and vote in the constituency of residence, and to provide proof of residence, registration workers and observers have much greater control over those who attempt to register fraudulently.
- An important element for controlling fraudulent registration is the presence of representatives from multiple political parties at the registration center to ensure that correct registration procedures are followed. Every system devised for controlling duplicate registration depends upon the integrity of the registrars, and the best way of ensuring this integrity is allowing the parties to police one another.
- It is also important that registration workers are appointed locally; a university student from a remote location cannot be expected to be familiar with the people s/he is registering.
- Registration workers should be provided with a well-defined set of procedures, a clearly-written registration manual, and adequate training and indoctrination to instill in them both a knowledge of procedures and a sense of civic responsibility.
- Yemen already uses photo ID cards for voters. If a new voter registration exercise is conducted it should include a plan for capturing the photos digitally. This can be done either through the use of digital cameras or by scanning actual photos. The digital photos can be stored in the database with the voter's personal information, providing two significant benefits in reducing fraud. First, the photos can be used as reference in the case of any suspected double registrations. Second, the photos can be printed on the voter register, providing immediate visual verification of the identity of any voter on Election Day.

In order to provide a long-term solution, the SEC should consider the use of an Automated Fingerprint Identification System (AFIS) that does not require the voter to travel to a computerized central registration site.

Companies such as Identicator, Inc., SAGEM Morpho Inc., and PrinTrak International provide systems that allow acquisition of fingerprints using paper and inkpads at the registration center. While these systems do not have the high-tech appeal of systems using live-scan fingerprint capture, neither do they require a computer system at every registration center. One word of caution – many countries have begun a registration process using fingerprint systems only to discover that the cost is much higher and the time required much longer than originally planned. Jamaica, for example, began a voter registration process in 1999 to register 1.5 million voters using AFIS to screen out multiple registrants. Their initial public information campaign promised that the new voter register would be available within 3-4 months, based upon the projections of the company that sold the system. In August of 2001, the electoral commission now projects that the system will be completed before the end of the year, a total timeframe of two-and-a-half years. Although the system appears to be working well, the public has lost confidence in the process, and the electoral commission has a large hurdle to overcome in restoring this confidence. It would not be unreasonable for SEC to plan up to 4 years to complete all scanning and validation of fingerprints.

While this would not provide a perfect voter register for 2003, the process would provide the following benefits:

- Immediate registration under full control of SEC.
- Ability to open the number of registration centers deemed necessary by the SEC, based upon voter needs rather than upon cost of technology.
- Production of a voter register that is not delayed by the requirement to scan fingerprints.
- The collection of fingerprints during registration would provide a deterrent against multiple registrations, even though the scanning and validation would not be completed prior to 2003 elections. This would reduce the number of duplicates, and provide a basis for future criminal prosecution of those who register more than once.

Database Security

Database security should be included as a central consideration for all work done in any accountable and sustainable environment. Database security should be considered at all stages of design, development and deployment of database applications used by SEC. Election database security generally falls into four categories, as follows:

- Security against unauthorized access.
- Security against data loss.
- Physical database security.
- Security to preserve data integrity.
- Security against loss of applications.
- Disaster recovery plan.

The responsibility for database security lies primarily with the information technology staff of SEC, however all branches should be involved in planning for disaster recovery. When disaster recovery planning is left to IT staff the result is often a recovery plan to restore computer resources in a manner that is not fully responsive to the needs of all branches. Contingency planning should therefore be seen as an election management issue rather than as a data processing issue, and all branches should be involved in creating/updating a recovery plan each time any significant technology is implemented.

Steps in developing the recovery plan include:

- Pre-Planning Activities (Project Initiation).
- Vulnerability Assessment and General Definition of Requirements.
- Election Impact Analysis.
- Detailed Definition of Requirements.
- Plan Development.

- Testing Program.
- Maintenance Program.

The completed plan document typically includes the following elements:

- Planning Scope and Plan Objectives.
- Project Organization and Staffing.
- Project Control.
- Schedule of Deliverables.
- Resource Requirements.

The primary objective of a Business Resumption Plan is to enable an organization to survive a disaster and to reestablish normal business operations. In order to survive, the organization must assure that critical operations can resume normal processing within a reasonable time frame.

Therefore, the goals of the Business Resumption Plan should be designed to:

- Identify weaknesses and implement a disaster prevention program.
- Minimize the duration of a serious disruption to normal operations.
- Facilitate effective co-ordination of recovery tasks.
- Reduce the complexity of the recovery effort.

10 - Data Entry Technology Options

Form Design

Up until the mid-1990's, the vast majority of data was entered into the computer using keyboards. Some specialized data such as questionnaires and academic exams were completed using scanners designed for this specific purpose, but most form-based data was keyed in. A number of techniques were developed for improving data entry speed. First was the careful study of forms design. It makes sense that a form that is difficult to read will be difficult to decipher for purposes of data entry; therefore, a first goal of good form design is to produce a form that encourages neat handwriting. For this purpose, a series of boxes is usually used, and the person completing the form is requested to enter a single letter in each box.

T	H	I	S		I	S		E	A	S	I	E	R		T	O		R	E	A	D			

This is more difficult to read

A second technique is the use of check boxes on the form to indicate items that are multiple choice:

☒ Male
☐ Female

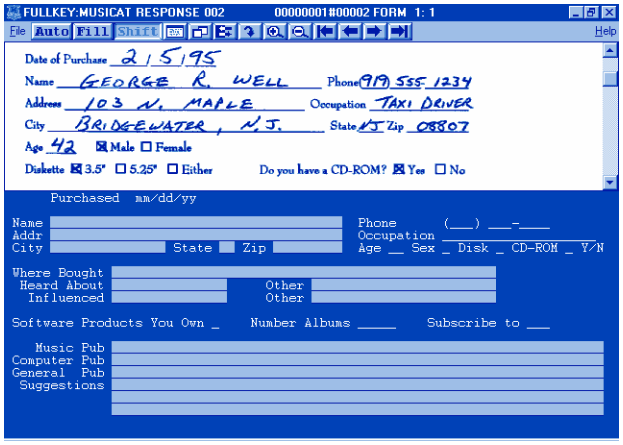
A number of principles have been developed which lead to good form design; coverage of these principles is beyond our scope. For the purposes of improving accuracy in the completion of a large number of forms it is well worth engaging a forms design specialist to aid in the creation of the registration form.

Visual Data Entry

With the proliferation of inexpensive image scanners a number of programs have been developed which speed data capture by displaying an image of the form on the top half of the screen As the typist moves through the form, completing each field of data, the image is scrolled, allowing the typist to view the correct portion of the handwritten form while typing data on the bottom portion of the screen.

"The average productivity rate for professional data entry operators is 11,600 keystrokes per hour. It has been reported that the average operator entering data with Access or standard Windows panels is only about 1,500 keystrokes per hour. This 9 to 1 productivity improvement quickly pays for good data entry software."

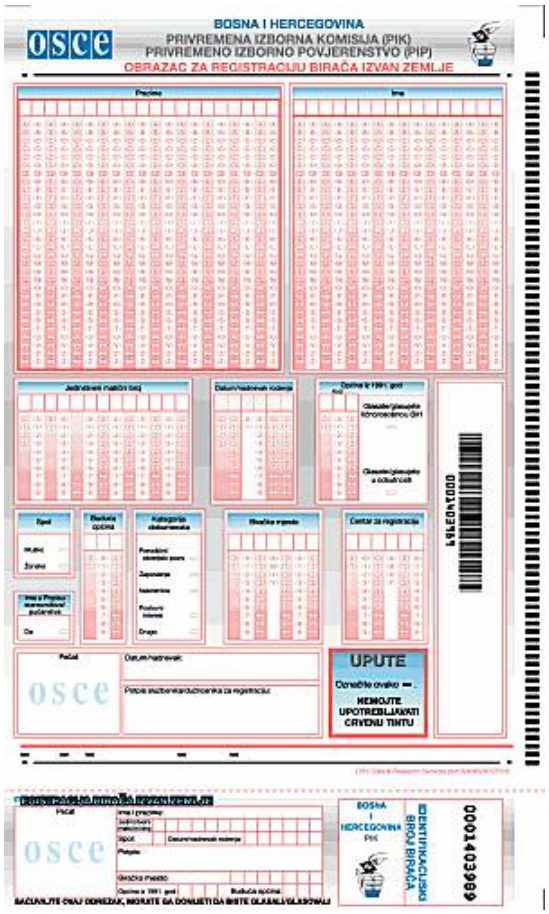
(Source: Viking Software Solutions)



When combined with a Workflow Management system, Visual Data Entry systems provide a powerful tool for quickly and accurately transferring data from handwritten forms to database. A typical workflow is pictured below using "double-blind" data entry. Images are scanned from one or many scanners and stored in an Image Server. Each form image is then sent to two different data entry operators, and each operator keys the

data into the system. The data from the two different operators is compared, and any differences must be reconciled before the data is stored in the database.

The best systems allow tracking the average number of keystrokes per hour, and the accuracy of each data entry clerk. By using “double-blind” data entry accuracy rates as high as 99.99% can be achieved. This is the most accurate, and usually the most expensive and time-consuming technology for doing data entry.



Optical Mark Recognition (OMR)

OMR recognize the presence or absence of a mark in specific area of a specially designed form. The exact meaning of the mark depends on the form's design. This technology is ideal for collecting standardized data where the person recording the data does not have sophisticated (and expensive) data recording equipment. In other words, a No. 2 pencil and piece of paper work just fine.

The technology involves the use of specially coded forms that provide space for shading in each character of data required. Optical scanners are used to read the forms, at maximum speeds of 7,500 forms per hour per scanner, producing a fixed-width ASCII data file which will be imported into Microsoft SQL Server relational database management system. Forms may be serially numbered, providing for controlled tracking of every step of form distribution, use, collection and storage. This serial numbering also allows integration with biometric data capture.

IFES has successfully employed OMR technology for registration projects in a number of large-scale data capture processes. In Ghana, six OMR scanners from NCSi were used to enter data from 10.5 million voters in 3 months. In Bosnia, DRS provided scanners, which were used to capture data in both Latin and Cyrillic. This technology is a well-tested and proven tool for reducing data entry time and costs, while improving accuracy. Accuracy rates for OMR can be as high as 98%.

Image Processing with Intelligent Character Recognition (ICR)

ICR Recognition requires several steps to convert the image on paper to data. These include:

- Form definition
- Scanning
- Image pre-processing
- Recognition / Validation
- Manual Data Entry of Rejects
- Workflow Management

These steps are discussed below.

Form definition

Before any scanning begins, someone (usually a System Administrator) must define the form. This usually involves scanning a blank form, then using a graphical user interface to define the location on the page for each field of data. Once a location on the page has been highlighted, the Administrator defines the attributes for the field. The attributes differ depending on the vendor, but include such information as:

- database field name
- field type (alpha characters only, numeric characters only, mixed, date, true/false, etc..)
- minimum and maximum field length allowed
- validation rules
- validation lookup table

Scanning

Once one or more forms is defined, scanning begins. Batch flow is very important at this stage, and a common workflow includes scanning an initial batch cover page, followed by scanning each page in the batch. All the pages in the batch are then stored together, organized in a way that makes it possible to retrieve any page later if required.

Image Pre-processing

Each image goes through a pre-processing phase that prepares the image for the recognition engine. The pre-processing may include:

- De-skew – If paper is fed into the scanner crooked, this step realigns the image.
- De-speckle – Removes the black "speckles" that often occur in a scanned image.
- Registration – Uses marks in the corners of the document to move the image so that every image begins at the same "top left corner" position.
- Black border removal – "Drop out" the form from the image, leaving only the handwritten text.

Recognition / Validation

This step is the actual character recognition, which allows hand printed alphanumeric characters to be interpreted by the computer and converted to data. The process is accomplished by comparing a bitmap image of each character to a large sampling of thousands of actual hand printed characters, and making an "intelligent" decision as to what character the shape represents. Some ICR recognition engines also support a "learn" mode, where the system adapts to the specific handwriting of the person(s) doing the handwriting. This type of system is most useful if there are a limited number of registrars each of whom fills in several hundred forms.

The best ICR systems use two or more recognition engines, and a "vote process". For each character, each engine submits a "preference vote" showing the top 3 most likely characters represented by the bitmap image, along with a "percentage of probability". A control module then makes a decision based upon the strength of the preferences.

Accuracy in an ICR system is increased dramatically when it is possible to use database lookup tables and dictionary matching. This technique compares the results of each field to an existing database or dictionary. If the field does not match an acceptable value in the database the field is flagged for review. For example, if the field is identified as "First Name", the software scans a list of all known names. If the interpreted name does not show up in the database, an operator must review the form.

Manual Data Entry

ICR Forms Processing is designed to reduce, not eliminate data entry! Claims made for the accuracy of ICR vary dramatically based upon the type and quality of input data, the recognition engine used, and the quality of the validation rules. A quick search of vendor literature turned up the following claims:

- *"While ICR does not replace the requirement for typists, it can perform up to 95% of the data capture, freeing typists to focus on problematic forms."*
- *"Successful remittance read rates of 80 percent can be achieved. As a result, Unisys CAR-ICR can help to significantly reduce operator data entry, operational costs, and processing time."*
- *"A very strong case can be made for the productivity of heads-up Key from Image data entry vs. ICR technology. Correction of inaccurate ICR can often cost as much as straight data entry. Even though Key*

from Image offers an excellent solution, the market's desire for ICR probably mandates its inclusion in the future."

With claims varying from recognition accuracy of 50% all the way up to 95%, a careful choice must be made as to when and where ICR processing is appropriate. The decision should involve extensive testing using sample forms similar to the actual forms that will be used.

Workflow Management

Workflow Management allows the System Administrator to control the movement of each image from scanner. A simplified workflow might include the following steps:

- Scan
- Image Cleanup
- Recognition
- Validation
- Data Entry of Rejected Forms
- Database Import

The specific workflow defined depends on the number of scanners, the number of data entry workstations, the number of forms to be processed, the degree of accuracy achieved during the recognition process, etc..

Building a System

Toolkit or Integrated Solution?

Most ICR Forms Processing systems today come as a set of tools, requiring a "do it yourself" approach to building an integrated system. The final system varies radically depending on whether the application is accounts receivable, order entry, inventory control, enrollment, or other. Building an integrated system takes time, and ideally includes a number of field tests to ensure that the system works efficiently. Any attempt to shortcut this step can lead to disastrous results, as it is difficult to modify the design of the system later.

There are a number of systems integrators with experience in ICR Forms Processing, who can help in the definition of an integrated system, however, once again, this process may take several months to complete.

Scanner Prices

The prices of image scanners appropriate for doing ICR vary widely depending on speed, durability, rating for maximum daily throughput, and vendor. Some sample prices are listed (as of Q1 2001):

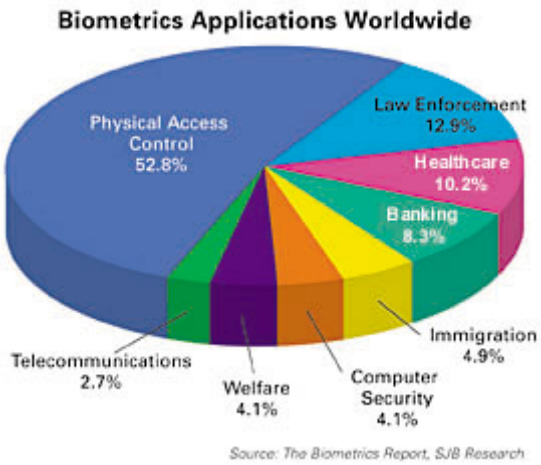
Scanner Model	Specs	Price ($)
VisionShape DS-60A	11 x 17, 66 ppm	9,500
VisionShape DS-60D	11 x 17, duplex (2-side), 66 ppm (equates to 120 ppm for 2-sided documents)	12,995
VisionShape DS-90A	11 X 17, 90 ppm	12,995
Kodak 7520S	12 x 30, 60 ppm, rated up to 24,000 pages per day	40,950

Kodak 9520S	12 X 30, 120 ppm, rated up to 33,000 pages per day	89,520
Fujitsu M3096EX	11 X 17, 22 ppm	5,495
Fujitsu M4099D-VRS	11 X 17, 90 ppm	22,995

11 - Biometric Identification Systems

Background: What are Biometrics?

Biometrics are methods for measuring physical characteristics and behaviors. Examples of traits that can be measured include fingerprints, speech, face, retina, iris, handwritten signature, and hand geometry. In the past decade there has been a proliferation of computerized devices that use biometrics for recognizing persons. Biometric recognition is used to secure computer networks, office buildings, border crossings and bank accounts. Biometric systems have been implemented by governments, businesses large and small, military organizations, and with the lowering prices for recognition devices, biometric systems are being built into personal computers for business and home use.



Biometric Functions

The basic task of all biometric systems is recognizing patterns in order to distinguish those that match closely enough to be considered identical, and those that have great enough variation to be considered non-identical. In order to perform this task, there must first be Enrollment, followed by either Verification or Identification, depending on the application of the technology. These three functions of the biometric system are discussed below:

Enrollment

Enrollment is the initial learning process, in which the system register biometric characteristics, i.e. signature, voice, facial characteristics, etc.. This means, that one or more biometric data sets are acquired and processed to achieve the respective features to be stored in the respective biometric database. Because the biometric system must depend upon statistical probabilities for all future matching, it is desirable to take multiple samples during the enrollment phase.

Verification (1:1 matching)

Verification is required when a person claims to be someone known to the biometric database. The verification system first locates the appropriate database record, then compares the stored reference data with the biometric features of the person requesting authorization. Verification is fairly quick because it requires only a single comparison.

Identification (1:many matching)

Identification requires that the biometric system find the person's identity by matching a single set of biometric features against those in the system's database and subsequently finding the best match to the requested person. This is much more problematic because it necessitates a comparison with every record in the database.

Steps in the Biometric Process

During each of these functions, the following steps must be accomplished:

Data acquisition is the first step in building the biometric database. This is the Process of acquiring the initial raw data from the respective sensing device (usually a live-scan fingerprint scanner). Te data record captured at this point is the basis for all following comparisons, and the quality of the raw data has a severe impact of the performance of the complete system. For biometrics, this implies that paying attention to high quality capture data should enhance recognition performance. Significant variability can be introduced into subsequent samples of the same person due to placement of the finger on the scanner, cleanliness of the finger, any subsequent calluses, cuts or scars; and to the potential for human error in operation of the acquisition device.

Preprocessing of data serves for quality enhancement of the acquired data. This may include such sub processes as compensating or misalignment of the finger on the scanner, and image enhancement

Feature extraction forms the basis for the systems recognition performance. The features must be optimized to work with the matching algorithm. Biometric feature extraction implies the task of determining the personal characteristics, in such a way as to guarantee that variations in the original person's characteristics can be tolerated while still preserving the uniqueness of the print.

Classification is the sequence of matching and decision. Matching is the process of calculating a similarity or dissimilarity measure between the current print and every other print in the database. The matching process must compensate for the statistical variability introduced into the biometrics signals during the acquisition process. Using statistical models of the data distributions the decision on the match can finally be performed.

Biometrics in Elections

Over the past seven years there have been numerous attempts to use automated fingerprint identification systems (AFIS) for purposes of voter registration. The relevance to election requirements will be immediately recognized by any election administrator who has dealt with problems of multiple registration of voters. However the attempts have achieved varying degrees of success. The problem is not entirely with the biometric systems, but with the expectations placed upon them.

In the case of voter registration the system must perform both *Enrollment* and *Identification* functions simultaneously. A description of the enrollment process in a typical voter registration system using biometrics will clarify the problem.

Step 1 – Application

The voter produces required documentation to prove eligibility, then completes a Voter Registration Application form. The information on this form is *biographical*. The form typically will have a barcode to assist in identifying the voter record.

Step 2 – Biometric Capture

The voter moves to a biometric capture station. The operator uses a barcode reader to scan the barcode from the registration form, then takes a photo and a fingerprint scan.

Step 3 – Data Synchronization

At the end of the day (or sometimes weekly), data from the registration center is transmitted to a central processing site, where the real work of fingerprint matching is performed. This is a costly and time-consuming process. When the very first fingerprint is stored, no matching need be done. When the second fingerprint is stored it must first be compared to fingerprint number one to ensure that this voter has not already been registered. Similarly, the 1,000th fingerprint must be compared to 999 fingerprints already in the system. The millionth fingerprint must be compared to 999,999 previously stored fingerprints. As one example of the speed of such comparisons, Unisys claims their system is the fastest on the market, capable of doing 2 million comparisons per second. However, in a country with 1 million voters, the number of comparisons required is equal to (1 + 2 + 3 + 4 + . . . 1,000,000) or just over 500 billion comparisons. At the claimed speed this process would take over 4,000 hours.

Step 4 – ID Card Production

Ideally, ID card production can begin before the close of registration, but production can never be completed before completion of all fingerprint matching! In the scenario given above, given a 48-hour work week, the matching would take almost 2 years to complete. Even with matching systems working around the clock with no down time and no human intervention required, the matching would take 6 months to complete.

Potential Problems with AFIS Identification Systems

Although AFIS has been used in law enforcement for 25 years, and has had a high degree of success in security systems based upon *Recognition (1:1 matching)*, the popularity of AFIS for civil identification systems is still relatively new and unproven. The following problems are inherent in the move to wide-scale identification systems:

- Law enforcement AFIS applications use "nail-to-nail" rolled fingerprint impressions as the basis for all identification processing. A live-scan print can be less than 50% of the area of the equivalent rolled print, providing significantly less data for identification processing.
- The proven law enforcement AFIS applications use either 8 or 10 finger images to achieve identification accuracy. Most civil AFIS applications only use 1 or 2 finger images. The other 8 fingerprints are not captured, and are not available for backup comparisons.
- AFIS systems were designed to cope with the typical problems of inked fingerprints, such as smearing and over-inking or under-inking. Electronic live-scan images are subject to image distortion, image breakup and other quality problems that are significantly different from the problems experienced with inked fingerprints.

- In law enforcement applications, the AFIS produces a "candidate list" of possible fingerprint matches (usually 10 - 100 records) which are reviewed manually by an expert fingerprint examiner to determine if any of the candidate records is truly a match for the search record.

Conclusion

Biometric systems show a great deal of promise for guaranteeing “one person one vote” in elections. However, a number of attempts to implement AFIS systems in voter registration have suffered from unrealistic expectations. AFIS identification systems should still be viewed as cutting-edge technology, and decisions to implement AFIS-based voter registration should be made cautiously, and with a realistic understanding that it may take many months, or even years, to complete necessary matching.

12 - Cost Projections

It is always difficult to estimate the costs for implementing new technology, and this is particularly the case when the solutions to be implemented depend upon vendor-specific offers. However, for initial planning purposes the following information may be helpful, even though the cost ranges are wider than what is desirable for budgeting and soliciting assistance. When the SEC begins to approach consensus on an strategy, specific vendors should be contacted and asked for estimated figures that can be used for budgeting.

The cost in 1999 for Optical Mark Recognition scanners capable of processing up to 7,500 forms per hour was in the range of USD $45,000 each. Printing costs for OMR forms on A4 size paper was roughly $100 per 1,000 forms. In order to conduct registration, The implementation of a successful registration system requires a great deal of vendor support, including consulting time, travel and spare parts, at a cost of up to half the hardware cost.

The SEC would need in excess of 5 million forms and 4 scanners, at a projected cost of $770,000 plus shipping. ($180,000 hardware plus $500,000 printing plus $90,000 vendor support).

Automated Fingerprint Identification Systems are more difficult to price. In the year 2000 Los Angeles Police Dept. wrote a proposal to spend between $8 - $10 million for AFIS hardware for matching approx. 1 million sets of prints. In the same year the state of Kansas budgeted $2.3 million for a system from PrinTrak to handle law enforcement with a database of 500,000 prints. In 1999, Harris County, Texas, spent $7.1 million for a system to maintain 700,000 sets of prints. In 2000, United Nations Mission in Kosovo spent over $5 million for an ID card production system that included both AFIS filtering for duplicates and printing of photo ID cards for 1.5 million voters. Forensic Press estimated in 2000 that a typical system for one of the states in the US would cost between $5-6 million. Using these bases for projection, we can estimate a cost between $2 million and $50 million.

The wide variation in costs is due to the number of matching servers required, which is directly correlated to the number of fingerprint matches that must be made in a given timeframe. A number of techniques can be used to reduce the number of matches. For example, matches can be restricted to a certain demographic cross-section. If a 40-year-old male registers, his fingerprints should not be matched against females, or against 20-year-old males. Some countries have even limited the matching by geographic proximity. The decisions about how comprehensive the screening should be can dramatically effect the cost of the system. Furthermore, a system that can accomplish the matching in 3 months will be many times higher than the cost of a system that can accomplish the matching in 2 years.

Due to the wide range of prices for systems it is impossible to project an accurate cost estimate for voter registration in Yemen without engaging input from the major vendors. The cost estimates given for each of the options represent a "best guess" at the time this report was written. Computer component prices were based upon Dell systems. This does not imply a recommendation; Dell simply has a website that makes it easy to customize systems and generate price quotes. The following table shows specifications for each of the systems quoted.

Database Server

PowerEdge 6400, Dual Processor Pentium III Xeon 700MHz/1MB Cache
8GB, RAM, 16X512,RGT DIMMs
Deluxe Windows Keyboard
P991, 19in (17.9in VIS)
PERC3/DC-Dual Channel Add-in RAID Card 128MB Cache (1-Int/1-Ext Channel)
RAID 5/No HardDrives in Cage, DLT7K UsingOn-board Controller, for Dell
73GB HD,1.0 in,10K RPM,U160 (4 ea.)
3.5", 1.44MB Floppy Drive
INTERNAL 35/70GB DLT-7000 Tape Backup Unit
Windows 2000 Advanced Server with 25 Client Licenses
MICROSOFT SYSTEM MOUSE
Network Interface Card - Onboard Intel Pro 100+
Tower Chassis
Dell Remote Assist Card V2 with 56K Modem
Price quoted by Dell (Oct. 2001) - $ 29,550

Basic Database Server
PowerEdge 2500 Intel Pentium III 933MHz w/256K Cache
256MB SDRAM, 133MHz, 2X128MB DIMMs
Standard Windows Keyboard
Dell P991, 19 in (17.9 in Viewable)
18GB HD,U160M,SCSI,1 in.
3.5 in, 1.44MB Floppy Drive
INTERNAL 35/70GB DLT-7000 Tape Backup Unit
Windows 2000 Server with 5 Client Licenses,4GB Utility Partition
Microsoft System Mouse
Drives attached to embedded SCSI controller, No RAID
Tower Chassis
Dell Remote Assist Card V2 with 56K Modem
Price quoted by Dell (Oct. 2001) - $6,875

Scanning Workstation
Dell OptiPlex GX240 Small Minitower
Pentium® 4 Processor 2.0GHz, 256K Cache, Integrated NIC and Sound
512MB ECC SDRAM
Quietkey PS/2 Spacesaver Keyboard
19 Dell M991, 17.9 VIS
32MB, ATI, Radeon w/ DVI Cable Graphics Card
80GB ATA/100 Hard Drive (7200 RPM)
1.44MB 3.5 Inch Floppy Drive
Windows® 2000 Professional SP2 with CD using NTFS
MICROSOFT SYSTEM MOUSE
Integrated 10/100 3Com Remote Wake-up NIC
DVD-CDRW Combo Drive for Windows 98 or 2000
Price quoted by Dell (Oct. 2001) - $ 2,400

Developer Workstation
Dimension ® 8200 Series, Pentium® 4 Processor at 1.7 GHz
512MB PC800 RDRAM
New Dell® Enhanced QuietKey Keyboard
19 in (18.0 in viewable,.26DP) M991 Monitor
32MB NVIDIA GeForce2 MX 4X AGP Graphics Card
60GB Ultra ATA/100 Hard Drive
3.5 in Floppy Drive
Microsoft® Windows® 2000
MICROSOFT SYSTEM MOUSE
10/100 PCI Fast Ethernet NIC
48X/16X Max Variable CD-RW
Price quoted by Dell (Oct. 2001) - $ 2,400