THE SOCIAL SECURITY DISABILITY INSURANCE AND VOCATIONAL REHABILITATION PROGRAMS: A STUDY OF TIME DELAYS

by

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ABSTRACT

A study of the two most important programs serving the disabled, the Social Security Disability Insurance determination and appeals program and the Vocational Rehabilitation program, is presented.

The effect of time delays on the services provided by the SSDI is analyzed using Petri nets. Also, projections of the number of SSDI applicants and SSDI beneficiaries to the year 2020 are given in an attempt to forecast difficulties that the SSDI program will face. Finally, a method for modeling and evaluating the VR program is proposed.

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CHAPTER I

INTRODUCTION

1.1 Disability and the US population

Disability is becoming a problem concerning more and more Americans. According to the Current Population Survey (CPS) of 1981, a little over 13 million resident americans aged between 16 and 65 were disabled, and it has been projected that the number of disabled americans of working age is going to increase to 19.5 million in 2010.

The financial crisis of the Social Security program, and more particularly that of the Social Security Disability Insurance system (SSDI) has become a major governmental concern over the last 10 years. It has been estimated that between 1967 and 1975, total expenditures for disability increased from $39 billion (4.9 percent of GNP) to $114 billion (7.5 percent of GNP). The SSDI program is by far the largest; its expenditures were $14.2 billion dollars in 1979.

In 1977, a new tax bill was passed to ease the financial situation of the Social Security program. The increase in taxes made people aware of the cost of disability insurance. Since the beginning of the 1980's, the programs serving the disabled population, particularily the Social Security Disability Insurance Program (SSDI), and the Vocational Rehabilitation Program (VR) have become the subject of many studies (see section 1.5 for an overview of the past research).

1.2 The Purpose of the Study

The aim of this thesis is to model the two major programs serving the disabled population: the SSDI and the VR programs and to study the effect time delays have on the services provided. (Unfortunately, the data which was needed to study the VR program was never received; therefore, only the methodology for

studying the VR system is presented in this thesis.)

In the remainder of this chapter, first a general overview of both the SSDI and the VR programs will be given, then review of past research will be presented, and, finally, the results of this study which agree or correlate with the conclusions of previous work will be summarized. Chapter II describes the SSDI appeals and determination program, pointing out one of the important problems faced by both the administration and the applicants: people who appeal decisions (it is their right to do so) can stay for almost two year in the program, not knowing whether they will finally receive benefits or not. In Chapter III, the SSDI program is modeled using Petri net theory to determine which are the different paths that may be followed by an applicant, what is the delay and the probability associated with each path, and finally how long should a worker applying to the SSDI program expect to stay in the determination program. In the same chapter, a sensitivity analysis is done to measure the impact of the different paths on the expected delay and determine which stages of the program are the most important when trying to minimize the time an applicant should expect to stay in the program (Throughout the thesis, this time is called the expected delay) . In Chapter IV, projections of the number of SSDI applicants, recipients of disability insurance benefits and the number of cases going through each stage are presented. The number of SSDI applicants is projected to increase drastically over the years. In this chapter some of the issues the country is going to be facing in the next 30 years are raised. Finally, in Chapter V, an attempt is made to present a method for modeling the Vocational Rehabilitation program in a realisitic way because it seems that there is a large discrepancy between how the system operates and how it is described in theory. Then, a few methods to measure the efficiency of the VR are presented ; first a study of time delays similar to that of the SSDI system is described, and then variables that measure the success of the rehabilitation program are proposed .

1.3 The Social Security Disability Insurance Program: an Overview

More than 50 different organizations, both private and public, pay benefits to disabled people. The largest organization paying benefits to the disabled is the

Social Security Disability Insurance (SSDI) program, which is part of the Social Security system. In 1981, 4.5 million people were receiving monthly benefits from the SSDI program.

Under the SSDI administration today, to be eligible for benefits, a disabled person must be between 18 and 64 years of age, must have earned at least $50 in covered employment in 20 of the last 40 quarters (including the quarters when he was disabled), and must be fully insured. After being out of the labor force for five months, the disabled person may apply to the SSDI determination and appeals program; if allowed benefits, he will receive the same monthly benefits as a retired worker who began receiving benefits at the age 65.

When applying to the SSDI determination and appeals program, a worker who is not satisfied by the adjudicator's decision may appeal the decision. The applicant may appeal four times, each time appealing to a higher level of jurisdiction. According to this study, an applicant may stay between 48 and 662 days in the program, depending on whether he is allowed benefits at the first stage or he appeals all the way up to the Federal District Court. Time is very precious when dealing with the disabled population, first because time is money and a person who stays in the SSDI appeals and determination program usually does not receive any income (but he gets it retroactively if he is allowed), second, because the longer a disabled person stays out of the labor force, the harder it is for him to go back to work: from the workers' point of view, his capital will have decreased, he will also have lost the habit of staying 8 hours at work (not easy when a person has not been working for a long time), and he will have a very hard time feeling part of the working force because of his disability. Therefore, most of the study in Chapter III focuses on time delays, trying to pinpoint what could be improved to minimize the expected delay.

1.4 The Vocational Rehabilitation Program

Another type of organization offering services to the disabled population, aims to rehabilitate the disabled workers into the workforce. Many of these organizations are coordinated by the Vocational Rehabilitation (VR)

programs . Each state has a VR program of its own, but the programs are very similar from state to state. The role of the VR is to determine whether a disabled person is eligible to receive rehabilitation services or not, develop a program, along with the client, to detemine which are the services that should be provided to meet the rehabilitation goals, and coordinate the agencies which actually provide the rehabilitaiton services to the clients. (Many VR programs provide some services to the clients, but they often send clients to private or public organizations.) In this thesis, a method to model the system to measure its effectiveness is proposed.

1.5 Previous Work

Most studies on the SSDI and VR programs are very recent. Crouch [1] describes and critiques the entire SSDI determination and appeals process, showing that the final decison can be very significantly delayed. He also explains that the inconsistency between the different state DDS, may result from the flexibility of the administration at the state level. Nadolsky [2] also criticizes the SSDI system; he believes that there is a need to improve the determination process. Nelson [3] mentions that non-medical and non-rehabilitative factors may affect the determination of disability at the state level.

Halpern [4] and Halpern et al. [5] describe a model to explain the level of SSDI applications as a choice under uncertainty: the disabled workers either apply or not apply considering that they may be denied benefits.

The Menninger Foundation has produced a series of reports since 1984 the aim of which is to understand the changes in the disabled population and the different programs which are serving the disabled workers. Levis et al. [6], made projections of the resident disabled population aged 16 to 64 , constructed two computer programs, one modeling the SSDI and the other modeling the VR program of Illinois. Stone et al. [7] developed a model showing the characteristics of workers who become disabled, the structure of the disability support and rehabilitation system, and the possible routes by which a person enters and leaves the system. Hester et al. [8] assess the current use of worksite modification among

Project With Industry (PWI) programs throughout the US; the program is recognized as an important job placement by the vast majority (87 percent) of agencies who are using it. Finally, Levis et al. [9] have presented a model for determining the projections of the newly-disabled population.

1.6 Results Correlating With Previous Work

The study in Chapter III showed that when the expected delay of the SSDI determination and appeals program is considered, the two first DDS decisions as well as the average appeal time were the most important variables. It was quite surprising to realize that almost 50 percent of the cases which had appealed to the Administrative Law Judge (this is the second appeal) were allowed when only 10 percent of the cases reconsidered by the state agencies were allowed. It was suggested that if the first DDS decisions were more consistent, fewer people would appeal, as they would trust the system, and know whether they should appeal or not. This suggestion agrees with what Crouch [1], Nadolsky [2], and Nelson [3] wrote. All three criticized the SSDI determination and appeals program, saying that the determination criteria should be more consistent and improved.

The projections of the number of SSDI applicants and beneficiaries, shown in Chapter IV, raise several problems that both the SSDI, and the whole country are going to face: First is the question of funding future demand for disability benefits. Then there is the issue of retraining and of workplace modification, if most of the disabled workers will not be able to keep the job they had before their disability. These questions emphasize the use and purpose of the research undertaken at the Menninger Foundation over the past three years, of which the aim and the name is "Preventing Disability Dependence"

CHAPTER II

DESCRIPTION OF THE SSDI APPEALS AND DETERMINATION PROGRAM

2.1 The Appeals Procedure

The Social Security Disabilty Insurance (SSDI) program pays benefits to the disabled workers who have filed an application for Disability Insurance (DI) or Social Security Insurance (SSI) benefits and have been determined to have a disability which stops them from performing a substantially gainful activity.

Applications for benefits are filed in one of the Social Security Administration's (SSA) district offices, and if the applicant meets the eligibility requirements, his file is forwarded to the Disability Determination Service (DDS) in the individual's home state. If the case is allowed, the client will receive benefits. If the case is denied, the client may appeal to the DDS for reconsideration . If his case is denied again after reconsideration, he may request a formal hearing before an Administrative Law Judge (ALJ) in one of the Social Security Administration's (SSA) offices located across the nation. If the client is not satisfied by the decision of the ALJ, he can request the Appeals Council (AC) to review the decision. The Appeals Council may confirm the denial of benefits, may rule in favor of the applicant, or may remand the case back to the Administrative Law Judge. If the appeal is denied by the AC, the client may further appeal through the US Federal District Court. At each stage, an applicant has sixty days to file an appeal after receiving notice of denial; if he does not do so, he is considered out of the SSDI system.

2.2 The SSDI Determination and Appeals Structure

The graphical representation of the SSDI structure is shown in Figure 1. The graph shows that a client may apppeal four times, and at each stage he will be either allowed or denied. At the Appeals Council and the US Federal District

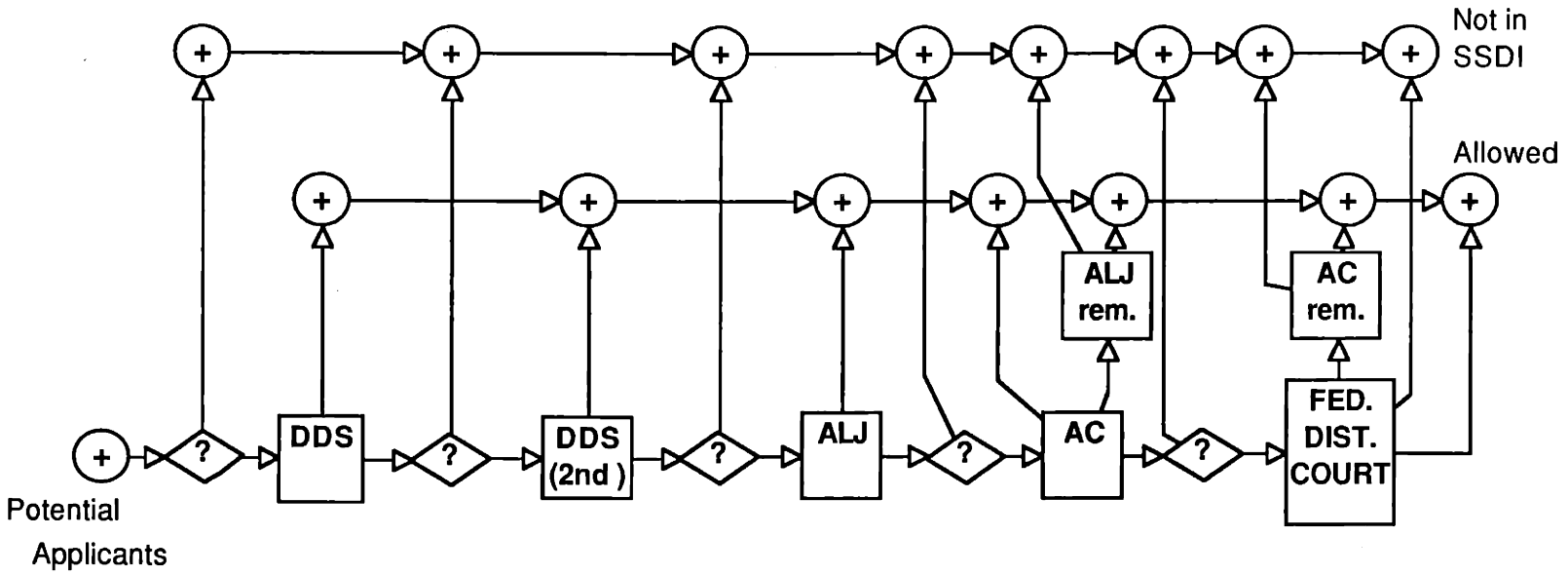

Figure 1. Graphical Representation of the SSDI Program

Court stages, there is another option: the case may be remanded to the ALJ by the AC, and to the AC by the US District Court . When modeling the system, it was assumed that after a case had been remanded to the AC or to the ALJ, the case could only be allowed or denied, and if denied, the client could not appeal. This assumption was made after considering the very small probability that an applicant who was remanded, denied, and appealed after the new denial would receive benefits. (This assumption was tested with the available data to show that the simplification, which changed the SSDI model from a cyclical to an acyclical graph, did not significantly affect the results.)

2.3 Population Projections

According to the SSDI administration [10], the number of SSDI applicants and beneficiaries has drastically increased over the years .

> " In recent years, the system has had a vastly larger caseload than was the case in earlier years of the program. In 1962, for example, there were about 440,000 disabled worker applications received in social security district offices. In fiscal year 1982, there will be about 1.3 million DI cases and more than 1.1 million SSI disability and blindness applications, of which 30 percent are expected to be appealed. "[10]

In order to have some understanding of how the number of SSDI applicants and benificiaries would evolve over the years, a computer model simulating the SSDI determination and appeals system was created by Levis et al.[6]. The program input is the the number of working age US residents who become disabled in a given fiscal year, and the output is the number of cases allowed and denied by the SSDI for that year. More recently (Levis et al., [9]), projections of the US disabled and newly-disabled population were made for the years 1980 to 2020. This forecast has been used to project the number of SSDI applicants and SSDI beneficiaries until the year 2020.

Table 1 shows these projections of the US disabled population and the

Table 1. Projections of the US Resident Disabled, Newly-disabled Workers and SSDI Beneficiaries (in thousands)

Year	Disabled	Newly-Disabled	SSDI Ben.
1980	13094	1302	411
1981	13189	1456	460
1982	13288	1474	466
1983	13392	1492	472
1984	13499	1508	477
1985	13612	1527	483
1986	13729	1546	489
1987	13852	1566	495
1988	13978	1586	501
1989	14110	1698	508
1990	14247	1638	518
1991	14430	1658	524
1992	14618	1681	531
1993	14815	1702	538
1994	15019	1726	546
1995	15228	1750	553
1996	15447	1776	561
1997	15672	1801	569
1998	15907	1829	578
1999	16148	1858	587
2000	16398	1879	594
2001	16702	1911	604
2002	17021	1942	614
2003	17352	1976	625
2004	17699	2011	636
2005	18061	1959	615
2006	18304	1982	627
2007	18557	2001	637
2008	18819	2033	643
2009	19093	2059	651
2010	19378	1952	617
2011	19466	1961	620
2012	19561	1968	622
2013	19660	1977	625
2014	19766	1984	627
2015	19876	1931	610
2016	19882	1931	610
2017	19888	1933	611
2018	19897	1933	611
2019	19911	1936	612
2020	19930	1939	613

US newly-disabled population, as well as projections of the number of SSDI applicants and the number of SSDI cases allowed and denied for the years 1980 to 2020. The number of newly-disabled increases constantly till the year 2010, and then starts decreasing. This increase in the newly-disabled population is a result of the ageing of the US population. In the 2010's, the people born during the baby boom of the 1950's will be in their fifties, the age group with the highest incidence of disabilty (21% of the population aged fifty five to sixty four has a disability). Since the number of SSDI applicants and beneficiaries depends on the size of the newly-disabled population, the number of cases allowed by the SSDI administration will rapidly increase till 2010, if no changes in SSDI policies are made. Considering that in 1981 the government was spending $12 billion on disability benefits, one may wonder how much money will be spent in the future, if no change in SSDI policies are made, or if effective disability prevention and intervention programs are not instituted.

The projected increase in the disabled population, in the number of SSDI applicants, and the number of SSDI recipients provides an incentive to look at the different systems which serve the disabled, understand how they function, and measure some aspects of their performance.

2.4 Major Problems Faced by the SSDI Administration

In the media, one regularly hears complaints and criticisms about the SSDI program; when reading the available litterature, it appears that the SSDI program is very difficult to manage. It seems that the complexity of the system is, for the most part, due to the clients' rights: not only can a client appeal up to four times, but also each time he appeals, his case is sent to a different administrator, often located in another region. (The DDS works at the state level, whereas the ALJ, the AC, and the Federal District Court work at the regional or national levels.) As a result, it is very difficult for the SSDI administration to process expeditiously each application and large delays are experienced by clients.

Time is a major worry for the disabled workers who apply for benefits. A case of an applicant who appeals all the way to the Federal District Court can stay in the system for more than two years, and finally the applicant may not receive any

benefits. Considering that "in order to apply, he must be out of the labor market for five months " [4], an applicant will not be performing any gainful activity for a period between six to forty-two months. While his case is evaluated, the applicant receives little or no income at all. Also, the longer he stays out of the labor force, the harder will it be for him to return to work or find a new job, the lower his wages will be, and, finally, the harder will it be for him to find the motivation and energy to perform the job. Long delays are also a problem for the SSDI administration. As the time applicants stay in the system increases, it becomes more difficult to monitor how the system is evolving and find which services could be improved. Therefore, the focus of this study of the SSDI system is on time delays.

CHAPTER III

METHODOLOGY OF THE STUDY: PETRI NETS AND TIME DELAYS

The purpose of this study is to understand which of the many stages of the SSDI appeals and determination program have the most impact on the expected delay of the system and where the longest delays are experienced. In this chapter, first Petri nets are introduced and then used to identify all the different paths a person may follow when applying for benefits to the SSDI program. Then, the probability of each path being used, as well as the delay associated with each path is computed. Finally, the different delays applicants should expect to experience when applying for benefits are computed, and the impact of each path on these delays is analyzed. Some recommendations are made on how to reduce the average time (also called expected delay) a case stays in the system.

3.1 Petri Nets and the Representation of the SSDI Appeals and Determination Program

Petri net theory is used to analyze the SSDI appeals and determination program. Petri nets are directed bipartite graphs which show explicitly the interaction and the flow of information between the various parts of an organization. The graphs contain two basic kinds of nodes: the circle node, or place that represents a signal or a condition, and the bar node, or transition that represents an event, a process, or function [11]. The presence of information in a place is denoted by one or more tokens (or black dots) in that place. A transition is enabled, if all its input places contain at least one token, (information is ready to be processed). Tokens are moved from the input places to the output places of a transition when the transition is fired: the information is then processed. A special kind of transition called a switch (shown as an oval) was introduced by Tabak and Levis [12] to represent " ....the internal decisionmaking by an organization member

... a decision rule ... specifies the position of the switch " [13] . Figure 2a is an example of a simple organization of two decision makers. Transition1 is enabled, since there is a token in place1. Figure 2b shows the net after transition 1 has been fired; the token has moved from place1 to places 2 and 3 .

Within the SSDI organization, the applicant, the DDS's, the ALJ, the AC, and the Federal District Court are each modeled as a decision making entity; the applicant decides whether to appeal or not, and the others process the applicant's file and decide whether to allow , deny, or remand the applicant. Figure 3 shows the SSDI system graphed as a Petri net . A token in a place implies that a case is ready to be considered, or an administrator has denied a case and it is possible for the applicant to decide if he wants to appeal. A transition is fired when an adjudicator processes a file or an applicant decides about appealing. A switch represents a decision with multiple outputs (e.g., the client decides whether to appeal or not: two possible outcomes are represented by two output branches of the switch).

3.2 The Stages of the SSDI Appeals and Determination Program

Let a time delay t_i be associated with each transition, and a probability p_i be associated with each branch of the decision switches. The values of t_i and p_i are average values obtained from the Committee on Finance of the United States [10]; the description of the variables is shown Table 2, and the numerical values are shown Table 3.

The values for p_{14}, the probability that a case is denied by the ALJ after it has been remanded to the ALJ by the AC, and p_{15}, the probability that a case is denied by the AC after it has been remanded to the AC by the Federal District Court, were not given in the committee print, as our model is a simplified version of the SSDI system. They were approximated under the assumption that a remanded case could only be allowed or denied; i.e., the client would not appeal that decision again .

The value for t_9, the average time it takes the Federal District Court to process a file, was not available; it was assigned a value of 100 days. It is not an important delay because very few cases reach the Federal District Court; i.e., there

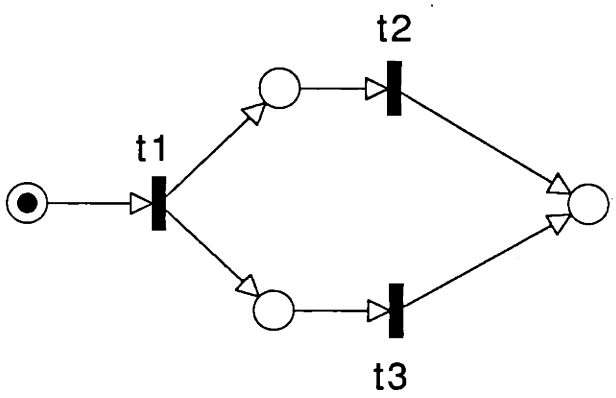

Figure 2a. Transition 1 is enabled

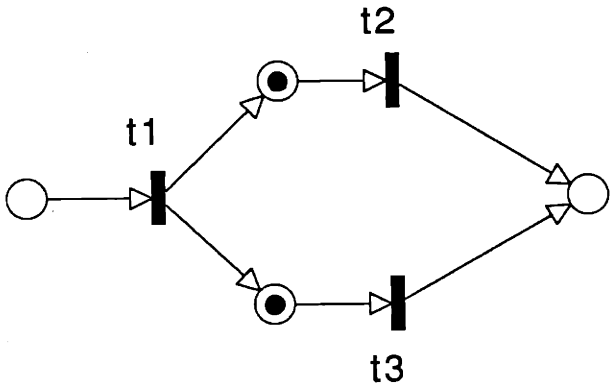

Figure 2b. Transition 1 has been fired

Figure 2. A Petri Net Representation of a Simple Organization

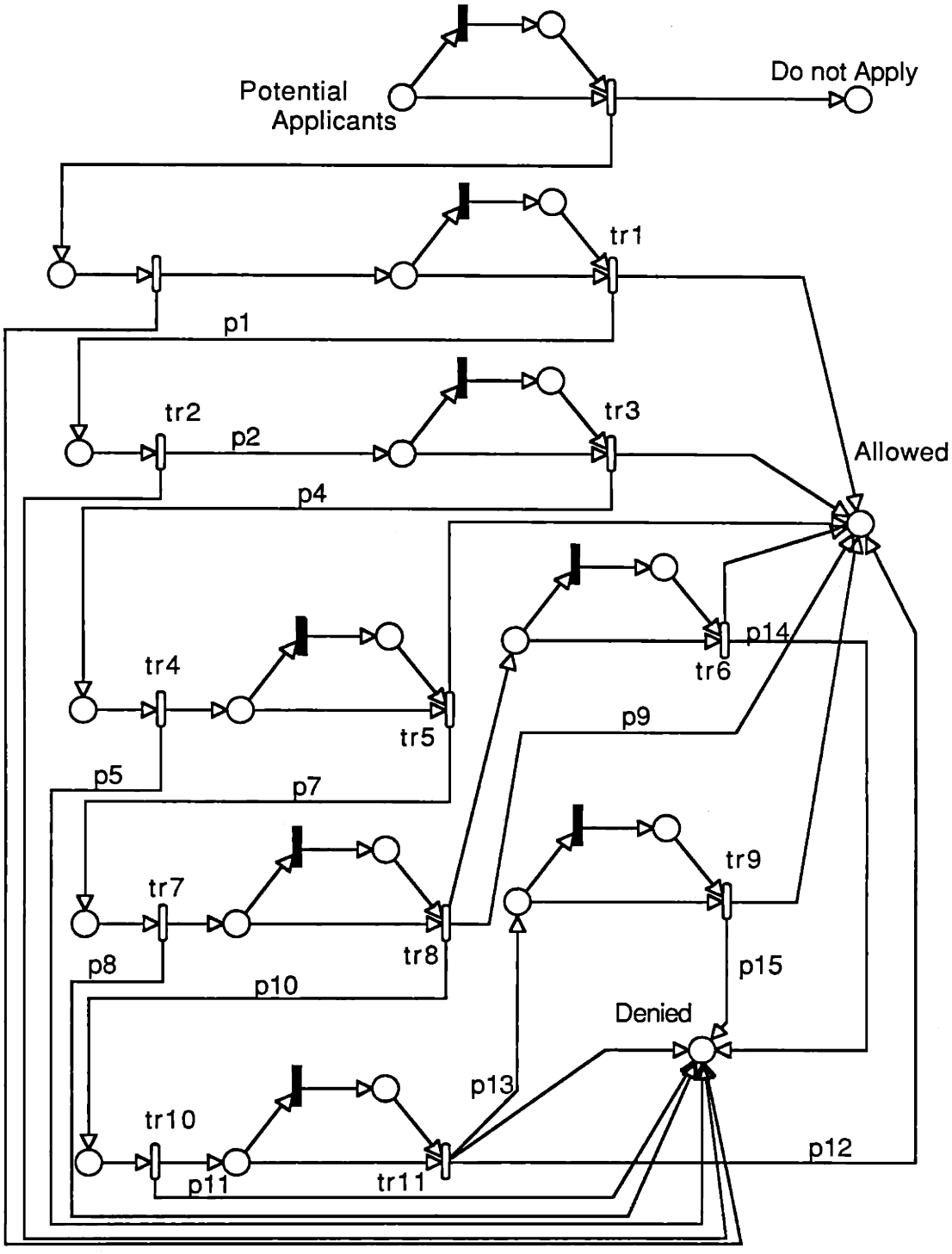

Figure 3 . Petri Net Representation of the SSDI Program

Table 2. The Delays and Probabilities of the SSDI Appeals and Determination Program (Variables)

Switch or transition	Probability a case is Allowed	Denied	Remanded	Delay
1	$1-p_1$	p_1		t_1
3	$1-p_4$	p_4		t_3
5	$1-p_7$	p_7		t_5
6	$1-p_{14}$	p_{14}		t_5
8	p_9	p_{10}	$1-p_9-p_{10}$	t_7
9	$1-p_{15}$	p_{15}		t_7
11	p_{12}	$1-p_{12}-p_{13}$	p_{13}	t_9

Switch or transition	Probability a case is Appealed	Not Appealed	Delay Appeal	Not Appeal
2	p_2	$1-p_2$	t"	t'
4	$1-p_5$	p_5	t"	t'
7	$1-p_8$	p_8	t"	t'
10	$1-p_{11}$	p_{11}	t"	t'

Table 3. The Delays and Probabilities of the SSDI Program (Numerical Values)

Switch #	Probability	Delay (days)
1	$p_1 = 0.7$	$t_1 = 46$
2	$p_2 = 0.51$	$t \leq 60$
3	$p_4 = 0.87$	$t_3 = 39$
4	$p_5 = 0.32$	$t \leq 60$
5	$p_7 = 0.42$	$t_5 = 165$
6	$p_{14} = 0.42$	$t_5 = 165$
7	$p_8 = 0.5$	$t \leq 60$
8	$p_9 = 0.04$	$t_7 = 66$
	$p_{10} = 0.89$	
9	$p_{15} = 0.08$	$t_7 = 66$
10	$p_{11} = 0.7$	$t \leq 60$
11	$p_{12} = 0.11$	$t_9 = 100$
	$p_{13} = 0.36$	

is a very low probability associated with it. Furthermore, it does not depend on factors related to the disability system.

The value for t, the period for requesting reconsideration, is not given precisely by the SSDI administration: it is smaller or equal to sixty days. In this study, we will consider two different t's : t" and t'. t" is the average time applicants take to appeal(t"< 60 days); t' is the maximum time to appeal. If the applicant does not appeal, he is considered to have left the system (t'=60 days). Throughout this study, the analysis will be done considering two distributions of t". The first assumption is that t" is uniformily distributed between 0 and 60 : t" = 30 days; the other assumption is that t" is a skewed distribution with mean 45. The results for both distributions are shown Section 3.3.

3.3 An SSDI Applicant's Possible Paths

The next step in the analysis of the SSDI program was to identify all the possible paths an applicant may follow, compute the delay associated with each path, and find the probability of each path being used.

The different paths were found by applying Petri Net theory. A Petri net with decision switches (such as the SSDI model) can be represented by a set of Petri nets with no switches (they are replaced by transitions) and by a set of rules that control the switches. (Jin et al., [13]). Each net is found by setting the switches on a certain position: therefore, there are as many nets as there are combinations of the position of the switches. If there are r switches each with S_r positions, then there are:

$$N = \prod_r S_r \qquad (3.1)$$

reduced Petri nets in the set. For example, Figure 4a shows a Petri net with one decision switch. This organization can be represented by a set of two reduced nets without decision switches by setting the switch either on position 1 or on position 2 (Figures 4b and 4c).

Within the SSDI organization, no events happen concurrently, (each place or transition has a single input and a single output); therefore, each reduced net represents a path which can be followed by an applicant . As there are 9 switches with 2 outcomes and two switches with 3 outcomes in the SSDI model, there should be:

$$N = 2^9 * 3^2 = 4608 \qquad (3.2)$$

paths. But once an applicant, whose case was following a certain net or path, has been allowed benefits or has purposely left the appeal and determination process, his case exits the system, and the rest of the path has no practical significance.

To illustrate this point, it may be helpful to look at an example. If a case has been allowed after the first DDS consideration, it does not matter how the switches of the rest of the net are positioned, since the case (or token) has already left the system; i.e., the other transitions could not be enabled as the token (or case)

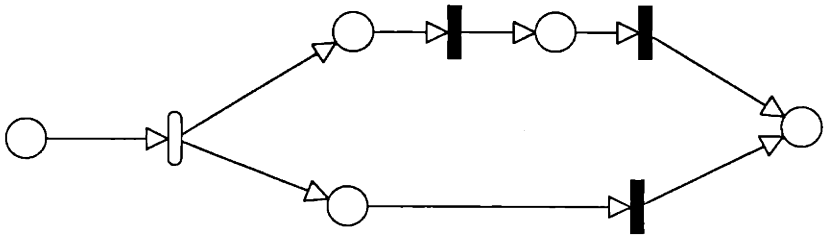

Figure 4a. The Net with a Switch

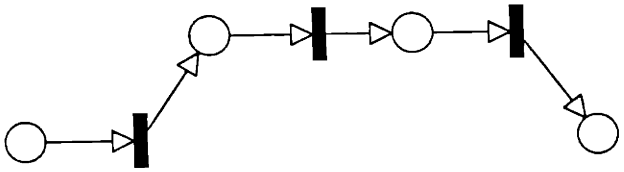

Figure 4b. First Reduced Net

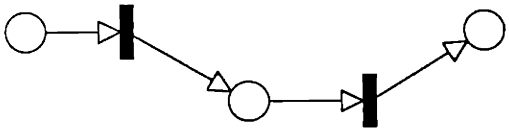

Figure 4c. Second Reduced Net

Figure 4. The Role of a Switch in a Petri Net Reprentation

left the net. Therefore, all the reduced nets, whose switches are set on the same positions (same places) until one of their switches s(i) is set on an exit place, are represented by the part of the net which lies before the switch (i) and are assumed to be similar. As a result, only 14 of the 4608 possible nets are feasible paths. Table 4 describes briefly each path. Figure 5 shows the simplest path: the applicant is allowed after the first consideration of the DDS. Figure 6 represents one of the most complex paths: the applicant appealed the DDS's decision, the DDS's reconsideration, the ALJ's hearing , the AC's decision, and he is allowed after he has been remanded to the AC by the Federal District Court. (The Petri net representation of each path is shown in Appendix A.)

Table 4. Description of Each Path

Path #	Description
1	Allowed benefits at the first DDS decision
2	Left the system after the first DDS denial
3	Allowed at the second DDS consideration
4	Left the system after the second DDS denial
5	Allowed by the ALJ
6	Left the system after the ALJ's denial
7	Allowed by the AC
8	Denied by the ALJ after the case was remanded by the AC
9	Allowed by the ALJ after the case was remanded by the AC
10	Left the system after the AC's denial
11	Allowed by the Federal District Court
12	Denied by the Federal DIstrict Court
13	Denied by the AC after being remanded by the Federal District Court
14	Allowed by the AC after being remanded by the Federal District Court

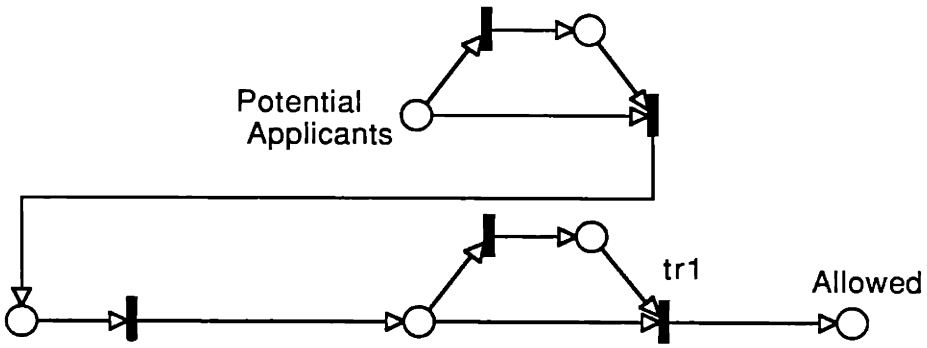

Figure 5. The Simplest Path of the SSDI Program (Path #1)

The time delay associated with each path and the probability of each path being used are computed considering that each path (or reduced net) is a sequence of places and transitions. A delay t(i) is associated with every transition i, (it is the same delay which was associated with switch i) , and for each transition , a probability $p_i(j)$ is associated with the link going from transition i to the next place of the path j .(The probability $p_i(j)$ is the probability that the switch i is positioned on the link of path j which leaves transition i. There is a relationship between the probabilities p_K, associated with each outgoing link of the switches and the the probabilities $p_i(j)$: i.e., $p_1(3)=1-p_1$.)

The time delay T(j) of path j is the sum of all the t(i)'s (associated with the transitions) of path j. The probabilities of switches taking a certain position are independent variables; therefore, the probability of a certain path being used is the product of the probabilities associated with its links.

When computing the delay on each path, it must be remembered that there are two types of delays. First, there is the delay from the SSDI's point of view

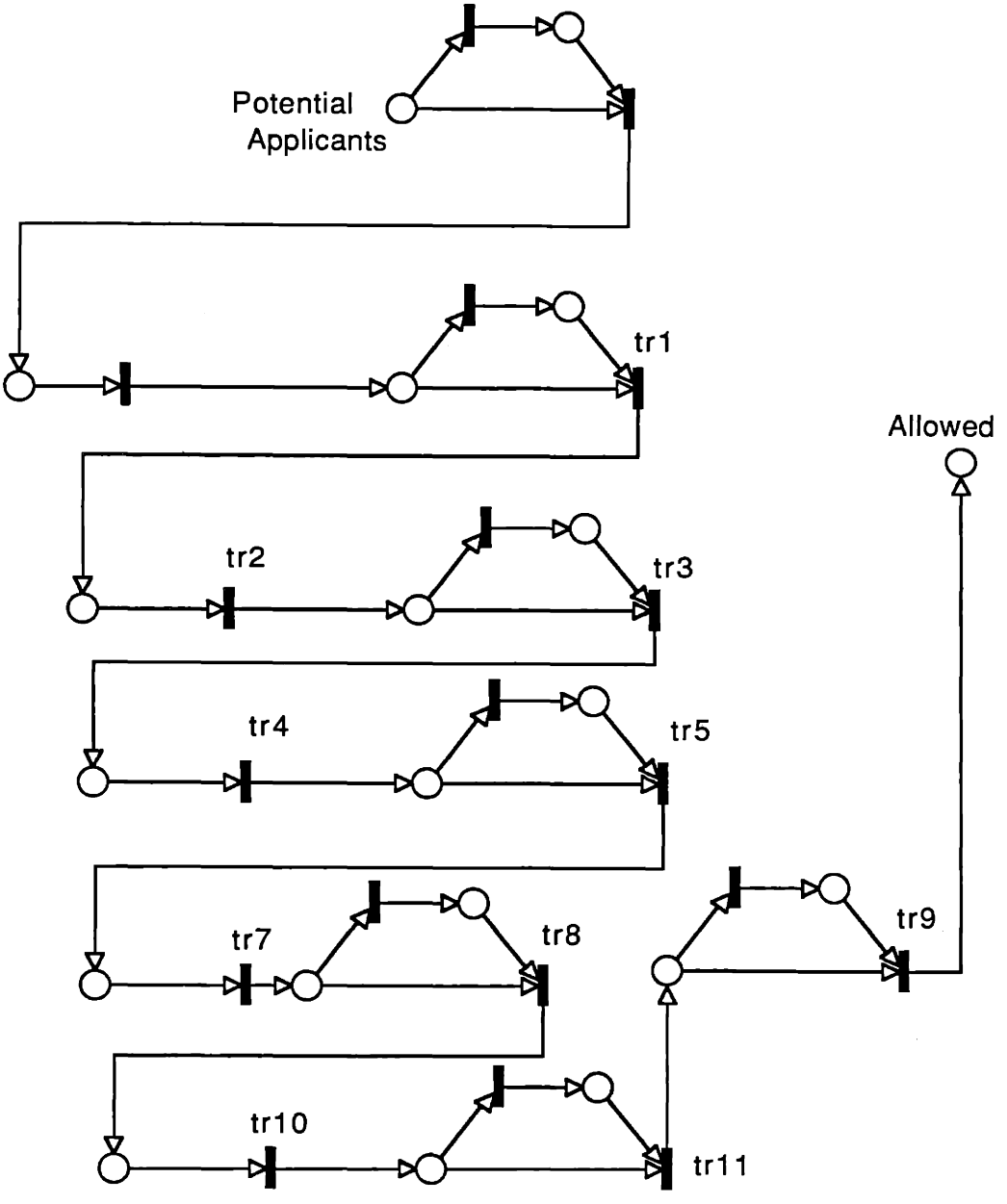

Figure 6. One of the longest Paths (Path # 14)

which includes the time between the opening of the case and the closure of the case, and second, there is the period an applicant actually stays in the system. For a given path i, the two delays will be noted T(i) and T'(i), where T(i) is the time perceived by the SSDI and T'(i) is the time perceived by the applicant. The difference between the two delays comes from the fact that when a client has been denied benefits by SSDI, the adjudicator considers that the client's case is closed only after the maximum period to appeal (t=60 days) is over. Therefore, T(i) and T'(i) will be different only for the paths where the applicant decides to leave the system, namely paths 2, 4, 6, and 10.

Example: Consider Path 2, in which the applicant does not appeal after the first denial. The delay and the probability that this path occurs were computed as follows:

$T(2) = t(1) + t' = 46 + 60$	$= 106$ days	(3.3)
$T'(2) = t(1)$	$= 46$ days	(3.4)
$P(2) = p1(2)*p2(2) = (1-p_1)*p_2 = 0.3*0.51$	$= 0.357$	(3.5)

where T (i) is the time an applicant's case is considered open by the SSDI, T'(i) is the time an applicant actually stays in the program, and P(i) is the probability an applicant follows path i.

The time delay for the SSDI and for the applicant, as well as the probability associated with each path, were computed and are shown Table 5. The delay is computed considering that t" is a uniformly distributed variable with mean 30 days, and then finally considering that t" has a skewed distibution with mean 45 days.

It appears that there are very large variations between the time delays and the probabilities of the different paths. The shortest path (Path 1) has a delay of 46 days and a probability of 30% of being used, whereas one of the longest paths (Path 14, T(14)=T'(14)) has a delay of 662 days (choosing t"=45 days and t_9=100 days), and only a probability of .03% of being used. Even though the delay on Path 14 is almost twenty times larger than that on Path 1, the probability of Path 1 being used is one thousand times larger than that of Path 14. Therefore, the

Table 5. The Delay and the Probability Associated with Each Path

Path #	Delay (Ti, in days)		Probability (Pi)
	t" = 30 days	t" = 45 days	
1	46	46	0.3
2	106	106	0.357
3	115	130	0.0459
4	175	190	0.0954912
5	310	340	0.1176928
6	370	400	0.0426129
7	406	451	0.0017045
8	571	616	0.0012528
9	571	616	0.0017301
10	466	511	0.0265479
11	536	596	0.0012515
12	536	596	0.0060308
13	602	662	0.0037683
14	602	662	0.0003277

influence of Path 14 on the expected amount of time an applicant stays in the program for the SSDI administration as well as from the applicants' point of view, will be 50 times (1000/20=50) less than that of Path 1.

This example shows that some paths may have a negligible impact on the expected delay of the system. In the next section, the importance of each path with respect to the expected delay in the SSDI system will be studied, because our major concern is to find what is the impact of each path and each service on the expected delay a disabled person applying to the the SSDI program will experience.

3.4 Expected Delays

It has been mentioned previously that there are two types of delays: the

time until a case is considered closed by the SSDI, and the time period an applicant stays in the system. Each party is interested in the expected delay that is relevant to it. The SSDI is trying to improve the way the system is managed, whereas the disabled want to have an idea of how long they should expect to wait before knowing whether they will receive benefits or not. Therefore, the expected delay of the whole system will be studied from both points of view, SSDI's and the applicants'; the results will then be compared.

But the expected delays of the whole system are not the only measures which are of interest. In previous work [6], only the expected delay of the applicants who would eventually be allowed benefits was computed. However, it seems that the expected delay of the denied cases as well as that of the whole system, could be of interest. The expected delay of the denied cases, as well as that of the whole system, could be a useful measure for the disabled workers who wonder whether they should appeal to the program or not. Halpern [4] has shown that a disabled worker's decision to apply to the SSDI program is influenced not only by the amount of possible benefits, but also by the foregone revenue of being out of work while in the program. The expected time delay of the allowed applicants, as well as that of the denied applicants, could be of interest not only to the disabled, but also to the SSDI administration. Therefore, for the SSDI, as well as for the applicants, three expected delays will be computed and analyzed : the expected delay of the whole system, that of the allowed cases, and finally that of the denied cases.

3.4.1 The SSDI's Point of View

3.4.1.1 The expected delay of all the applicants

The expected time an applicant will stay in the SSDI program is

$$E(\text{Delay}) = \sum_{i} P(i) * T(i) \qquad (3.6)$$

where T(i) is the delay associated with path i, and P(i) is the probability of path i being used .

In order to compute the expected delay, a value must be assigned to t" (the average time an applicant takes to appeal), because most of the T(i)'s are a function of t". As mentioned previously, the expected delay of the program was computed for two values of t" , (assuming that t(9) =100 days):

1) t"=30 E(Delay)= 147 days (3.7)
2) t"=45 E(Delay)= 156 days (3.8)

It has been mentioned in section 3.3 that some paths may have a much smaller impact on the expected delay than others; Path 14 is an example. The paths which have a probability of less than one percent of being used (Path 7 and Paths 9 to 14) should be of little importance when computing the expected time an applicant's case will be considered open. Even though long delays are associated with them, the probability of them being used is so small that their impact will be negligible on the expected delays. Figure 7 shows the probability mass function of the delay with respect to each path (for t"= 45 days); a path i being represented by its own delay T(i). In order to understand what the impact of each path is on the expected delay of the program, the sensitivity of the expected delay with respect to

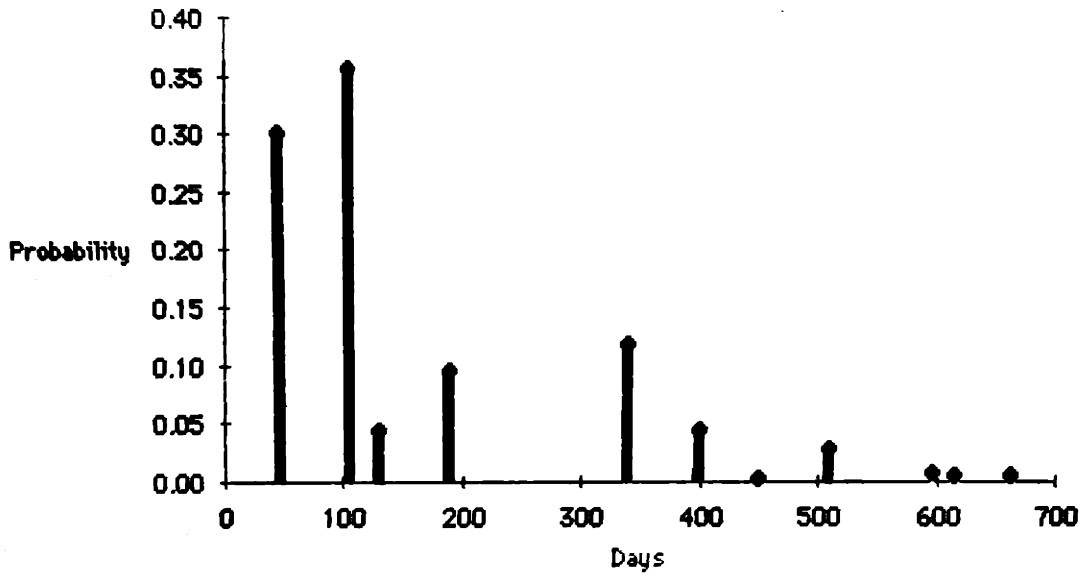

Figure 7. Pmf of the Delay (SSDI's Viewpoint)

each path was computed as follows:

$$S(i) = [\partial(E(Delay) / \partial(C(i))] * [C(i) / E(Delay)] \quad (3.9)$$

$$C(i) = P(i) * T(i) \quad (3.10)$$

where C(i) is the weighted value of path i, S(i) is the sensitivity of delay with respect to path i, P(i) is the probability of path i being used, T(i) is the delay associated to path i, and E(Delay) is the expected time a case stays in the system from the SSDI's view point.

The sensitivity of delay with respect to each path, as well as the weighted values, are shown in Table 6 (for t"=30 days and for t" = 45 days). It has

Table 6. Sensitivity of the Delay with Respect to the Different Paths (SSDI's Viewpoint)

Path #	Sentivity (in percent)	
	t"=30 days	t"= 45 days
1	9.4	8.9
2	25.8	24.3
3	3.5	3.7
4	11.4	11.6
5	24.8	25.7
6	10.7	10.9
7	0.5	0.5
8	0.5	0.5
9	0.7	0.7
10	8.4	8.7
11	0.5	0.5
12	2.2	2.3
13	1.5	1.6
14	0.1	0.1

already been mentioned that some paths, particularily Path 7 and Paths 9 to 14, have a negligible impact on the expected delay. The results not only confirm this assumption, but also show that the sensitivity of the remaining paths varies very significantly from one path to an other. Path 2, in which the applicant leaves the system after the first DDS decision, and Path 5, in which the applicant is allowed benefits by the ALJ, result in sensitivities of 24.8 and 25.7 percent (for t"=30 days), whereas Paths 1 (allowed after first DDS decision), 4 (exit the system after DDS reconsideration is negative), 6 (exit the system after ALJ denies benefits), and 8 (exit the system after AC denies benefits) each result in a sensitivity of approximately 10 percent. The sensitivity of the expected delay to the last eight paths, Paths 3, 7, and 9 to 14, ranges from 0.13 to 3.5 percent.

The sensitivity of the expected delay with respect to six of the fourteen paths is larger than 10 percent. This result is impressive but not suprising, considering that the seven of the other paths have a probability of being used which is less than one percent. However, the suprise comes from the fact that the sensitivity with respect to two paths, Paths 2 and 5 cause sensitivities of almost 25 percent. Path 2 (the applicants drop out after the first denial) has a short delay (T(2) = 116 days), but Path 5 (the applicants are allowed benefits by the ALJ) has a delay of 340 days. In the first case, the large sensitivity is due to the large number of people who leave the system after the denial of the first DDS decision, where as in the second case, it is due to a combination of a relatively high probability that a disabled who applies will be allowed benefits by the ALJ (P(5)=0.11) and a relatively long delay.

3.4.1.2 The expected delay of the applicants who are allowed

The expected time an applicant who will receive benefits stays in the system is:

$$E(\text{Del.all.}) = \left(\sum \beta_\alpha * P(a) * T(a) \right) / P(\text{a case is allowed}) \qquad (3.11)$$

$\beta_\alpha = 1$ if a case following path a is allowed
$\beta_\alpha = 0$ if a case following path a is denied

$$E(\text{Del. all.}) = (P1*T1 + P3*T3 + P5*T5 + P7*T7 + P9*T9 + P11*T11 + P14*T14) / P(\text{a case is allowed}) \quad (3.12)$$

where P(a case is allowed) is 0.4673.

The value was computed for t" = 30 days and t" = 45 days; assuming that t9=100 days.

a) t" =30 days E(Del. all.) = 124 days (3.13)

b) t" = 45 days E(Del. all.) = 134 days (3.14)

The expected delay of the allowed applicants is shorter than that of the whole system. It is approximitavely 20 days less than that of the total expected delay. The probability mass function of the expected delay of the allowed cases is shown Figure 8 (for t" = 45 days). The delay is unevenly distributed between the different paths . There are two peaks. One is caused by Path 1 represented in Figure 8 by T(1)=46 days; the probability of Path 1-the cases are allowed after the first DDS decision- being used by an allowed case is 64.2%. The other peak is caused by Path 5 represented by T(5) = 340 days; the probability of Path 5 -cases are allowed by the ALJ- is 25.2 percent. The average delay of the allowed cases, 134 days, is nearer Path 1 than Path 5. In order to find the actual impact of each path on this average delay, the sensitivity of the average time an allowed case stays in the program was computed with respect to each path; the results are shown in Table 7 . The results (computed for t"=45 days) are surprising. The sensitivity with respect to Path 5 is 64 percent and the sensitivity with respect to Path 1 is 24 percent, that with respect to Path 3 (allowed after DDS reconsideration) is 9.5 percent, whereas the sensitivity with respect to the other four paths is less than 0.5 percent.

Remarks

It seems normal that the sensitivity with respect to the first Path is 24

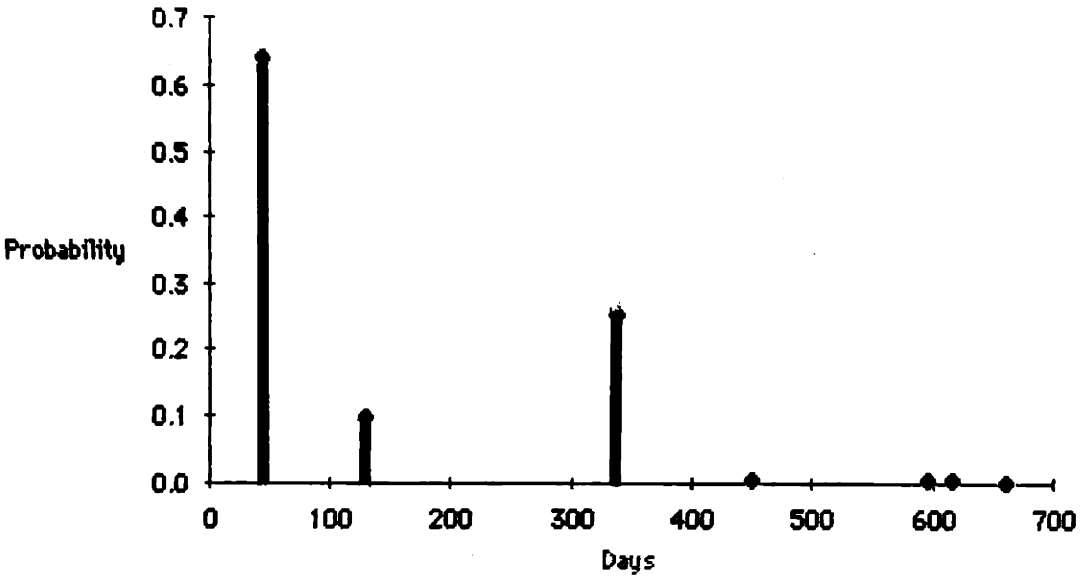

Figure 8. Pmf of the Delay of the Allowed Cases

percent, but that the sensitivity with respect to Path 5 is 64 percent, when that of Path 3 is only 8.7 percent, makes us wonder what is the role of the DDS reconsideration and why the cases which are allowed by the ALJ were not allowed at an earlier stage. (Only 13 percent of the cases which are reconsidered by DDS are allowed at this stage, when 58 percent of the cases reviewed by the ALJ are allowed.) The very high percentage of acceptances by the ALJ's probably occurs because this stage is the first independent stage outside the DDS system. It is also important to keep in mind that the case which is reconsidered by the DDS is often very similar to that which was presented to the first DDS adjudicator. When a case reaches the ALJ to be considered again, the applicant's file is often much thicker than it was for the DDS considerations, since the applicants have had time to collect most, if not all, the necessary information as well as doctors' reports which will help them to defend their case in the most effective way.

Table 7. Sensitivity of the Delay of the Allowed Cases with Respect to the Different Paths

Path #	Sensitivity (in percent)
1	22.1
2	0.0
3	9.3
4	0.0
5	64.1
6	0.0
7	1.2
8	0.0
9	0.9
10	0.0
11	1.2
12	0.0
13	0.0
14	0.3

3.4.1.3 The expected time denied cases stay in the program

The expected delay of the denied cases may be expressed as follow:

$$E(\text{Del. Den.}) = \left(\sum \beta_{\alpha} * P(d) * T(d) \right) / P(\text{a case is denied}) \qquad (3.15)$$

$\beta_{\alpha} = 1$ if a case which follows path d is denied benefits
$\beta_{\alpha} = 0$ if a case which follows path d is allowed benfits

$$E(\text{Del. Den.}) = (P2 * T2 + P4 * T4 + P6 * T6 + P8 * T8 + P10 * T10 + P12 * T12 + P13 * T13) / 0.5327 \qquad (3.16)$$

The expected delay was computed for t"=30 days and t" =45 days

a) t" = 30 days E (Del. Den.) = 167 days (3.17)
b) t" = 45 days E (Del. Den.) = 175 days (3.18)

The expected time an applicant (who will be denied benefits) stays in the system is about 45 days longer than that of an applicant who will be allowed benefits. This is an important difference, if one considers that the applicants whose cases are denied will most probably have to go back to the labor force and look for a job; they are the applicants for whom the time delay is the most important. But this figure gives the delay from the SSDI's point of view and not the applicants': The 60 days limit to appeal which is given to the applicant after his case was denied is included in the expected delay even if the client does not appeal. (The applicant's expected delay, which will be discussed later, is shorter).

The probability mass function of the delay of the denied cases is shown Figure 9 . The probability of a path being used by an applicant who will not receive benefits decreases as the length of the path increases. From Figure 9, it seems

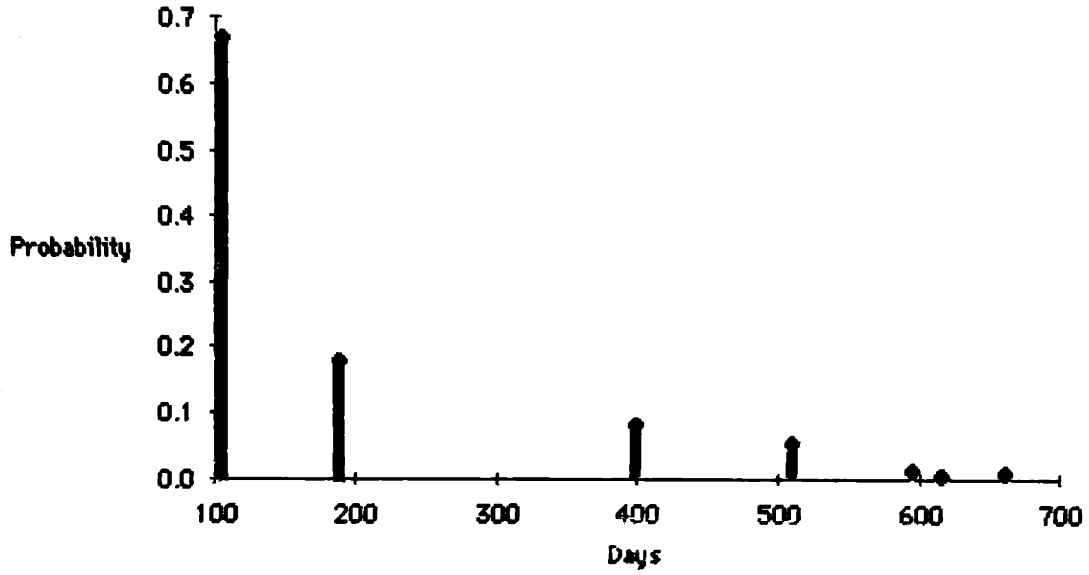

Figure 9. Pmf of the Delay of the Denied Cases (SSDI's Viewpoint)

that Path 2, where the applicants leave the process after the first denial, is the path which has the most impact on the delay. In order to verify this assumption, the sensitivity of each path with respect to the delay of the denied cases was computed. The results are shown Table 8. The sensitivity of the delay with respect to Path 2 is 41 percent, whereas the sensitivity with respect to Path 4 (the applicants leave the process after the second DDS denial), Path 6 (the applicants leave the process after the ALJ denial), and Path 10 (the applicants leave the process after the AC denial), vary from 14 to 19 percent. The sensitivity of the delay with respect to the last three paths, Path 8 (denied by the ALJ after remanded by the AC to the ALJ), Path 12 (denied by the AC after remanded to the AC by the Federal District Court), and Path 13 (denied by the Federal District Court) is negligible; it is less than 5 percent.

Table 8. Sensitivity of the Delay of the Denied Cases with Respect to the Different Paths (SSDI's Viewpoint)

Path #	Sensitivity (in percent)
1	0.0
2	40.5
3	0.0
4	19.4
5	0.0
6	18.2
7	0.0
8	0.8
9	0.0
10	14.5
11	0.0
12	3.8
13	2.7
14	0.0

Remarks

The fact that the sensitivity of Path 2 is 41 percent shows that a very large part of the delay is caused at the first stage by applicants who do not stay for long in the system, as they do not appeal the first DDS denial. However, the sensitivity sensitivity caused by Paths 6 and 10 is large, considering that the applicants who follow these paths have appealed two or three decisions.

Looking at the delay from the SSDI' s point of view, it is not quite certain whether a long expected delay for the denied cases is negative or not. A long delay will tend to scare applicants away and maybe discourage people who are not convinced that they should receive benefits from applying. But the longer a case stays in the system , the more man-hours have to be used in handling the case and the harder it is to keep track of the files. A reduction of the delay would most probably have a double effect; it would decrease the number of man-hours in handling the cases, but it would increase the number of SSDI applicants (in particular the applicants who have debated a lot before applying) (Halpern, [4]), and increase the costs, not only of processing the cases, but maybe of paying benefits. It has been shown by Halpern that an applicant's decision to apply for benefits is influenced for the most part by the possible amounts of benefits, but also by the cost (foregone wages) of not working while in the program and then looking for a job when denied benefits.

3.4.1.4 The Expected delays from the SSDI's point of view (Conclusion)

The following six paths have the most impact on the expected delay of the SSDI program, when looking from the SSDI point of view:

Path 1 : allowed by first DDS consideration
Path 2 : drop out after first denial
Path 4 : drop out after second DDS denial
Path 5 : case allowed by the ALJ
Path 6 : drop out after ALJ's denial
Path 10 : drop out after AC's denial

It seems that the expected delays could be reduced by either increasing

the accuracy and definiteveness of the first two DDS decisions,(in order to reduce the number of cases appealing so many decisions) or by decreasing the average time applicants take to appeal (by simplifying the appeals process for example). In the next section, the expected delays from the applicants' point of view will be analyzed.

3.4.2 Expected Delay From the Applicants' Point of View.

When looking from the applicants' point of view, the expected delays are much shorter, because it was assumed that the applicants consider themselves out of the program once they are denied benefits and not after the 60 days limit they have to appeal is over.

Equation 3.4 showed the total expected delay from the SSDI point of view; the expected delay was expressed as a function of the delay T(i) associated with each path i. One could have a different approach and re-express the expected delay as a function of the delays associated with each stage of the program: i.e., the delay , t_j, necessary to process a case at stage i:

$$\begin{aligned} E(Delay,SSDI) &= \Sigma P(i) * T(i) \\ &= \Sigma P(i) * [\Sigma \beta_{ij} * t_j] \\ &= \Sigma \Sigma P(i) * (\beta_{ij} * t_j) \\ &= \Sigma t_j * \Sigma (P(i) * \beta_{ij}) \end{aligned} \qquad (3.19)$$

where $\beta_{ij} = 0$ if transition j does not belong to path i
$\beta_{ij} = 1$ if transition i belongs to path i

When values are substituded in equation 3.19, the expected delay of the program from the SSDI' s point of view is expressed as:

$$E(Delay,SSDI) = t_1 + 0.343 * t_3 + 0.206 * t_5 + 0.0467 * t_7 + 0.0114 * t_9 + 0.522 * t' + 0.600 * t'' \qquad (3.20)$$

The expected delay from the applicants' point of view is very similar to that of the SSDI's view except that the delay t' is set to 0. Therefore the expected

delay from the applicants' view may be expressed as :

$$E(\text{Delay,Appl.}) = t_1 + 0.343 * t_3 + 0.206 * t_5 + 0.0467 * t_7 + 0.011 * t_9 + 0.600 * t'' \quad (3.21)$$

As a result, the applicants' expected delay for the whole system, as well as for the denied case, is reduced by approximatively 31 days ($0.522_*60=31.32$ days). The probability mass function of the delays with respect to the ti's is shown in Figure 10. Figure 10a shows the SSDI's viewpoint, whereas Figure 10b shows the applicants' viewpoint.

The delay of the whole system, as well as that of the denied cases, are discussed in the next sections. The expected delay of the allowed cases is the same for the applicant and for the SSDI since the maximum time given to appeal is not taken into account.

3.4.2.1 The average time an applicant should expect to stay in the system

The total expected delay function is shown equation 3.10. The actual number was computed for both t"= 30 days and t"=45 days.

For t" = 30 days E(delay,total) = 116 days (3.22)

For t" = 45 days E(Delay,total) = 125 days (3.23)

The probability mass function of the delay with respect to the different paths is shown Figure 11. From Figure 11, it appears that the first five paths have a large impact on the delay, whereas the other nine paths have a much smaller impact; this hypothesis is reinforced by the fact that the mean of the delay is situated between Paths 1,2 and 3,4, between the two shortest delays: 46 and 130 days.

In order to prove this hypothesis, the sensitivities of the delay with respect to the different paths was computed again. As the results were very similar for t" =45 days and t" =30 days, the analysis was done only for the value of 45 days and are shown Table 9 . As it was expected from the analysis of the SSDI's point of view, the sensitivity caused by each path varies significantly among all the paths.

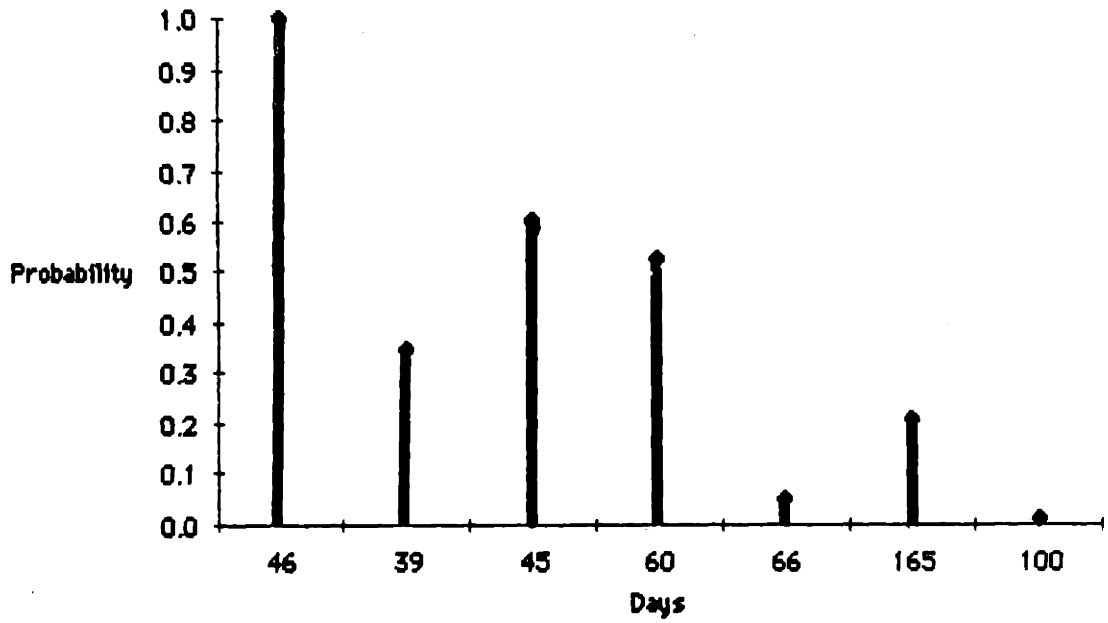

Figure 10a. SSDI's Viewpoint

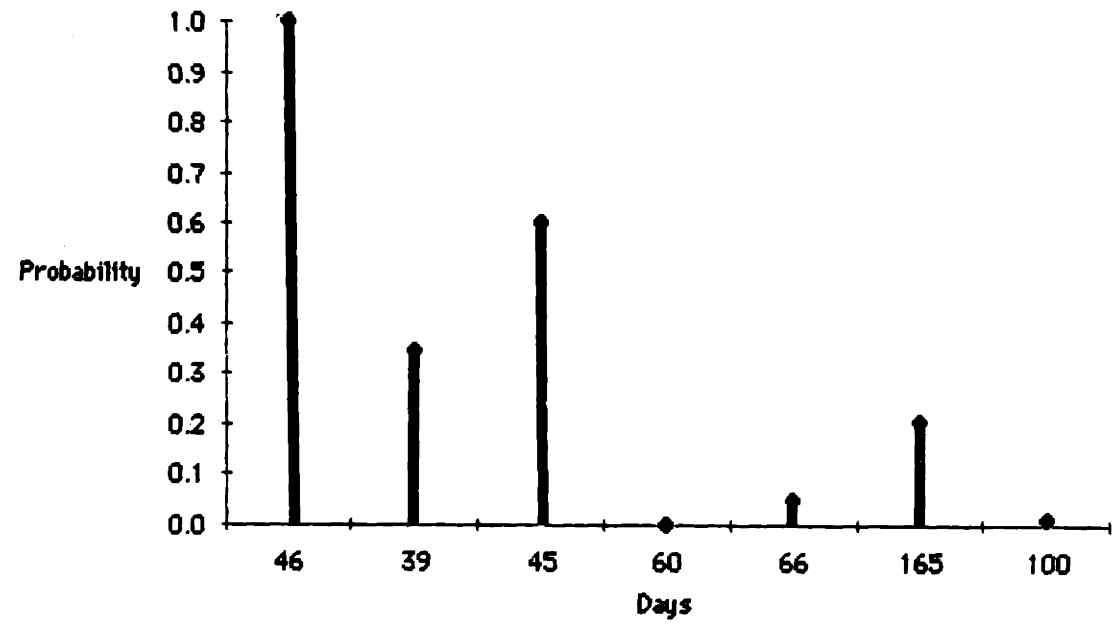

Figure 10b. Applicants' Viewpoint

Figure 10. Pmf of the Delay with Respect to the Different Stages

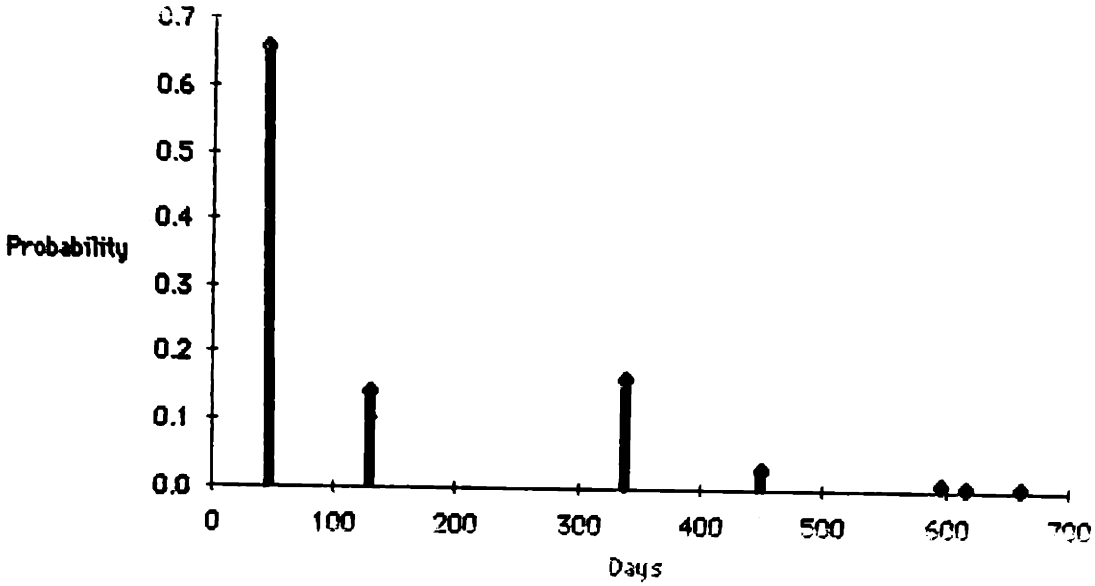

Figure 11. Pmf of the Delay (Applicants' Viewpoint)

Path 5 (applicants allowed by the first ALJ decision) causes a sensitivity of almost 26 percent, when Path 14 , allowed by AC after being remanded by the Federal District Court causes a sensitivity of less than 1 percent. The analysis shows that Path 5 is as important for the SSDI (in terms of average delay) as it is for the applicant -the sensitivity of delay with respect to Path 5 is almost the same from the SSDI's point of view and from the applicants'- (S(path5)=25%). However, the impact of Path 2 (applicants drop out after first DDS denial), has decreased from 24 percent to about 14 percent. The smaller sensitivity caused by Path 2 is due to the much shorter delay applicants associate to Path 2 (46 days as opposed to 106 days). All the other paths have a slightly larger share from the applicants' views than from the SSDI's view. Path 1 (allowed after first DDS consideration), Path 2 (left the system after first DDS denial), Path 4 (left the system after second DDS denial), Path 6 (left the system after ALJ denial), and Path 10 (left the system after AC denial), each cause a sensitivity of approximatively 10 percent .

Remarks

It is more attractive for disabled people to apply to the program if they

Table 9. Sensitivity of the Delay with Respect to the Different Paths (Applicants' Viewpoint)

Path #	Sensitivity (in percent)
1	11.1
2	13.2
3	4.7
4	10.0
5	32.1
6	11.6
7	0.6
8	0.6
9	0.9
10	9.6
11	0.6
12	2.9
13	2.0
14	0.2

know that they can exit the system within 46 days, than if they know that the minimum time they have to wait in case that they are denied benefits is 106 days.

3.4.2.2 The average time applicants who are denied benefits stay in the program

The expected delay of the denied cases may be expressed as follows.

$$E(\text{Del. Den.}) = (P2 * T'2 + P4 * T'4 + P6 * T'6 + P8 * T'8 + P10 * T'10 + P13 * T13 + P14 * T14) / P(\text{a case is denied}) \quad (3.24)$$

where $T'i = Ti\text{-}t' = Ti - 46$ days

$P(\text{denied}) = 0.5327$ = Probabilty that a case is denied by SSDI

The expected delay of the denied cases is computed for two values of t".

a) t" = 30 days	E(Del. Den.) = 108 days	(3.25)
b) t" = 45 days	E(Del. Den.) = 117 days	(3.26)

The probability mass function of the delay with respect to each path is shown Figure 12 . This pmf is very similar to that of the denied cases from the SSDI point of view; the difference is that the first four paths, Paths 2,4,6,and 10 are shifted by 60 days. In order to find the impact of each path, the sensitivity of the average delay of the denied cases (from the applicants' point of view) was computed with respect to each path. Table 10 shows that Path 2 (the applicants exit the system after DDS denial), Path 4 (the applicants exit the system afte second DDS denial), Path 6 (the applicants exit the system after AIJ denial), and Path 10 (the applicants exit the system after AC denial), all have a fairly similar impact on the average delay; the sensitivity of the delay with respect to these paths

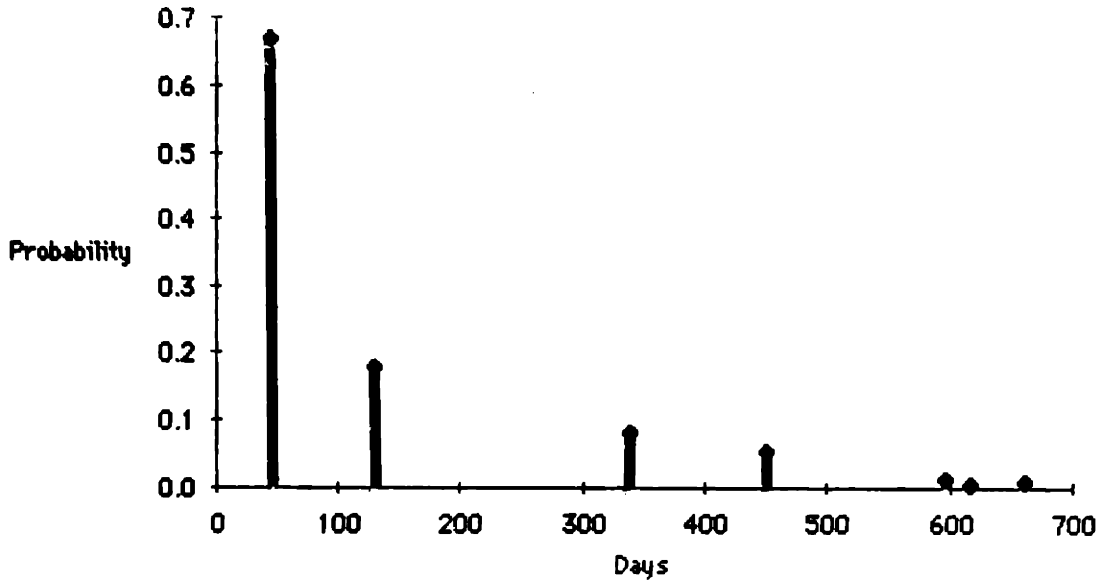

Figure 12. Pmf of the Delay of the Denied Cases (Applicants' Viewpoint)

Table 10. Sensitivity of the Delay of the Denied Cases with Respect to the Different Paths (Applicants' Viewpoint)

Path #	Sensitivity (in percent)
1	0.0
2	26.4
3	0.0
4	20.0
5	0.0
6	23.3
7	0.0
8	1.2
9	0.0
10	19.3
11	0.0
12	5.8
13	4.0
14	0.0

varies from 19 to 28 percent. This result is quite different than that obtained when looking from the SSDI's viewpoint where the sensitivity with respect to Path 2 was 40 percent; from the applicants' viewpoint, the sensitivity of the delay with respect to Path 2 is 28 percent . The sensitivity with respect to Path 12 (applicants denied by the Federal District Court) is almost 6 percent, and that with respect to Path 13 (applicants are denied benefits after they have been remanded to the AC by the District Court) is almost 4 percent. This is a large figure when considering that the applicants who exit the system through these paths have stayed more than a year and a half out of the labor force and they do not receive benefits. After such a long time, it is very hard for them not only to find a job, but also to keep it as they have a disability and their behaviour patterns have changed.

3.4.3 Expected Delays and the Different Paths

From this analysis, it seems that the expected delays from the SSDI's viewpoint could be reduced either if the average time workers needed to appeal decisions was shorter, or if less people decided to appeal adjudicators' decisions; whereas from the applicants' standpoint, it seems that it is mostly the latter reason which would decrease the delay. The appeals process is very complex and time consuming. An SSDI applicant who decides to appeal an adjucator's decision must gather all the necessary information (doctors' reports., X-rays,...) and fill in all the required forms before he appeals. If the appeals process was simplified, the average time a disabled worker takes to appeal would be reduced and, as a result, the average delay of the system would also be reduced (both from the SSDI's and applicants' view.)

The very high percentage of disabled workers who appeal decisions has a crucial impact on the average delays: 49 percent of the applicants who are denied benefits at the first DDS decision appeal at least one decison. There are several reasons that could explain why so many people appeal.

First, many applicants do not have a complete file (even though they probably do not know that they are missing some important information) when they first apply to the program. Most of the applicants who are reconsidered by the DDS present essentially the same information that they presented when they first applied for benefits. This is probably one of the reasons why only 13 percent of the DDS reconsiderations, when 58 percent of the cases reviewed by the ALJ, are allowed. When the applicants appeal to the ALJ, they know what to present and what to omit, a real investigation is made, the lawyers have come in, and there is a person to person interview; all these factors are often favorable to the applicants. It seems that if perspective applicants were better informed on the information they need to present, and if they were advised on how to present their cases in order to convince the adjudicators that they should receive benefits (assuming they should), the average delay would be reduced as fewer workers would present incomplete or inadequate files at the first stages (and they would not need to appeal).

Second, from what one hears in the media, the eligibility system is not well managed and it is neither fair nor consistent. Hearsay cases of people who really should receive benefits and do not receive any, when others who are not in

real need receive benefits not only from the SSDI, but also from two or three other agencies are often mentioned. It seems that something could be done at the DDS level. If fewer DDS decisons were changed at other stages of the program, the number of cases allowed at further stages would first decrease, and then applicants would have a lower incentive to appeal the DDS decisions, as their chance of being allowed would be much smaller. The inconsistency of the determination system is due to the fact that "SSA guidelines for determining benefit eligibility require a good deal of judgement on the part of the agency making the determination, although improvement in theses guidelines has occurred recently. A General Accounting Office study [15] , in which 11 state agencies and adjuducators at the Bureau of Disasbility Insurance (BDI) in Baltimore reviewed the same 221 DI and SSI claims, showed that the agencies could agree to either approve or deny only 38 of these claims, and in many cases where several agencies agreed on the same disposition different rationales were offered for the decision. This study underscores the difficulty state agencies have in determining whether an individual qualifies for DI benefits. " (Halpern, [4]).

The lack of consistency is felt more particularly at the DDS level; therefore an effort at this stage would improve the overall performance of the system, and reduce the impact of Path 5 which causes a sensitivity of almost 25 percent. It seems that if there was a higher level of consistency, the system would develop a reputation of being fair and reliable. (Now, it is possible for disabled workers to move to another state and apply for benefits because they have been denied in their own state.). If the system was more consistent, workers would be able to observe from the media, fellow workers, friends,etc...what are the qualifying criteria to receive disability benefits from the SSDI program. Workers would be able to judge much more accurately whether they should appeal an adjudicator's decision or not, and most probably fewer applicants would appeal decisions. A more consistent program would also result in a shorter average time cases stay in the program, a more manageable SSDI program (as the average cases would not stay as long in the program), and there would not be a feeling of discontentment and resentment towards the SSDI as there seems to be now.

CHAPTER IV

THE SSDI PROGRAM: SOME PROJECTIONS

4.1 SSDI applicants: 1960 to 1984.

The number of SSDI applicants and beneficiaries has drastically increased over the years, particularily between 1967 and 1979, when the number of people receiving monthly disability insurance benefits increased from 2.1 to 4.8 million. Over the same period, the total monthly benefits paid increased by a factor of 7.4, from $148 million to $1.1 billion [5]; in 1979 the total SSDI expenses were $14.2 billion [4].

Between 1979 and 1984, however, the number of SSDI benificiaries was very significantly reduced; it fell from 4.8 million in 1979 to 4.5 million in 1981, and to only 3.8 million in 1984. The sharp decrease in 1984 was the result of very strict governmental policy, which aimed in reducing the Social Security spending: the number of allowed cases were suddenly reduced and many people who were receiving benefits were declared recovered and were taken off the rolls. Very soon after, however, a large proportion of those people were allowed benefits again and the determination criteria were somewhat loosened. In the remainder of this chapter, projections of the number of SSDI applicants, SSDI recipients, as well as the caseloads of the adjudicators at each stage will be made. First, the computer model which was used to obtain the projections will be discussed. Then, projections of the number of SSDI applicants and beneficiaries will be shown and finally the impact of the growing number of applicants on the SSDI administration will be discussed.

4.2 The Computer Model

In 1983, a computer model simulating the SSDI appeals and

determination program was created by Levis et al. [6]. This model was based on the August 1982 print from the Commitee of Finance describing the SSDI appeals and determination program, and providing data for 1981 [10].

The input to the computer program is the number of US residents (belonging to the workforce), who become disabled in a given fiscal year, and the output is the number of SSDI applicants, as well as the number of allowed and denied cases for that year. Since throughout this thesis a simplified version of the SSDI program was studied (it was assumed that when a case was remanded either by the AC to the ALJ, or by the Federal District Court to the AC, the applicant could not appeal the decison: he was either allowed benefits or denied benefits and exited the system), a few changes were made to the computer model so that the SSDI projections would be consistent with the study of time delays of chapters 2 and 3. Actually, the program was modified even more as it seemed that it would be interesting not only to look at the projection of the number of applicants, cases allowed and denied, but also at the projections of the caseload at each stage: how would the SSDI administration be affected by an increase in the number of cases going through the system? The new version of the program produces the number of cases allowed and denied, as well as the number of cases going through each stage of the system.

When the computer model was created, it was assumed that both the number of applicants, and the number of SSDI recipients would increase at the same rate as the newly disabled population. Even though constant rates are quite improbable, the model is useful since it gives a general idea of how the number of SSDI applicants and recipients will evolve till the year 2020 if the incentives for disabled workers to apply to the program and the determination policies do not change over the years. It appears almost impossible to project the application as well as acceptances and appeals rates. In section 4.1, it was shown that from the 1960's till now, the application rates as well as acceptance rates have varied very significantly. Halpern [4], explained these changes saying that the program slowly became known to workers, and was then influenced by governmental policies as well as the economic situation. However, the system has matured since its beginnig in 1957, and the government has realized that it can not take drastic measures to reduce the number of benificiaries (i.e., as in 1984). Thus, one may

assume that the system has stabilized.

4.3 Projections of the Number of SSDI Applicants and Beneficiaries

The projections from 1980 to 2020 of the newly disabled US labor force, as well as the projections of the number of SSDI applicants, recipients and denied cases are shown Table 11. Considering our assumptions, there will be 41.4 percent more SSDI applicants and cases allowed benefits in 2009 than there were in 1981. The number of applicants will increase fairly rapidly up to 2009 and then will slightly decrease, before it increases again and the changes dampen. Because of the model used, the SSDI applicants follow the same pattern as the newly disabled population: their number increases rapidly because of the ageing of the population and the people born during the baby boom who reach their mid fifties near 2009 (the age-groups 45 to 54 and 55 to 64 have the highest disability incidence.)

The large increase in SSDI applicants and beneficiaries will not only increase the amount of money paid for benefits, but also the costs of handling the cases: medical examinations, medical staff,..... Several issues are raised by such projections. The first is a financial problem; additional funds will be needed to pay the benefits for the larger number of recipients and the associated SSDI expenditures. The second is more a managerial issue and will be discussed in section 4.4 : how are the adjudicators at the different stages going to handle a 41.4 percent increase in the number of cases that must be processed in year 2009 ? Where is the SSDI program going to find the funds to run the program and also pay benefits to the cases allowed ?

In 1977, when the financial crisis in the Social Security Insurance program became of great public and governmental concern, a bill was passed to raise scheduled payroll taxes and levels of taxable earnings in order to help the SSI's financial situation. Will such a measure be needed in the year 2000 ? Because the population is ageing, the number of non-disabled workers is going to rise much more slowly than the number of disabled and retired workers. Therefore, it seems quite unrealistic to believe that the non-disabled workforce will be able to

Table 11. SSDI Applicants and Beneficiaries: 1980-2020

(in thousands)

YEAR	NEW.DIS.	APP.	ALLOWED	DENIED
1980	1302	881	411	469
1981	1456	985	460	525
1982	1474	997	466	531
1983	1491	1010	472	538
1984	1508	1020	477	543
1985	1527	1033	483	550
1986	1546	1046	489	557
1987	1566	1060	495	564
1988	1586	1073	501	571
1989	1608	1088	508	579
1990	1638	1108	518	590
1991	1658	1122	524	597
1992	1681	1138	531	606
1993	1702	1152	538	613
1994	1726	1168	546	622
1995	1750	1184	553	631
1996	1776	1202	561	640
1997	1801	1219	569	649
1998	1829	1238	578	659
1999	1858	1257	587	670
2000	1879	1272	594	677
2001	1911	1293	604	689
2002	1942	1314	614	700
2003	1976	1337	625	712
2004	2011	1361	636	725
2005	1959	1326	619	706
2006	1982	1341	627	714
2007	2007	1358	634	723
2008	2033	1376	643	733
2009	2059	1393	651	742
2010	1952	1321	617	703
2011	1961	1327	620	707
2012	1968	1332	622	709
2013	1977	1338	625	712
2014	1984	1343	627	715
2015	1931	1307	610	696
2016	1931	1307	610	696
2017	1933	1308	611	697
2018	1933	1308	611	697
2019	1936	1312	613	699

support the disabled and the elderly through an increase in taxes alone. Funding the disability insurance program will become more and more a problem over the next 25 years.

Other measures should be considered to deal with this problem. Organizations which have been working with the disabled populations such as the Menninger Foundation, propose several programs which could decrease the financial burden created by the disabled and help the disabled return to productive employment. Some suggestions would be to prevent disability by increasing the safety on the jobs, bettering the working conditions, and very important, improving the relationship between the workers and the disability councelors. Studies indicate that if a disabled worker is helped and counseled soon after the occurence of his disability, or as the disability progresses in the case of a chronic disability, his chance of going back to work is much greater. Another solution which could be taken in consideration at the same time as the ones mentioned above, would be to encourage employers to create a program that would rehabilitate (as often as possible) a disabled person within the same company. Some large companies already have such a program; the worker is employed doing another job that is not contraindicated by his disability or he works half time if he can not work for a full day. Finally, a change in the SSDI regulations could encourage the rehabilitation of the disabled. According to the present set of rules, as soon as a disabled finds a job and earns more than $50 a month, his disability benefits are cut or drastically reduced (Halpern et al.,[5]). This measure does not encourage the disabled to look for a job, first because they often need to go through the rehabilitation program which is not very well designed for the disabled workers (Hester et al, [7]), second, because while working they might receive a monthly income which is lower than their SSDI monthly benefit, and finally because if they loose their job, they do not automatically receive benefits again.

The projected increase in the number of newly-disabled SSDI applicants and SSDI beneficiaries should encourage a reevaluation of the SSDI and VR programs, in order to make changes that would help the rehabilitation of the workers, and encourage the companies to realize that disability is a real problem, that can not only be dealt with by Social Security, but should also be dealt with by the companies.

4.4 Projections of the Number of Cases Handled at Each Stage

The number of cases going through the SSDI determination and appeals program is going to increase by 41.4 percent between 1981 and 2009. How is the system going to handle such an increase? The projections of the number of cases going through are shown Table 12.

4.4.1 The State Level : The DDS

The first stage through which SSDI applicants go is at the state level. The DDS adjudicators make the first decisions concernig a case. But will it be financially possible to increase the number of adjucators by 41.4 percent, or is the workload of each DDS adjudicator going to be increased by 41.4 percent? It appears that even now at the DDS level, the caseload per adjudicator is very high and this could be one of the reasons why the determinations at the DDS level are so inconsistent. If the number of cases gradually increases by 41.4 percent, the situation will worsen. It has been shown in Chapter III that a greater effort should be made at the DDS level to consider each case more carefully, and with more consistency, so that people start to believe in the system, thinking that it is a fair system, even though not always consistent. Such an effort for consistency from the DDS adjudicators would help people who are denied benefits know whether they should appeal or not, and at the same time reduce the expected time delay of the system.

It seems that the DDS can not handle many more cases without seriously affecting the reliability of the system, but the government is trying to reduce its deficit and it is doubtful that it will increase the money given to suport the DDS adjudicators as well as all the employees that work to process the cases. (It has been mentioned earlier that it is unrealisitic to believe that the taxpayers would be able to support all the burden.) It appears that the only plausible solution would be to encourage programs which would prevent serious disabilities and help rehabilitate the workers.

Table 12. The Caseload at the Different Stages of the SSDI: 1980-2020

(in thousands)

YEAR	DDS#1	DDS#2	ALJ	AC	FED. COURT
1980	881	302	181	41	10
1981	985	338	202	46	11
1982	997	342	205	46	11
1983	1010	346	207	47	11
1984	1020	350	210	47	11
1985	1033	354	212	48	11
1986	1046	358	215	48	11
1987	1060	363	218	49	12
1988	1073	368	221	50	12
1989	1088	373	224	50	12
1990	1108	380	228	51	12
1991	1122	385	231	52	12
1992	1138	390	234	53	12
1993	1152	395	237	53	13
1994	1168	400	240	54	13
1995	1184	406	243	55	13
1996	1202	412	247	56	13
1997	1219	418	251	56	13
1998	1238	424	254	57	14
1999	1257	431	258	58	14
2000	1272	436	261	59	14
2001	1293	443	266	60	14
2002	1314	450	270	61	14
2003	1337	458	275	62	15
2004	1361	466	280	63	15
2005	1326	454	273	61	15
2006	1341	460	276	62	15
2007	1358	466	279	63	15
2008	1376	472	283	64	15
2009	1393	478	287	65	15
2010	1321	453	272	61	15
2011	1327	455	273	62	15
2012	1332	456	274	62	15
2013	1338	459	275	62	15
2014	1343	460	276	62	15
2015	1307	448	269	61	14
2016	1307	448	269	61	14
2017	1308	448	269	61	14
2018	1308	448	269	61	14
2019	1310	449	269	61	14
2020	1312	450	270	61	14

4.4.2 The Federal District Court

The ALJ, and AC, should be significantly affected by a 41.4 percent increase in the number of cases , but they do not handle as many cases as the DDS, and if there is not an increase in staff, the average delay for processing files will increase.

The Federal District Court, on the other hand, does not only handle disability cases, it also handles all the other jurisdiction problems, such as frauds, crimes, etc.... which happen around the country. As of June 30, 1982, they were already 20,000 disability cases pending in the Federal Court System, when there were only 10,000 new disability cases appealing to the Federal District Court in 1981. If there are more than 10,000 new disability cases appealing every year to the Federal District Court, and up to 15,000 in 2009, how many disability cases will be pending in the system every year between now and 2015? One does not know which percentage of all the Federal District Court cases the disability cases represent, but one may wonder what will happen in the 2010's. Will the Federal District Court become clogged because of disability cases or will the queues for disability cases become almost indefinitely long? (The average processing time for a disability case by the Federal DIstrict Court is unknown, throughout the study it was assigned a value of 100 days for computational purposes).

It seems, however, that an increase of 41.4 percent of the number of SSDI applicants would not automatically mean a 41.4 percent increase in the number of ALJ, AC and Federal DIstrict Court cases, if some of the suggestions of Chapter III were thought through and maybe applied by the SSDI: increased consistency by the DDS adjudicators could reduce quite significantly the number of people appealing decisions, as the applicants would both trust the system, and make a realistic estimate of whether they should appeal or not. Another solution could be to give better advice to the workers who apply to the program for the first time, so that their file is well documented, not missing any pertinetnt information. If either or both of the suggestions were applied, it seems that only a fraction of the 41.4 percent increase in applicants would appeal the DDS decisions, and the increase in ALJ, AC and Federal Court cases would be less than 41.4 percent, and

would decrease at each stage as fewer and fewer people would appeal.

4.5 Conclusion

According to the assumptions that were used, there will be a drastic increase in the number of SSDI applicants and beneficiaries over the next 25 years. Between 1980 and 2009, the number of SSDI applicants and recipients is going to increase by 41.4 percent. This situation will cause serious financial and managerial problems within the SSDI. There are no immediate solutions to these problems. It seems, however that it is very important to develop programs to encourage disabled workers to go back to work, to revise the SSDI and VR policies so that the two programs go hand in hand as opposed to being almost totally seperated (only 11 percent of the SSDI recipients apply to the VR program). Finally, the issue should be raised with employers, so that they understand that disability is a problem which concerns them. New programs such as Projects With Industry have been developped over the past years. The aim of these programs is to link private business, industries and rehabilitation programs in an effort to place disabled persons in competitive employment. Unfortunately, most industries do not really know how the programs are run and many are relunctant to adopt them. The employers could improve very significantly the situation by providing counceling to the workers who have just become disabled and trying to rehabilitate these workers by offering them another job in the company. It is necessary to help newly disabled workers right from the beginning of their disability, when they still feel part of the workforce and feel that they could contribute to society.

CHAPTER V

THE US VOCATIONAL REHABILITATION PROGRAM

5.1 Introduction

Each state has its own vocational rehabilitation (VR) program, but the program is very similar from state to state. The aim of all VR programs is to rehabilitate disabled people in the workforce. A VR client is said to be successfully rehabilitated, if he is employed in the same job for more than six months after having received VR services. The purpose of this study is to present a method for analysing the VR program, and measuring its efficiency in terms of time delays and success of the rehabilitation services.

5.2 Description of the VR Program

In previous work, a flow graph representation of the VR system was developed by Levis et al. [6] for the state of Illinois, (see Figure 13). The graph was made according to the description of the case flow through the VR system found in the Illinois Client Services Manual [14]. According to the manual, there are seven major stages through which an applicant may go: referral, application, extended evaluation, program development, delivery of services, closures and post employment services. The rehabilitation process consists of at least two stages, (the case must go at least through referral and closure), but it may involve all seven stages. The manual identifies twenty different statuses which correspond to stages at which the client may be during the rehabilitation process. In the graph representation, each status was modeled as a node. The resulting set of nodes were defined and are shown in Table 13; each node was assigned a descriptive name consisting of the prefix VR (for Vocational Rehabilitation), and the two digit number identifying the status in the VR manual.

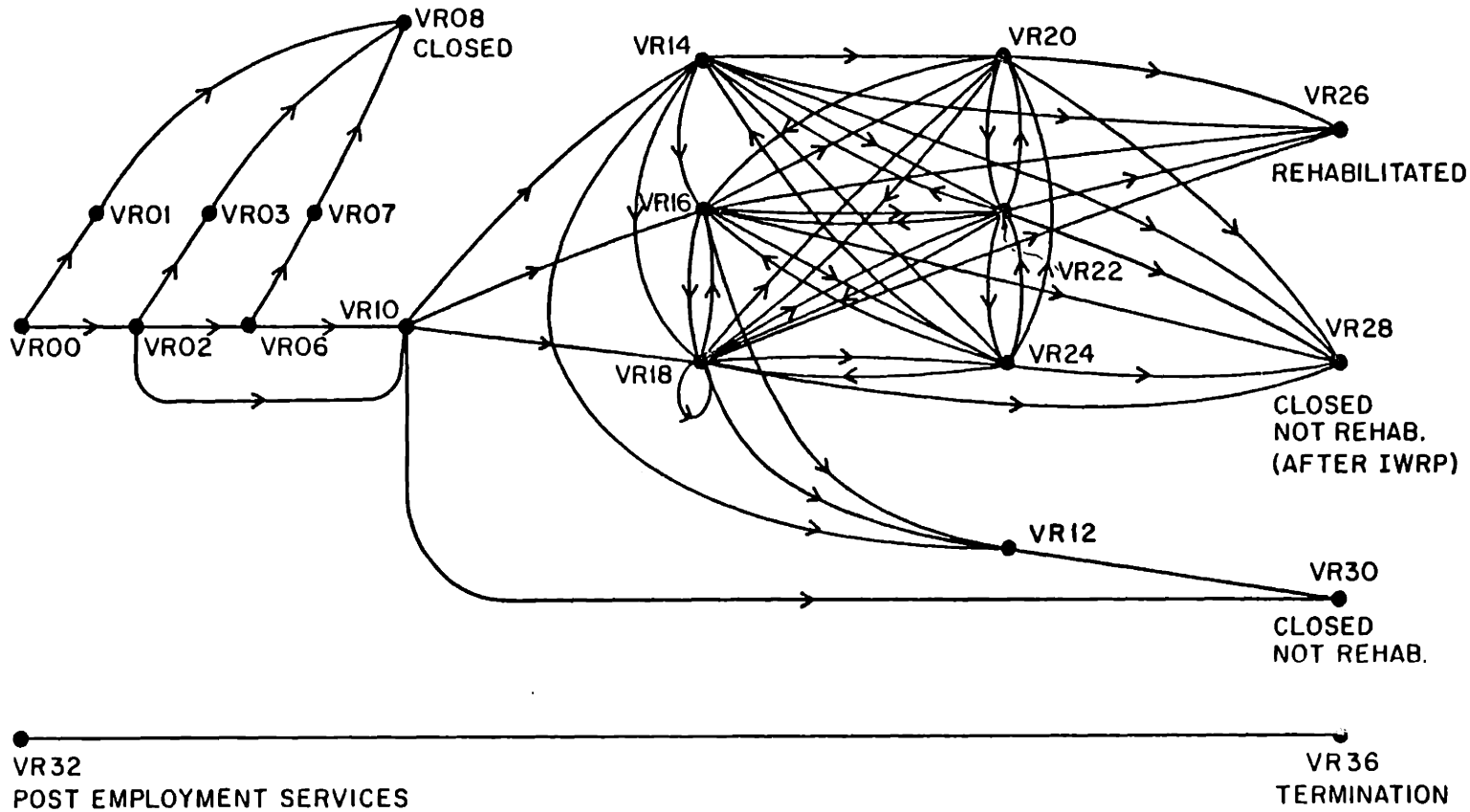

Figure 13. The Illinois VR System: flow graph representation

Table 13: The Statuses of the VR Program

NODE NAME	DESCRIPTION
VR00	Referral
VR01	Closed from Referral
VR02	Applicant
VR03	Closed from Applicant
VR06	Extended Evaluation
VR07	Closed from Extended Evaluation
VR08	Closed after Referral or Extended Evaluation
VR10	IWRP Development
VR12	IWRP Completion
VR14	Counseling and Guidance
VR16	Physical Restoration
VR18	Training
VR20	Ready for Employment
VR22	In Employment
VR24	Service Interrupted
VR26	Closed Rehabilitated
VR28	Closed, not Rehabilitated after IWRP Initiated
VR30	Closed, not Rehabilitated
VR32	Post Employment Services
VR36	Termination from Post-Employment Services
TOTAL NUMBER OF NODES:	20

All the disabled who enter the VR program go through referral, status 00. At this step, the client is provided with information about the agency's services; he may then either apply for rehabilitation or exit the system through closure, status 01. After the application is filed, the VR councelor considers whether the client is eligible for services and should proceed to the program development (case moved to status 10), whether an extended evaluation is needed (case moved to status 06), or the client is ineligible for services and the case should be closed, (status 03). When extended evaluation is needed (status 06), the VR councelor tries to determine whether the applicant is eligible for services (and should be moved to status 10), or whether the case should be closed because of ineligibility (status 07).

If a client reaches the program development stage (status 10), he and the councelor develop together the Individualized Written Rehabilitation Program (IWRP) which states the client's rehabilitation goals as well as the services which will be needed to achieve these goals. It sometimes happens that a case is closed just before the initiation of the IWRP form because of unforeseen events; in this case, the client's case is closed in status 30. After the IWRP form is developed, the client finally receives one of the three services. He can either receive counseling and guidance (status14), physical restoration (status 16), or training (status 18). A client may receive either one, two or all three services, but if he receives guidance, it should be the first service he gets. After a client receives services, he may either have his case closed as rehabilitated (status 28) or as not rehabilitated (status 26), or he may be declared ready for employment (status 20), or in employment (status 22) before his case is eventually closed as rehabilitated or not rehabilitated. If the services are never initiated, the client's case is moved to status 12 and is then closed in status 30.

5.3 The VR Program: Some Projections

Because the system is complex and only few data are available, an aggregate representation of the VR system was also derived by Levis et al. [6] (see Figure 14). This representation emphasized the input-output properties of the system and de-emphasized the different paths clients can take through the system.

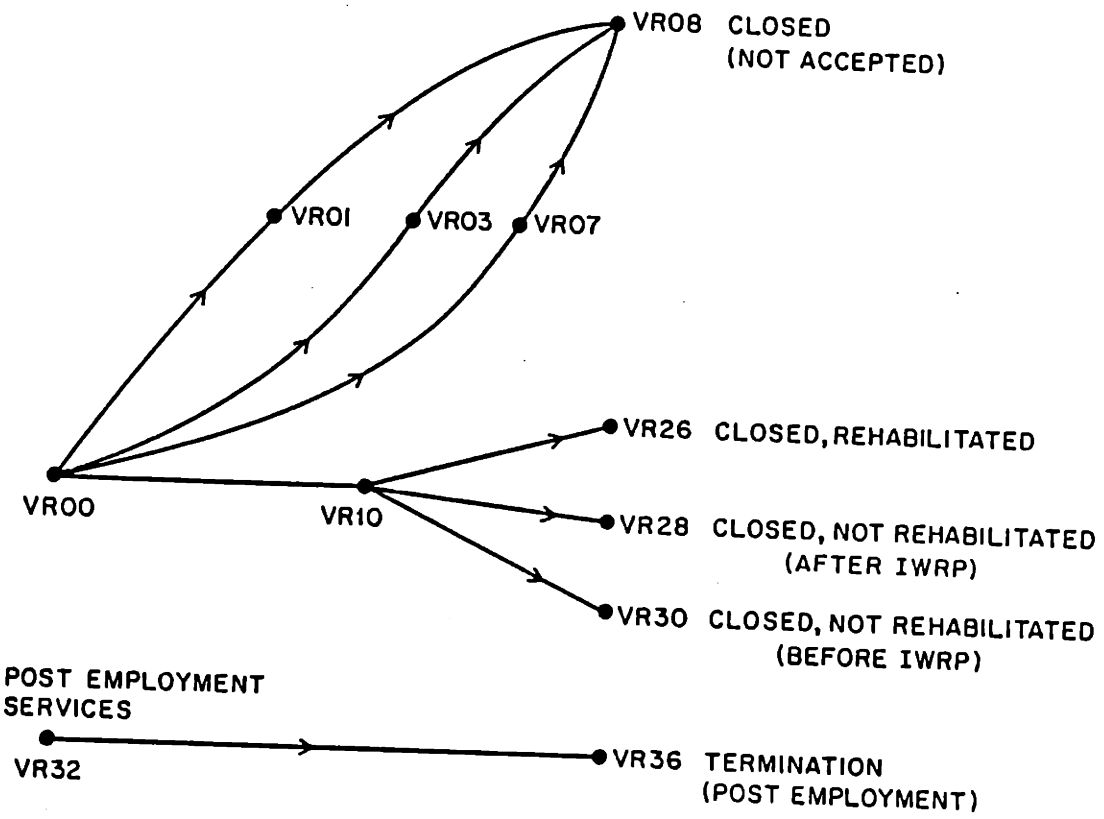

Figure 14. Aggregate Representation of the Illinois VR System

From the Department of Rehabilitation Services of the State of Illinois, data were made available for closed cases for the fiscal years 1981,1982,1983 and 1984. Using a simple linear trend model and the projections of the Illinois resident population from 1980 to 2000 [6], projections of the referrals to the Illinois VR program (see Table 14), as well as projections of the number of closures by status were made for the years 1980 to 2000 (see Table 15). The projections of the referrals (Table 14) showed an increase in the number of referrals and allowed cases till 1990 and then a slight decrease till the year 2000. This trend is due to the ageing of the population of Illinois, the number of people in the age groups 45 to 54 and 55 to 64 (the age groups with the highest disability incidence rates: 12.3% and 24.1%, respectively), should increase till the year 1990 and then slightly decrease.

Table 14. Referrals to Illinois VR: 1980-2000

YEAR	ALLOWED	DENIED	TOTAL
1980	2705	1246	3951
1981	2712	1252	3964
1982	2718	1259	3977
1983	2725	1265	3990
1984	2732	1272	4004
1985	2739	1279	4018
1986	2746	1285	4031
1987	2752	1292	4044
1988	2759	1299	4058
1989	2766	1305	4071
1990	2773	1312	4085
1991	2769	1313	4082
1992	2765	1315	4080
1993	2762	1316	4078
1994	2758	1318	4076
1995	2754	1319	4073
1996	2750	1321	4071
1997	2746	1322	4068
1998	2743	1324	4067
1999	2739	1325	4064
2000	2735	1327	4062

Table 15. VR Closures by Status: 1980-2000

YEAR	VR 08	VR 26	VR 28	VR 30	TOTAL
1980	1788	1333	672	136	3929
1981	1796	1335	674	136	3941
1982	1805	1338	677	136	3956
1983	1813	1340	679	136	3968
1984	1822	1343	681	136	3982
1985	1830	1345	683	136	3994
1986	1839	1347	686	137	4009
1987	1848	1350	688	137	4023
1988	1856	1352	690	137	4035
1889	1865	1355	693	137	4050
1990	1874	1357	695	137	4063
1991	1876	1355	692	137	4060
1992	1877	1354	690	136	4057
1993	1879	1352	687	136	4054
1994	1880	1351	684	136	4051
1995	1882	1350	681	135	4048
1996	1884	1348	679	135	4046
1997	1885	1346	676	135	4042
1998	1887	1345	673	135	4040
1999	1888	1343	671	134	4036
2000	1890	1342	668	134	4034

From Table 14 one can see that out of 3,964 people who applied to the VR Illinois program in 1981, only 2,712 were allowed services, and only 674, (or 17 percent) were successfully rehabilitated. Only 17 percent are actually rehabilitated! This is a very small figure considering that the purpose of the VR program is either to rehabilitate workers who had to quit their job because of a disability, or to introduce in the workforce young adults who were born with a disability.

5.4 Major Problems Faced by the VR Program.

People in the field know that the VR program is very difficult to manage. When one looks at the graphical representation of the VR (see Figure 13), one is not suprised. From the descriptions in the manual, it appears that a client may be at any one of 20 different statuses. It is infeasible to compute all the possible ways a client may go from referral (status 00), to closure (statuses 26,28 and 30) because there are several loops in the system . Not only there are cycles, but also, services can be interrupted for an undetermined period of time. (When a client stops receiving services for an undetermined period, he is considered to be in status 24, and services will later be reinitiated at any stage after status 10 (development of an IWRP)). Finally, the manual emphasizes the fact that the VR councelors and employees should fill in the appropriate forms after each status or service is terminated, and each time a change in the initial plans are made. Therefore, it seems that the VR councelors have a very large amount of paperwork to do when dealing with a case.

As a result of this very complicated system, there is a large gap (according to Dr. Edward Hester of the Menninger Foundation, [16]) between theory (what is allowed by the manual) and the practice (what is actually done and allowed by the VR councelors and managers). Therefore, there is a need to create a model which describes what actually happens, before an attempt is made to measure the efficiency of the system using time delays and success of the rehabilitation. The realistic model could only be done using detailed data from one of the nation's VR programs. The next section presents first a method for constructing a realistic model; then two measures of effectiveness of the VR program are presented.

5.5 The VR Program: Model and Analysis

5.5.1 The Design of a Realistic Model

The vocational rehabilitation program studied in previous works by Levis et al. [6], was the Illinois VR program. Unfortunately, the Department of Rehabilitation Services of the state of Illinois could not make available the detailed data which were needed for this study. However, the Nebraska VR program was willing to provide the necessary information. Computer sheets from their data base were to be sent. These sheets should have included all the closed cases for a particular year; for each closed case, the referral and closure dates as well as the different statuses the client had gone through were to be included.

There are approximately 4000 cases closed every year by the Nebraska VR program. In order to have reasonably reliable results, it was decided that approximately one thousand cases would be picked randomly to be studied. Unfortunately, the data were never received because of a bug in the database. The procedure which would have been followed to analyze the data, if it had been received on time, is described in this section.

The first goal was to design a 'realistic' model of the VR program. Therefore, it was necessary to determine which were the different paths actually followed by clients. After several meetings with Dr. Edward Hester of the Menninger Foundation, it appeared that some simplifications could be made. It was said that statuses 12, 20, and 22 are never used. It also appears that some combinations of services almost never occur; more particularly, it almost never happens that a client receives rehabilitation services (statuses 14,16 or18) more than five times before his case is closed.

Therefore, after ignoring status 24, it was estimated that there were 84 possible paths. It was decided that status 24 would be taken into account, if the data showed that it was used by a significant number of clients.

The feasible paths were first constructed; they are shown in Appendix B. Then from the data sample, the incidence of each path, or the probability of each

path being used, should be computed and called Pi. The value of Pi could be found as follows:

$$Pi = Ni / N \qquad (5.1)$$

where Pi = probability of path i being used
Ni = # of closed cases which followed path i
N = # of cases considered

It was decided that the paths which would have an incidence of less than 5 percent would be aggregated into a category called 'others'. Finally, in order to have a complete model, it seemed important to find the average delay on each path. The delay on each path was computed using the sample mean of the delays experienced by the clients who had followed that particular path. The value of the delay on path i could be computed as follows:

$$Ti = (\sum_{j} t_{ji}) / Ni \qquad (5.2)$$

where Ti = average delay on path i
t_{ji} = delay of case j which followed path i
Ni = # of cases which followed path i

The next step of our study would have addressed the measuring of the effectiveness of the VR system.

5.5.2 Two measures of effectiveness

As we have seen in Chapter III, time is an important measure when looking at programs serving the disabled. Long delays are resented for two main reasons: they are a cost to the disabled and often to the organization, and the longer a disabled person stays out of the labor force, the harder it is for him to adapt himself to a new job with his disability.

Therefore the first step in measuring the effectiveness of the VR program would be to determine the expected time a client stays in the VR system. The expected delay of the whole system is not the only interesting measure. One can look at three expected delays: that of the whole system, that of the people who were successfully rehabilitated, and that of the people who were expected to be rehabilitated (passed status 10), but were not rehabilitated. The first two measures show how long a person should expect to stay in the system; they give a general idea on how fast the system runs, whereas the last shows how long people who receive services can stay in the system and not be rehabilitated. The three expected delays could be computed as follows: (the values for Pi and Ti were computed in section 5.2)

i) Expected delay of the whole system

$$E(Del.all) = \sum_{i} Pi * Ti \qquad (5.3)$$

where Pi = Probability that path i will be used
Ti = Average delay associated to path i

ii) Expected delay of the rehabilitated clients

$$E(Del.reh.) = \sum_{i} a_i * Pi * Ti \qquad (5.4)$$

where Pi = Probability that path i will be used
Ti = Average delay associated to path i
a_i = 0 if the closure status of path i is 26 or 30
a_i = 1 if the closure status of path i is 28

iii) The expected delay of the non-rehabilitated who developed an IWRP form

$$E(Del.non) = \sum_i b_i * Pi * Ti \qquad (5.7)$$

where Pi = Probability that path i will be used
Ti = Delay associated to path i
b_i = 0 if path i includes status 10 and status 26 or 30
b_i = 1 otherwise

The next step of the study of the expected delays would be to proceed with sensitivity analysis to determine which paths have the most impact on the expected delays. At this stage of the analysis, only the expected delay of the whole system as well as that of the rehabilitated clients would be studied.

Considering that there are approximatly 85 paths, the sensitivity of the expected delay with respect to each path should not be computed. Instead, the probability mass function of the delays with respect to the paths should be drawn; this graph could give a better idea of which paths should be looked at more closely. It seems that special emphasis should be put on the paths which go beyond status 10 (development of the IWRP form), and at the same time do not lead to rehabilitation, (the client's case is closed at status 26 or 30). One would focus on these paths because it is quite probable that the counselor made an error in judgement when developing the IWRP with the client, or that the services provided to the client were not adequate. The next step of the study should focus on the success of the rehabilitation program itself.

It has been shown earlier, that in 1981 only 17 percent of the disabled referred to the VR system were successfully rehabilitated. This small figure is an incentive to look in detail how the rehabilitation process is structured.

Even though once in the system the client may be at 20 different statuses, the client can actually only receive three types of services: counceling and guidance: status 14, physical restoration: status 16, and training: status 18. At all the other statuses of the system, the client does not receive any services which

could actually work towards his rehabilitation; it is almost as if the VR system was passive: the VR does not actually provide any service but instead the councelors fill out forms and make decisions about which type of service, if any, should be offered to the client. Therefore, when measuring the success of the VR sytem, one should focus on the efficiency of all the preliminary administrative effort as well as on the success of the services offered: statuses 14, 16, and 18. Two questions could be raised: How accurate was the VR councelor in deciding which services the client should receive to be rehabilitated? What is the performance of the rehabilitation services: statuses 14,16 and 18?

Once in status 10, a client is considered eligible to receive services and the councelor believes that the client should ultimately be rehabilitated. At this status, the VR councelor along with the client develops the IWRP form, which states the client's rehabilitation goals and objectives. The efficiency of the preliminary scanning (to eliminate all the clients who are not considered eligible for services) as well as the role of the IWRP form could be measured using two values: β_1 and β_2. (β_2 emphasizes the role of the IWRP and the councelor's ability to estimate the client's needs and possibilities.) The higher the values of ß1 and ß2 are, the better the services of the VR program. β_1 and β_2 were computed as follows:

$$\beta_1 = (C_{26}+C_{28}) / C_{10} \qquad (5.8)$$

$$\beta_2 = C_{26} / C_{10} \qquad (5.9)$$

where β_1 = percentage of cients who were considered rehabilitatable and received some service

β_2 = percentage of clients who were considered rehabilitatable and were rehabilitated

C_{10} = number of clients considered eligible for services (reached status 10)

C_{26} = number of clients who were successfully rehablitated (there case was closed in status 26)

C_{28} = number of clients who were not successfully rehabilitated but developed an IWRP form, (case closed in status 28)

The other interesting measure would be to see what percentage of the people who actually received some kind of service were eventually rehabilitated; this measure will be called β_3.

$$\beta_3 = (C_{i,26}) / (C_{14}+C_{16}+C_{26}) \qquad (5.10)$$

where $C_{i,26}$ = number of clients who received at least one service and were actually rehabilitated

If the value of β_3 is small, it will show that a large number of clients had not prepared (along with their councelor) an adequate IWRP form. If such is the case, one can recommend that an effort be made at the councelors' level to increase the accuracy of the IWRP forms.

5.6 Conclusion

The VR program appears to be very complex and almost impossible to manage when one first looks at the Illinois VR flow graph representation. However, the program may be disaggregated and simplified to show what actually happens as opposed to what the Client Services Manual [16] indicates that could happen. The methodology that is proposed in this chapter presents the VR program as an acyclical model, eliminating the loops and three of the existing statuses (statuses 12, 20, and 22.)

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

The SSDI and the VR programs are two programs which serve the disabled population. One pays benefits to disabled workers, whereas the other provides rehabilitation services to the disabled workers. This study described the two systems, measuring their efficiency using time delays (and success for the VR). Projections of the number of SSDI and VR applicants were made and it was shown that the SSDI has the potential of facing a dramatic crisis within the next thirty years, if no measures are taken to decrease the incidence of disability and to rehabilitate the disabled population.

In Chapter II, the SSDI program was described, and it was shown that the delays in the SSDI are very difficult to control because of its structure. The fact that an applicant has the right to appeal up to 4 decisions makes it very hard, if not impossible, for the SSDI administration to decrease the time applicants can stay in the system.

In Chapter III, it is shown that a client may actually follow 14 different paths to go through the SSDI determination and appeals program. For each path, the average time needed to follow that path was computed, as well as the probability that an arbitrary applicant would follow that path. (The time a client stays in the system varies between 48 and 662 days, and the probability associated with each path varies between 30 and 0.3 percent.) The expected delay of the system was then computed. It appeared that there were different expected delays: First the expected delay from the SSDI's point of view and then that from the applicant's point of view. The two differed because it was assumed that the applicant considered himself out of the system after his case was denied, whereas the SSDI waited, till the time given to appeal expired, to close a case. The expected delay of all the cases, the cases allowed, and finally the cases denied, was computed from both the SSDI's and the applicant's point of view. For all six cases, a sensitivity analysis was done to compute the impact of each path on

the expected delay and determine which stage of the appeals and determination program was the most important when trying to minimize the expected delay. The conclusion was that the SSDI administration should focus on the first two determination stages (the two DDS decisions) and make the determinations of disability more consistent so that people would believe in the system and have a better idea on whether they should appeal or not. If the system developed a reputation of being fair and consistent, time and money would be saved as (most probably) less people would appeal. It also seems important to give better advice to the applicants before they apply so that they present applications containing all the necessary information and are not denied just because of a lack of information.

Chapter IV analyzes the projections of the number of SSDI applicants and beneficiaries, between the years 1980 and 2020. According to the assumptions used in the computer model, the number of SSDI applicants and recipients is going to increase by 41.4 percent between 1981 and 2009. This drastic increase is going to create both financial and managerial problems within the SSDI, if no measures are taken to improve the system. The projections show that new approaches concernig the disabled population should be taken. It will become necessary to encourage more vigorously and to assist disabled workers to find a job. It has been said that it is often cheaper for the SSDI to pay benefits to a worker than to send him to a rehabilitation program. However, the SSDI policies are such that they do not protect disabled workers who look for a job and find one. If these workers loose their job, they do not automatically receive benefits again. New policies should be considered so that workers receiving benefits are more protected when they try a new job. Another important effort should be made within industry. Employers should start to understand that disability is a problem that concerns them and their companies. New programs such as the Projects With Industry (PWI), were started in large industries (e.g., at the National Restaurant Association, IBM, and AT&T). The aim of these programs is to link private business and industry with rehabilitation agencies in an effort to place disabled persons in competitive employment. The PWI focus on job placement, work adjustment skills training and job linkage, in a cooperative arrangement between rehabilitation and business, establishing an ideal environment for the use of woksite modification. " (Hester et al., [8]) The use of worksite modifcations among Projects With Industry

(PWI) seemed successful [8]: 87 percent of the industry in the program which responded to the survey said it had been "posisitive or very positive". Worksite modifications can be defined as work-related changes that enable a disabled person to be employed. These modifications include "adaptive modifications": changing hours, work procedures and task assignment, equipment or environmental adaptation of the workplace.... Unfortunately, most small and many large industries are relunctant to try these programs. A study at Berkeley [17], showed that some of the barriers to these programs are people's attitudes towards disability, safety concerns, unclear requirements, cost, and the state of the economy.

The expansion of the PWI programs would most probably help the situation significantly, but it seems important to also consider the rehabilitation programs which have been operating for many years. In the first part of Chapter V a method to design a realistic model of the Vocational Rehabilitation program is described. It was necessary to develop a model of the program, before measuring its efficiency, since there is a significant difference between the description of the VR program in the Client's Manual and what actually happens as a client goes through the VR. Unfortunately, the method for modeling the VR system presented in this thesis is only described; the actual model is not presented because the data which should have been received from the VR program of Nebraska never arrived at M.I.T. The second part of Chapter V, proposes a method to measure the effectiveness of the VR. A set of measures are proposed, first a study of time delays similar to that of the SSDI program, and then several measures of the success of the VR program (the percentage of people actually rehabilitated among the people considered eligible for services, the percentage of people rehabilitated among the people who actually received some kind of service, and finally the percentage of people who received some service among the ones who were eligible for services.) The third part of this chapter proposes to focus on the SSDI beneficiaries who go through the program.

Disability in the US should be a problem where everybody feels involved, particularly the employers. (The taxpayers in 1977 understood that disability was becoming important when their taxes were raised.) It is important to try to develop programs such as the PWI and to introduce them into the smaller

industries, maybe subsidising the programs when necessary.

Further research on the modeling of the VR program of Nebraska using the method developed in Chapter V is warranted when the data become available. Then one could measure the efficiency of the program, and one could track the paths of the SSDI beneficiaries who apply to the VR. It would be particularily interesting to understand who among the SSDI beneficiaries apply to the VR, and why they apply when most of the beneficiaries do not apply.

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APPENDIX A

PETRI NET REPRESENTATION OF THE POSSIBLE PATHS FOLLOWED BY SSDI APPLICANTS

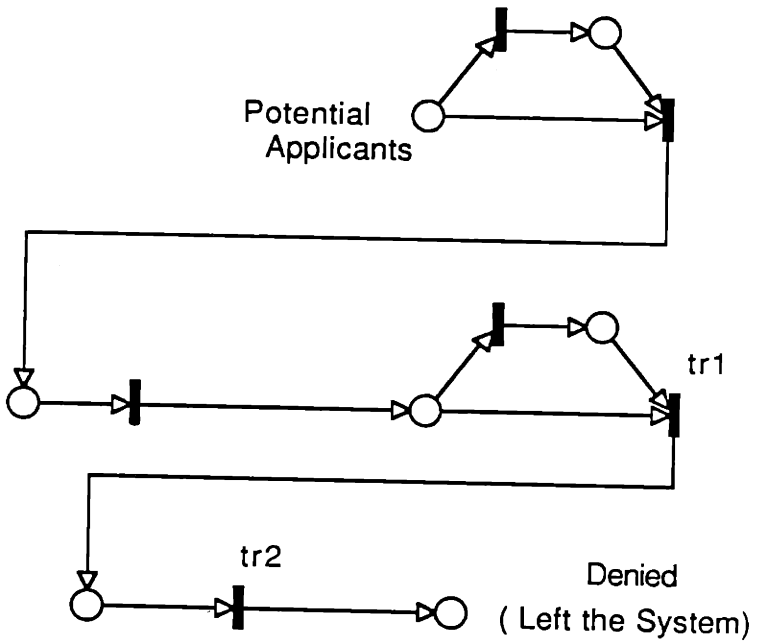

Figure A1. Petri Net Representation of Path 2

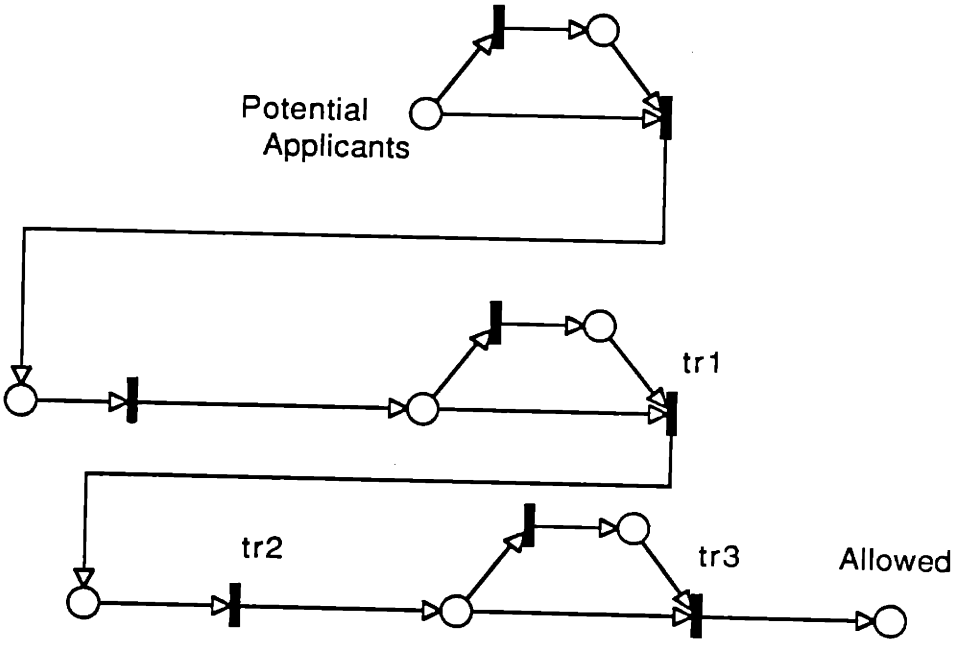

Figure A2. Petri Net Representation of Path 3

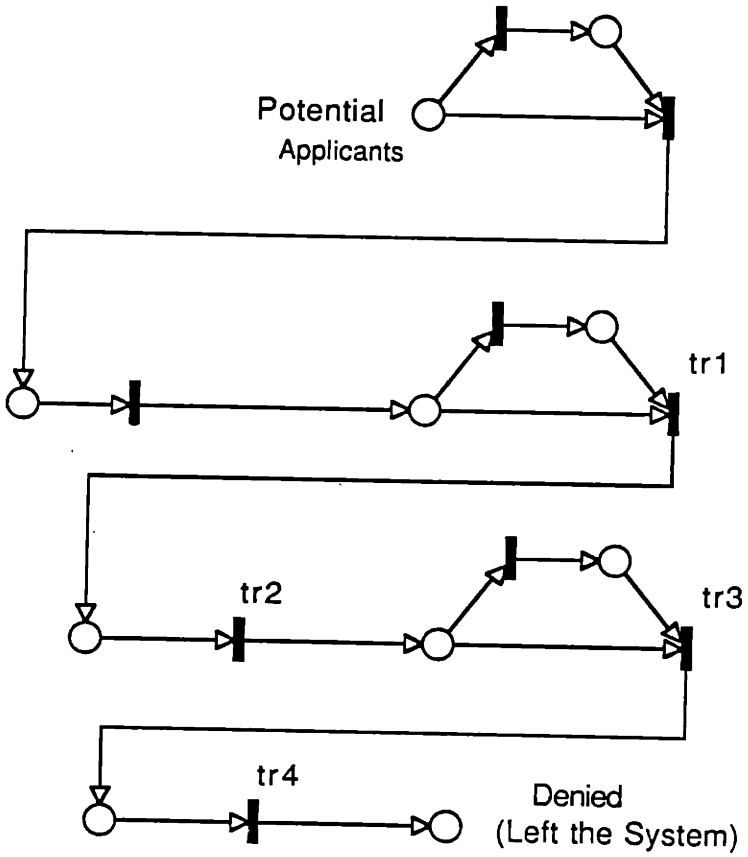

Figure A3. Petri Net Representation of Path 4

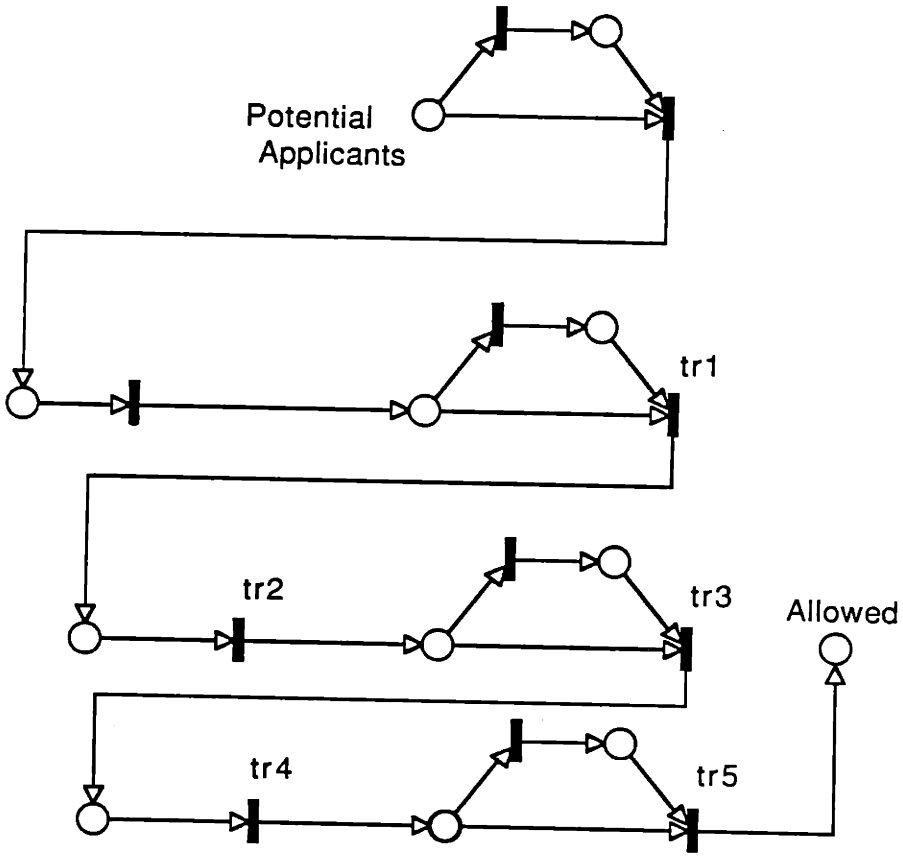

Figure A4. Petri Net Representation of Path 5

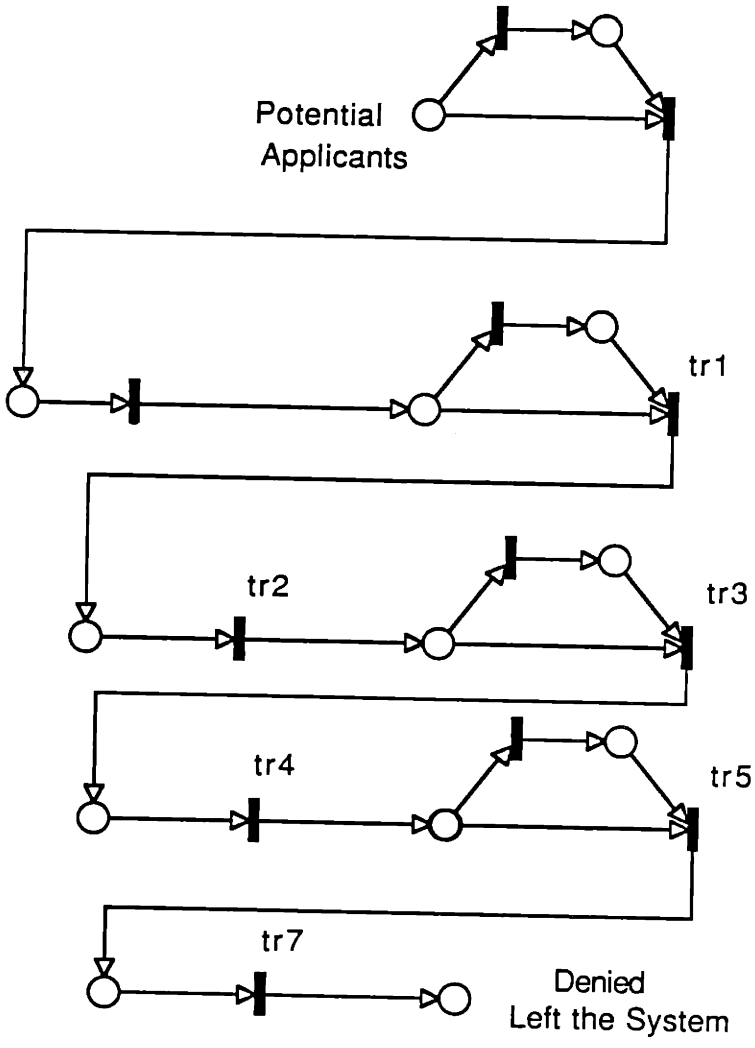

Figure A5. Petri Net Representation of Path 6

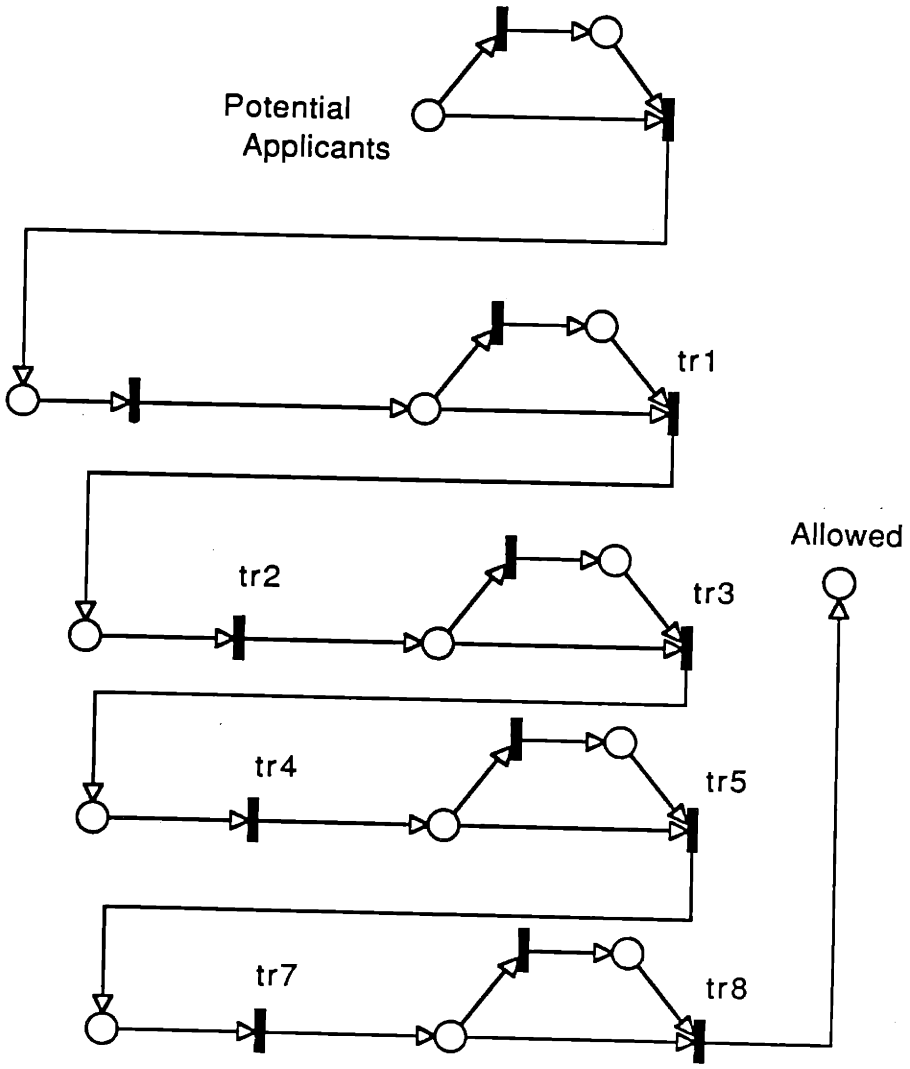

Figure A6. Petri Net Representation of Path 7

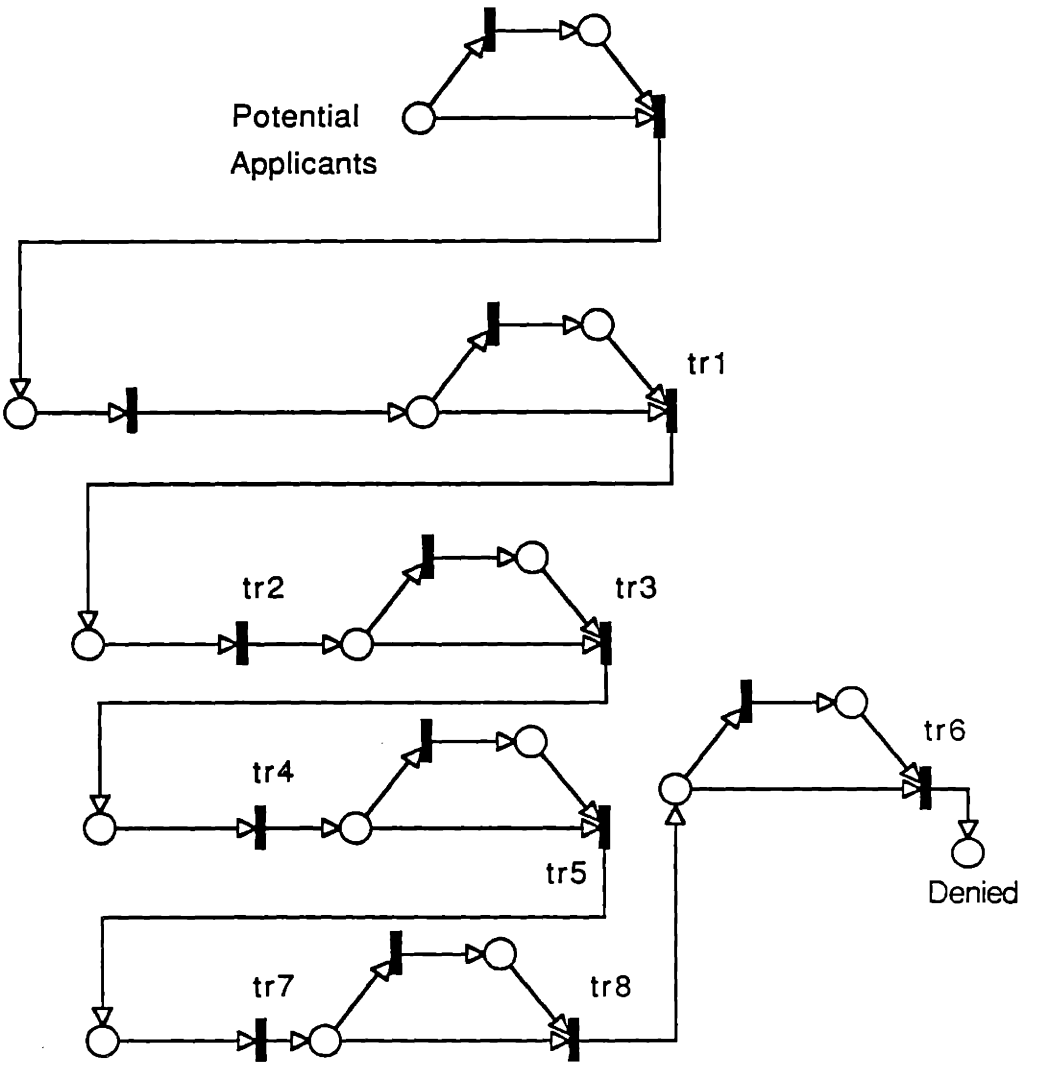

Figure A7. Petri Net Representation of Path 8

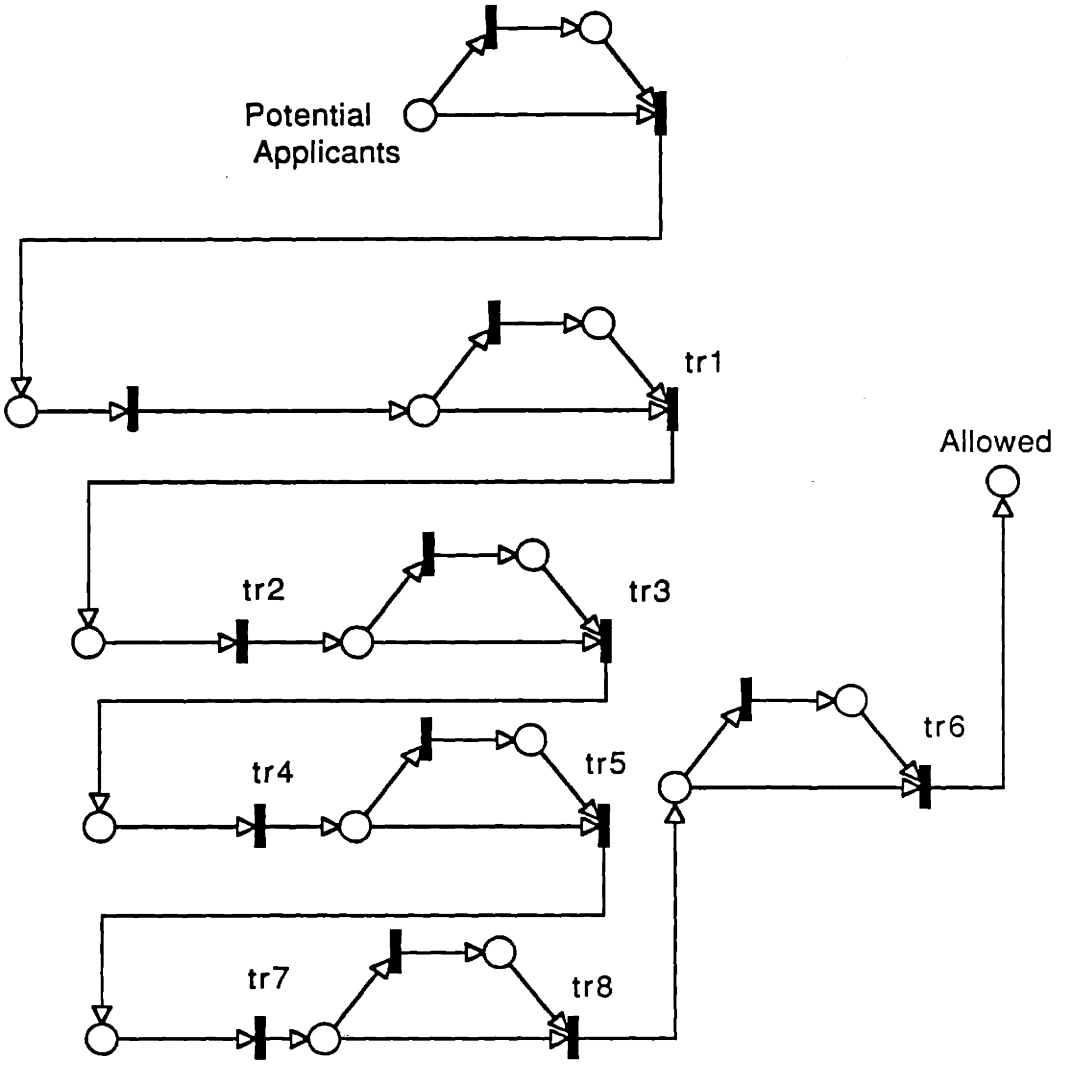

Figure A8. Petri Net Representation of Path 9

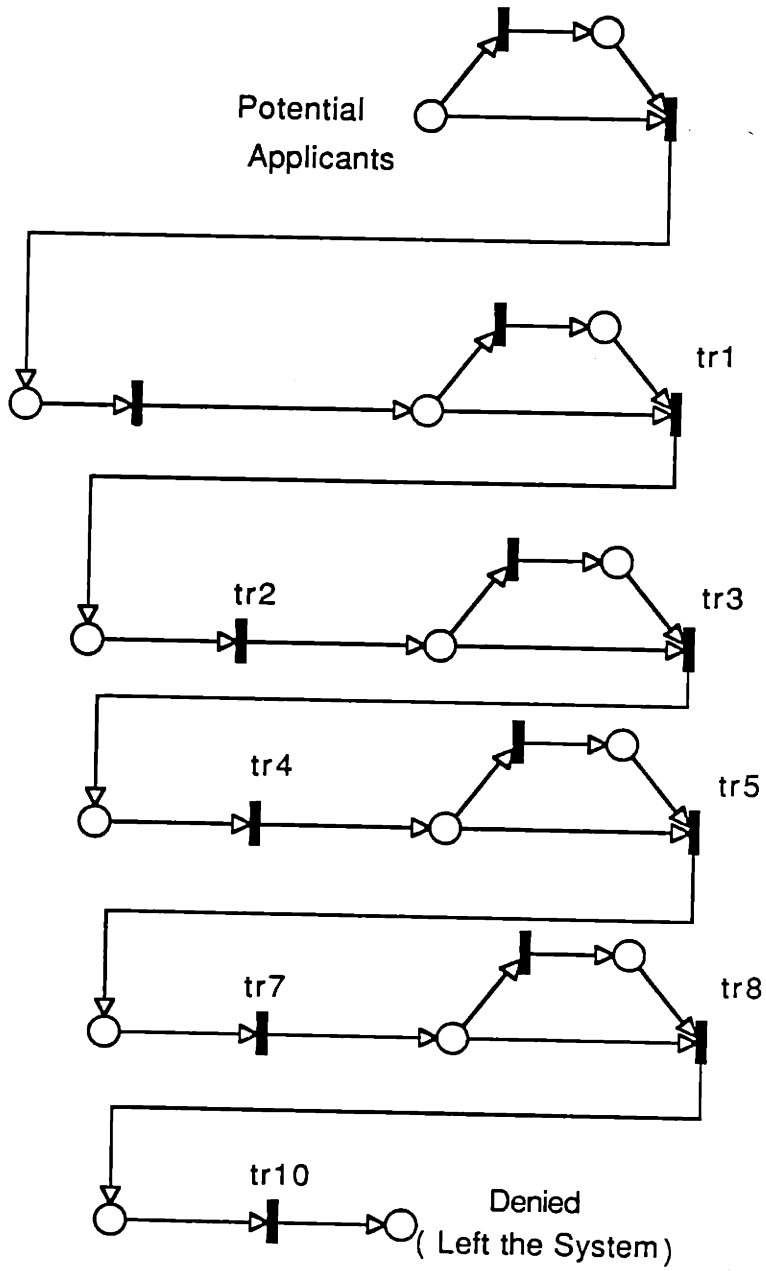

Figure A9. Petri Net Representation of Path 10

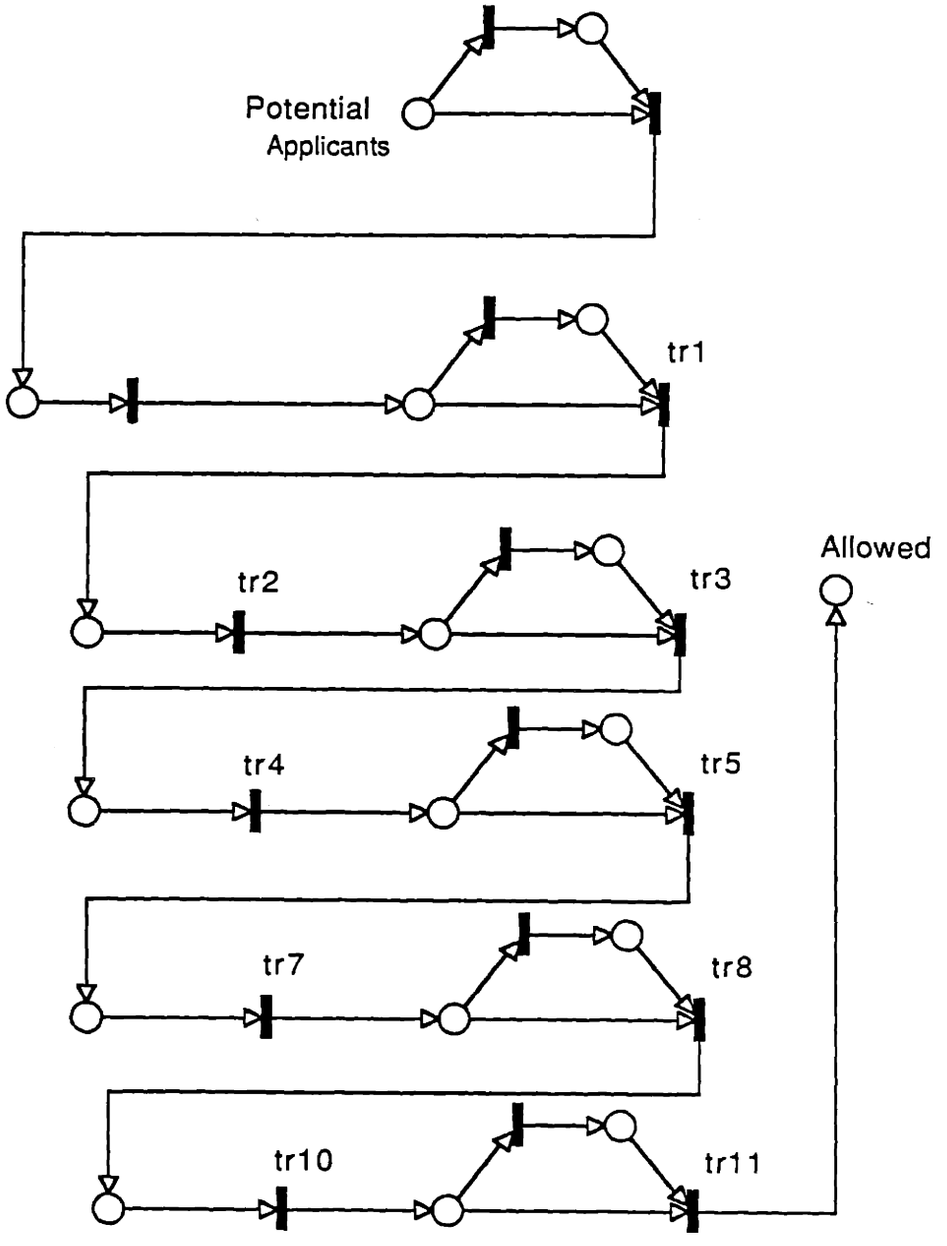

Figure A10. Petri Net Representation of Path 11

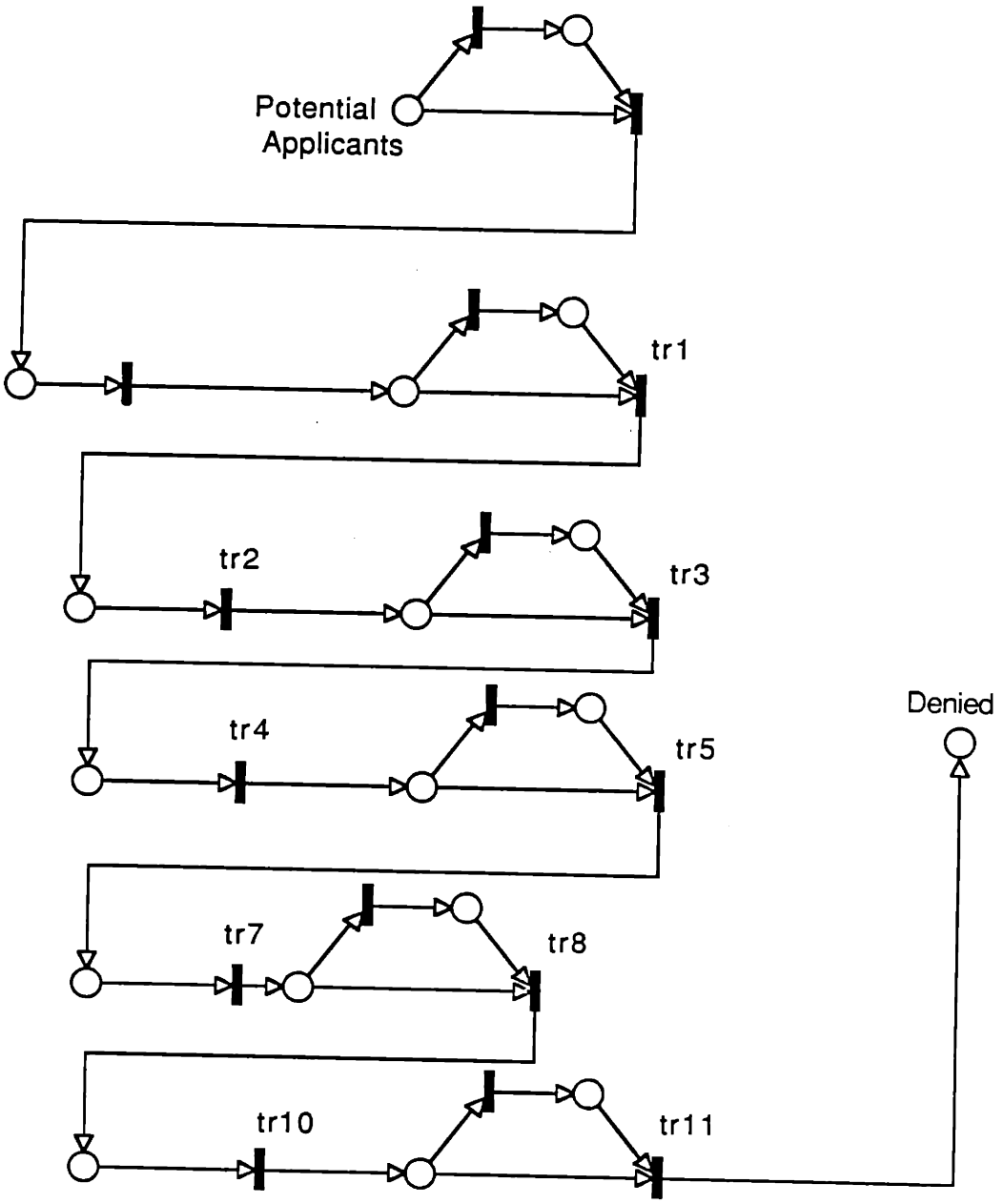

Figure A11. Petri Net Representation of Path 12

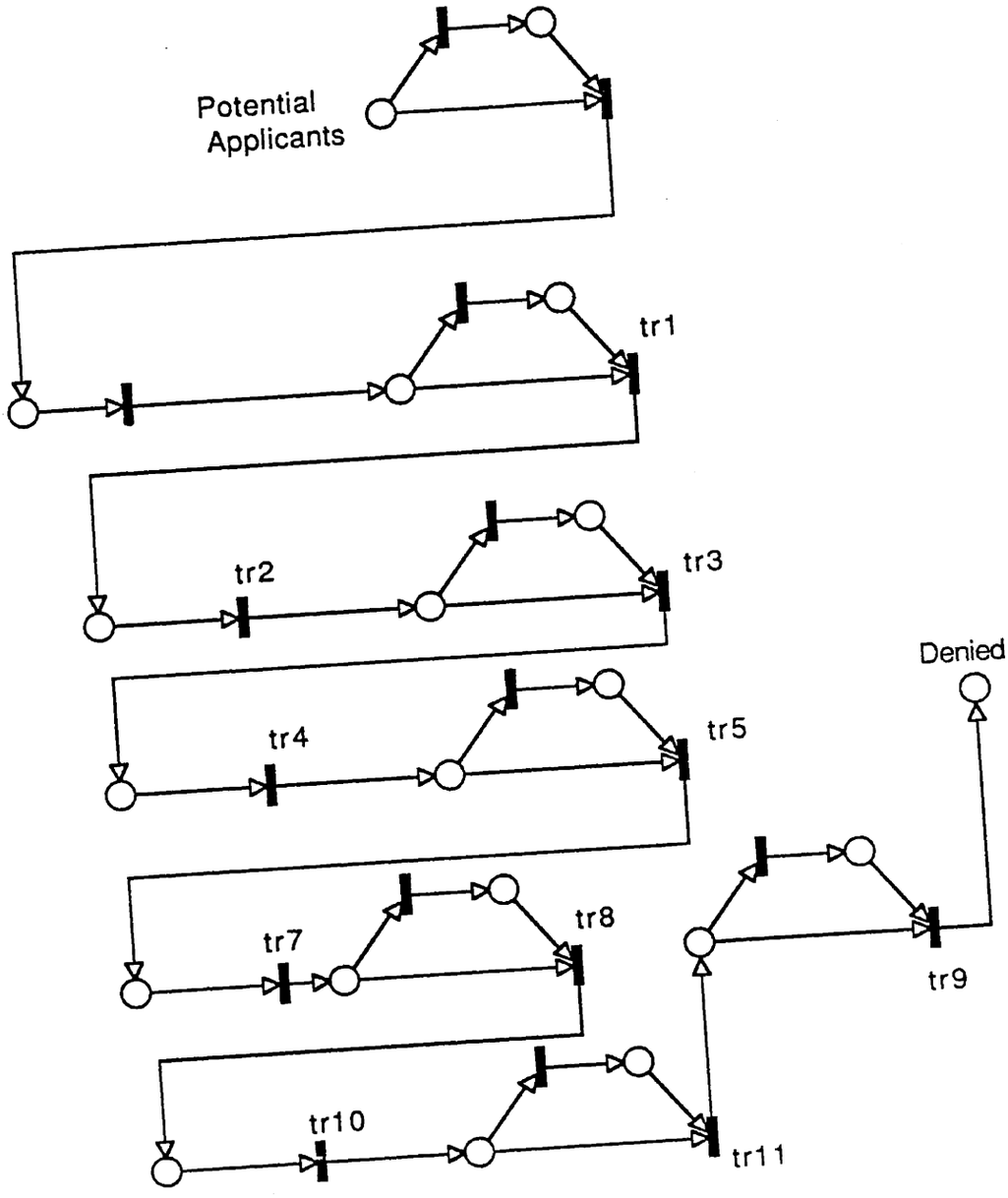

Figure A12. Petri Net Representation of Path 13

APPENDIX B

THE PATHS OF THE VR PROGRAM THAT ARE CONSIDERED FEASIBLE

Table B1. List of the Feasible Paths of the VR Program

Paht #	Statuses through which the clients go
1	00 - 01 - 08
2	00 - 02 - 03 - 08
3	00 - 02 - 06 - 07 - 08
4	00 - 02 - 06 - 10 - 14 - 26
5	00 - 02 - 06 - 10 - 14 - 28
6	00 - 02 - 06 - 10 - 14 - 30
7	00 - 02 - 06 - 10 - 16 - 26
8	00 - 02 - 06 - 10 - 16 - 28
9	00 - 02 - 06 - 10 - 16 - 30
10	00 - 02 - 06 - 10 - 18 - 26
11	00 - 02 - 06 - 10 - 18 - 28
12	00 - 02 - 06 - 10 - 18 - 30
13	00 - 02 - 06 - 10 - 14 - 16 - 26
14	00 - 02 - 06 - 10 - 14 - 16 - 28
15	00 - 02 - 06 - 10 - 14 - 16 - 30
16	00 - 02 - 06 - 10 - 14 - 18 - 26
17	00 - 02 - 06 - 10 - 14 - 18 - 28
18	00 - 02 - 06 - 10 - 14 - 18 - 30
19	00 - 02 - 06 - 10 - 14 - 16 -18 - 26
20	00 - 02 - 06 - 10 - 14 - 16 - 18 - 28
21	00 - 02 - 06 - 10 - 14 - 16 - 18 - 30
22	00 - 02 - 06 - 10 - 14 - 18 - 16 - 26

Table B1 (continued)

23	00 - 02 - 06 - 10 - 14 - 18 - 16 - 28
24	00 - 02 - 06 - 10 - 14 - 18 - 16 - 30
25	00 - 02 - 06 - 10 - 14 - 16 - 18 - 18 - 26
26	00 - 02 - 06 - 10 - 14 - 16 - 18 - 18 - 28
27	00 - 02 - 06 - 10 - 14 - 16 - 18 - 18 - 30
28	00 - 02 - 06 - 10 - 14 - 18 - 18 - 16 - 26
29	00 - 02 -06 - 10 - 14 - 18 - 18 - 16 - 28
30	00 - 02 - 06 - 10 - 14 - 18 - 18 - 16 - 30
31	00 - 02 - 06 - 10 - 16 - 18 - 26
32	00 - 02 - 06 - 10 - 16 - 18 - 28
33	00 - 02 - 06 - 10 - 16 - 18 - 30
34	00 - 02 - 06 - 10 - 16 - 18 - 18 - 26
35	00 - 02 - 06 - 10 - 16 - 18 - 18 - 28
36	00 - 02 - 06 - 10 - 16 - 18 - 18 - 30
37	00 - 02 - 06 - 10 - 18 - 16 - 26
38	00 - 02 - 06 - 10 - 18 - 16 - 28
39	00 - 02 - 06 - 10 - 18 - 16 - 30
40	00 - 02 - 06 - 10 - 18 - 18 - 16 - 26
41	00 - 02 - 06 - 10 - 18 - 18 - 16 - 28
42	00 - 02 - 06 - 10 - 18 - 18 - 16 - 30
43	00 - 02 - 10 - 14 - 26
44	00 - 02 - 10 - 14 - 28
45	00 - 02 - 10 - 14 - 30
46	00 - 02 - 10 - 16 - 26
47	00 - 02 - 10 - 16 - 28
48	00 - 02 - 10 - 16 - 30
49	00 - 02 - 10 - 18 - 26
50	00 - 02 - 10 - 18 - 28
51	00 - 02 - 10 - 18 - 30
52	00 - 02 - 10 - 14 - 16 - 26
53	00 - 02 - 10 - 14 - 16 - 28

Table B1 (continued)

54	00 - 02 - 10 - 14 - 16 - 30
55	00 - 02 - 10 - 14 - 18 - 26
56	00 - 02 - 10 - 14 - 18 - 28
57	00 - 02 - 10 - 14 - 18 - 30
58	00 - 02 - 10 - 14 - 16 - 18 - 26
59	00 - 02 - 10 - 14 - 16 - 18 - 28
60	00 - 02 - 10 - 14 - 16 - 18 - 30
61	00 - 02 - 10 - 14 - 18 - 16 - 26
62	00 - 02 - 10 - 14 - 18 - 16 - 28
63	00 - 02 - 10 - 14 - 18 - 16 - 30
64	00 - 02 - 10 - 14 - 16 - 18 - 18 - 26
65	00 - 02 - 10 - 14 - 16 - 18 - 18 - 28
66	00 - 02 - 10 - 14 - 16 - 18 - 18 - 30
67	00 - 02 - 10 - 14 - 18 - 18 - 16 - 26
68	00 - 02 - 10 - 14 - 18 - 18 - 16 - 28
69	00 - 02 - 10 - 14 - 18 - 18 - 16 - 30
70	00 - 02 - 10 - 16 - 18 - 26
71	00 - 02 - 10 - 16 - 18 - 28
72	00 - 02 - 10 - 16 - 18 - 30
73	00 - 02 - 10 - 16 - 18 - 18 - 26
74	00 - 02 - 10 - 16 - 18 - 18 -28
75	00 - 02 - 10 - 16 - 18 - 18 - 30
76	00 - 02 - 10 - 18 - 16 - 26
77	00 - 02 - 10 - 18 - 16 - 28
78	00 - 02 - 10 - 18 - 16 - 30
79	00 - 02 - 10 - 18 - 18 - 26
80	00 - 02 - 10 - 18 - 18 - 28
81	00 - 02 - 10 - 18 - 18 - 30
82	00 - 02 - 10 - 18 - 18 - 16 - 26
83	00 - 02 - 10 - 18 - 18 - 16 - 28
84	00 - 02 - 10 - 18 - 18 - 16 - 30