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South Carolina Department of Corrections

Jim Hodges, Governor
William D. Catoe, Director

197353

FINAL REPORT

Evolving Optimum Classification Policies in the Implementation of Truth-in-Sentencing: A Dynamic Model to Predict Bed-Type Mix

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College of William and Mary

May 19, 2000

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Approved By: ______________

Date: ______________

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PRACTITIONER-RESEARCHER PARTNERSHIP PROJECT

In October, 1998, the South Carolina Department of Corrections (SCDC) obtained funding from the National Institute of Justice (NIJ) and formed a practitioner-researcher partnership with the COMPETE Center, Graduate School of Business, College of William and Mary. For eighteen months, partnership staff coordinated and conducted research activities independently and jointly via meetings, site visits, e-mail correspondence, and literature and electronic data exchanges. SCDC, the practitioner, defined the operational and research objectives of the partnership, conducted empirical data analyses, specified performance requirements, generated model parameters, reviewed and tested software, and applied the model to analyze classification polices and their impact on bed type mix. The practical correctional program/research experience ensures that the final product will be user friendly and addresses the operational requirements of correctional managers and criminal justice planners/policy analysts. On the other hand, the COMPETE Center applied highly technical knowledge and skills in operational research and information systems, both of which are mandatory and critical to deliver PC software tools to assess the concomitant effects of modifying classification and sentencing policies. Individuals staffing this NIJ funded Practitioner-Researcher Partnership:

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ACKNOWLEDGEMENTS

During the eighteen-month project period, October 1, 1999 - March 31, 2000, the Offender Information Management Branch, Division of Resource and Information Management, South Carolina Department of Corrections (SCDC), and the COMPETE Center, Graduate School of Business, College of William and Mary formed a strong and vital practitioner-researcher partnership to deliver a PC based model to simulate the interactive dynamics of prison classification policies, sentencing structure and inmate behavior and then impact on prison bed type requests. Numerous entities and individuals supported and contributed in various ways to this partnership project:

- National Institute of Justice funding enabled SCDC and COMPETE Center to launch and implement the partnership.
- National Institute of Corrections shared information and data from national surveys and Ms. Sammie Brown engaged in active dialogue with partnership staff.
- Business School, William and Mary College, endorsed and supported the partnership
- Mr. William D. Catoe, SCDC Director, provided executive support and SCDC resources to supplement NIJ funding.
- Technical staff from the Division of Resource and Information Management, SCDC, delivered essential hardware/software on a timely basis.
- SCDC Classification staff engaged in the review and feedback process.
- Dr. Jim Austin, Criminal Justice Institute, George Washington University and Ms. Wendy Naro, formerly with National Council on Crime and Delinquency, shared their experience and knowledge relating to criminal justice modeling for prison population projections.
- Ms. Barbara Tombs and Mr. Kun Lun Chang, Kansas Sentencing Guidelines Commission, participated in a comparative analysis of partnership product.
- Justice Research and Statistics Association provided facilities for partnership staff to demonstrate product and obtain feedback.

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ABSTRACT

Final Report to the National Institute of Corrections Evolving Optimum Classification Policies in the Implementation of Truth-in-Sentencing: A Dynamic Model to Predict Bed-Type Mix

The Dynamics of Sentencing, Classification and Inmate Behavior in Prisons

This partnership examined various dynamic factors, which affect the level and type of security beds required by a prison system. After an inmate's initial classification at intake, his/her re-classification outcome is a function of time, sentence (or time to serve), classification policy/practice, and his/her behavior. The effect of these factors on an individual inmate are analyzed to determine their dynamic interactions and impact on individual inmate location assignment, and accordingly the corresponding aggregate demand for bedspace of various security levels.

Development of a Rule-based Simulation Model

Project goals focused on analyzing and illustrating the dynamics of classification, sentencing structure and inmate behavior patterns; thus partnership staff explored creative ways to incorporate these dynamics, as parameter or rule modifications, in the PC simulation model. The project applied operations research concepts and deployed modern information system development methodology which included data warehouse construction, object-oriented computing, and On-Line Analysis Processing (OLAP) through the use of a sophisticated simulation. The simulation model was developed to focus on classification policy/scenario changes capable of providing interactive data access and decision support front ends for inputting classification criteria. While the data, procedures, algorithms, and technical documentation related to the simulation model will be submitted to the National Institute of

Justice separately, the final report elaborates on the conceptual framework used in model development and presents relevant data input and findings.

Analysis of Inmate Behavior in Prison

This project has unveiled early evidence of worsening institutional behavior among TIS (versus Non-TIS) inmates who committed similar crimes and were admitted during the same time period. This observation is consistent across various age and time to serve population subgroups as illustrated in Figures 1-3.

AVERAGE DISCIPLINARY INFRACTION RATE BY AGE
TIS VS. NON-TIS SCDC ADMISSIONS (JANUARY 1, 1996 –DECEMBER 31, 1998)
WHO COMMITTED SIMILAR VIOLENT CRIMES
(2,390 TIS AND 1,253 NON-TIS INMATES)

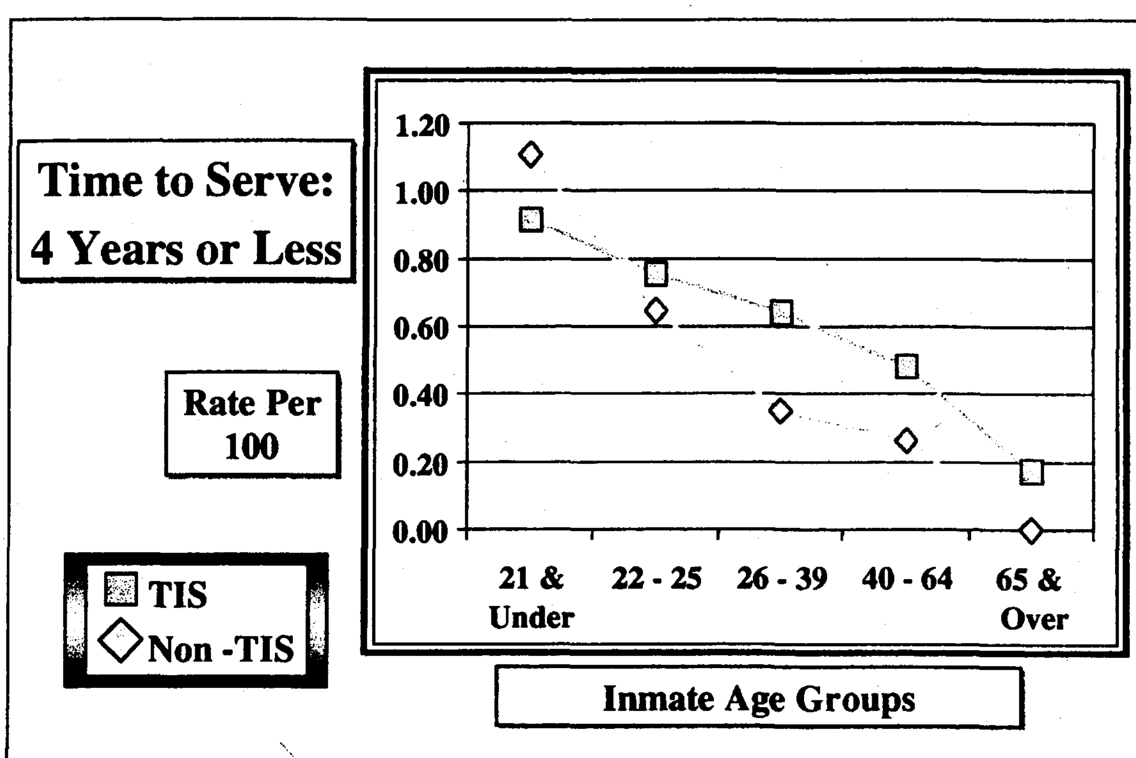


FIGURE 1

Average Disciplinary Infraction Rate by Age
TIS vs. Non-TIS SCDC Admissions (January 1, 1996 –December 31, 1998)
Who Committed Similar Violent Crimes
(2,390 TIS and 1,253 Non-TIS Inmates)

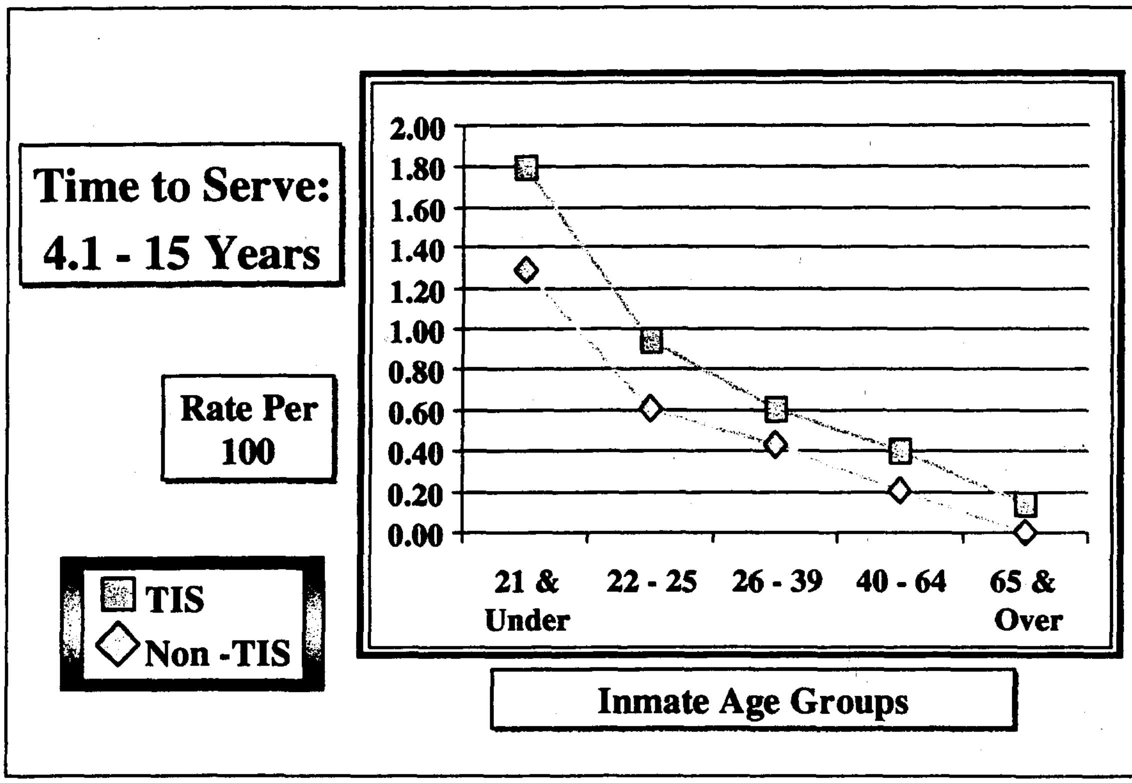


Figure 2

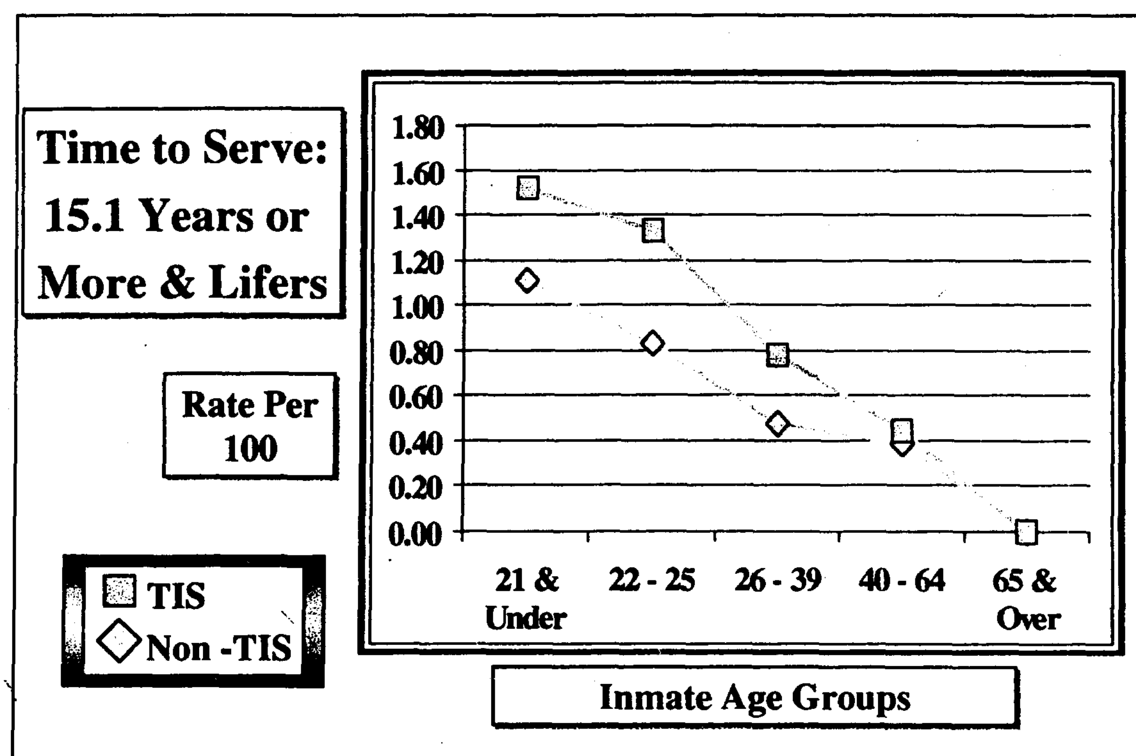


Figure 3

Disciplinary infraction data analysis centered on methods for the translation of these data into useful model parameters - parameters suitable to simulate the dynamics of inmate behavior pattern changes, independently or in conjunction with sentence structure changes. Numerous measures for various age and time served/time to serve groups were generated and examined--infraction rates, distributions based on number of infractions, and distributions of time between disciplinary infractions. The first two statistics were analyzed to identify trends and relationships (such as age and TIS, which are significant independent variables in regression analysis), while probability distributions, and average time span between admission, first, and subsequent disciplinary infractions were generated to provide model parameters capable of distinguishing between past and expected behavior patterns. Figures 4 and 5 provide a summary of the results that were developed and applied in the simulation model.

Figure 4 shows that TIS inmates have a ~~lower~~ probability of ~~NOT~~ committing infractions – 81% that of Non-TIS inmates (or 19% lower). TIS inmates also commit infractions more frequently – the mean time between infractions ranges from 49% to 66% that of their Non-TIS counterparts.

Derivation of "Multipliers" for All Disciplinary Infractions
Truth-in-Sentencing (TIS) versus Non-Truth-in-Sentencing (Non-TIS) Admissions
with Same "1995 Non-Parolable" Type Crimes

		Average Lag-Time Between Infractions in Months				
Inmate Groups	**% of Inmates with Zero Infractions**	**Admission and First Infraction**	**First and Second Infraction**	**Second and Third Infraction**	**Third and Fourth Infraction**	**Third and Fourth Infraction**
Truth-in-Sentencing	34.90	7.96	3.74	3.22	2.44	2.20
Non-Truth-in-Sentencing	43.30	13.09	6.64	4.85	5.00	4.06
Adjustment Multiplier	**0.81**	**0.61**	**0.56**	**0.66**	**0.49**	**0.54**
Derivation	*34.90/43.30*	*7.96/13.09*	*3.74/6.64*	*3.22/4.85*	*2.44/5.00*	*2.20/4.06*

FIGURE 4

Figure 5 illustrates that for inmates with less serious crimes and shorter time to serve (i.e., "1995" Parole Type Crimes), the behavior among admissions are worse than that of releases – while the probability of NO infractions remains similar, the admission cohort has a relatively shorter time between disciplinary infractions. On the other hand, based on data in Figure 4, it is projected that inmates admitted for the "1995" No Parole Type Crimes would more likely commit disciplinary infractions at shorter intervals. The multiplier in Figure 4 is applied to this group of inmates to derive the aggravated behavior pattern.

Behavior Dynamics						
	Average Lag Time Between Infraction in Months					
Inmate Behavior Pattern	**% of Inmates with "No" Disciplinary Convictions**	**Admission and First Infraction**	**First and Second Infraction**	**Second and Third Infraction**	**Third and Fourth Infraction**	**Third and Fourth Infraction**
"1995" Parole Type Crimes						
Current Behavior *(Based on Release Data)*	66.50	9.55	6.33	5.44	5.25	4.55
Aggravated Behavior *(Based on Admissions Data)*	66.83	8.21	4.45	3.91	3.38	2.95
"1995" No Parole Type Crimes						
Current Behavior *(Based on Release Data)*	40.70	22.43	13.29	11.30	10.57	10.27
Aggravated Behavior *(Applying Mutiplier to Release Data)*	32.80	13.64	7.50	7.51	5.17	5.57
Derivation	*(.81)(40.70)*	*(.61)(22.43)*	*(.56)(13.29)*	*(.66)(11.30)*	*(.49)(10.57)*	*(.54)(10.27)*

FIGURE 5

Illustration of the Dynamics of Sentence, Classification and Inmate Behavior - Impact on Level Three - Maximum Beds

To illustrate performance of the simulation model, a simplified version of the South Carolina Department of Corrections' current classification policies is used as the base line to produce Level 3 bed estimates. Hypothetical classification policy modifications focusing on the "remaining time-to-serve" criterion for Level 3 - Maximum security eligibility/placement were introduced to generate results for two classification scenarios--one more conservative and one more liberal. The former requires inmates with remaining time to serve of 6 years or more (instead of 9 years or more) to be housed in maximum security facilities. The latter requires inmates with remaining time to serve of 15 years or more (instead of 9 years) to be housed in a maximum-security facility. These two hypothetical classification scenarios along with the base scenario are applied to four combinations of assumptions - whether sentencing guidelines are implemented and whether inmate behavior patterns in prison would worsen. An additional hypothetical classification scenario focuses on age to determine the size of an older inmate population (55 or over). An attempt was made to more concretely quantify the common hypothesis that prison population will consist of a larger number of older inmates.

	Sentencing Scenarios				
	Pre-Guidelines Implementation		Post Guidelines Implementation		
	Behavior Scenarios				
Scenarios	Similar to Recent Releases	Aggravated Behavior	Similar to Recent Releases	Aggravated Behavior	Definition of Scenarios
Classification Scenario One - Current Practice					
1.1	X				Current Classification Policy with No Sentencing Guidelines and No Changes in Current Behavior
1.2		X			Current Classification Policy with No Sentencing Guidelines and More Aggravated Behavior
1.3			X		Current Classification Policy with Sentencing Guidelines and No Changes in Current Behavior
1.4				X	Current Classification Policy with Sentencing Guidelines and More Aggravated Behavior
Classification Scenario Two - More Punitive					
2.1	X				More Punitive Classification Policy with No Sentencing Guidelines and No Changes in Current Behavior
2.2		X			More Punitive Classification Policy with No Sentencing Guidelines and More Aggravated Behavior
2.3			X		More Punitive Classification Policy with Sentencing Guidelines and No Changes in Current Behavior
2.4				X	More Punitive Classification Policy with Sentencing Guidelines and More Aggravated Behavior
Classification Scenario Three - More Liberal					
3.1	X				More Liberal Classification Policy with No Sentencing Guidelines and No Changes in Current Behavior
3.2		X			More Liberal Classification Policy with No Sentencing Guidelines and More Aggravated Behavior
3.3			X		More Liberal Classification Policy with Sentencing Guidelines and No Changes in Current Behavior
3.4				X	More Liberal Classification Policy with Sentencing Guidelines and More Aggravated Behavior
Classification Scenario Four - Special Mission-Geriatric Unit for 55 Years of Age or Older					
4.1	X				Special Mission Classification Policy (Geriatric Unit for Inmates 55 Years or Older) with No Sentencing Guidelines and No Changes in Current Behavior
4.3			X		Special Mission Classification Policy (Geriatric Unit for Inmates 55 Years or Older) with Sentencing Guidelines and No Changes in Current Behavior

FIGURE 6

The various scenarios described above illustrate a wide range of results and are presented in Figures 7, 8 and 9. These variations show that classification policy, as much as inmate attributes and behavior, *controls* the demand for bedspace by bed type. For example, seven years into the future, Level 3 bed demand can range from 3,314 to 13,690, depending on which classification scenario is applied, whether sentencing guidelines are implemented, and if inmate behavior continues to deteriorate. Applying the model to identify older inmates suggests that SCDC can expect this population to increase from the current level of 550 to 750 in Year 3, 1,071 in Year 7, and 1,349 in Year 10 if sentencing guidelines are not implemented. With sentencing guidelines, these projected numbers would be slightly lower in Year 3 - 738, but would be higher in Year 7 and Year 10 -- 1,117 and 1,429 respectively.

A COMPARISON OF BEDSPACE CONFIGURATION FOR 12 SCENARIOS OF CLASSIFICATION, SENTENCE, AND BEHAVIOR DYNAMICS

YEAR THREE

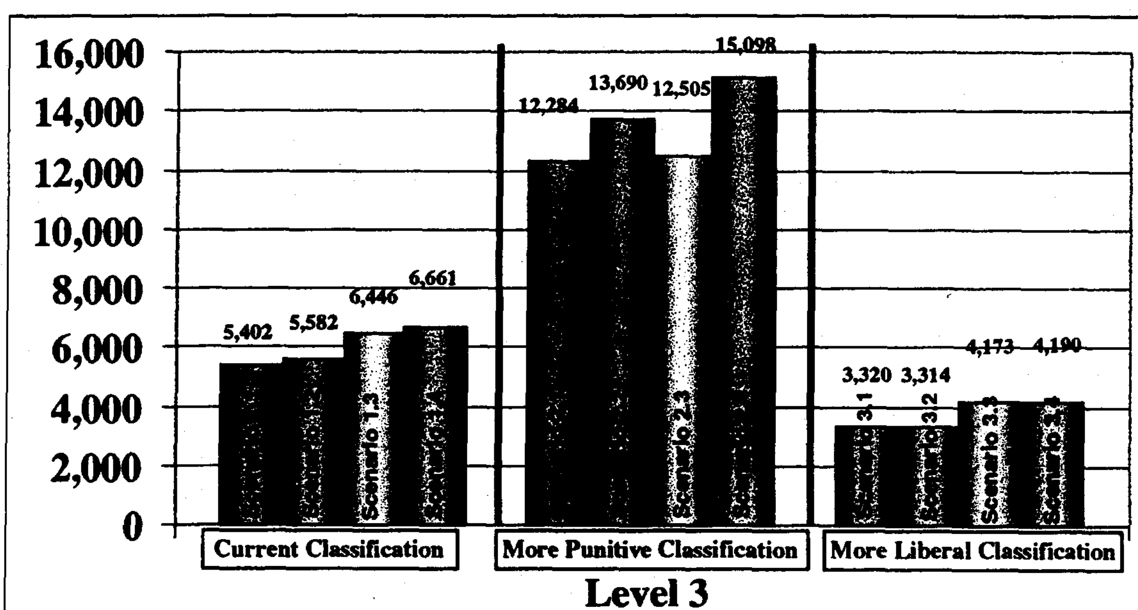


FIGURE 7

A COMPARISON OF BEDSPACE CONFIGURATION FOR 12 SCENARIOS OF CLASSIFICATION, SENTENCE, AND BEHAVIOR DYNAMICS

YEAR SEVEN

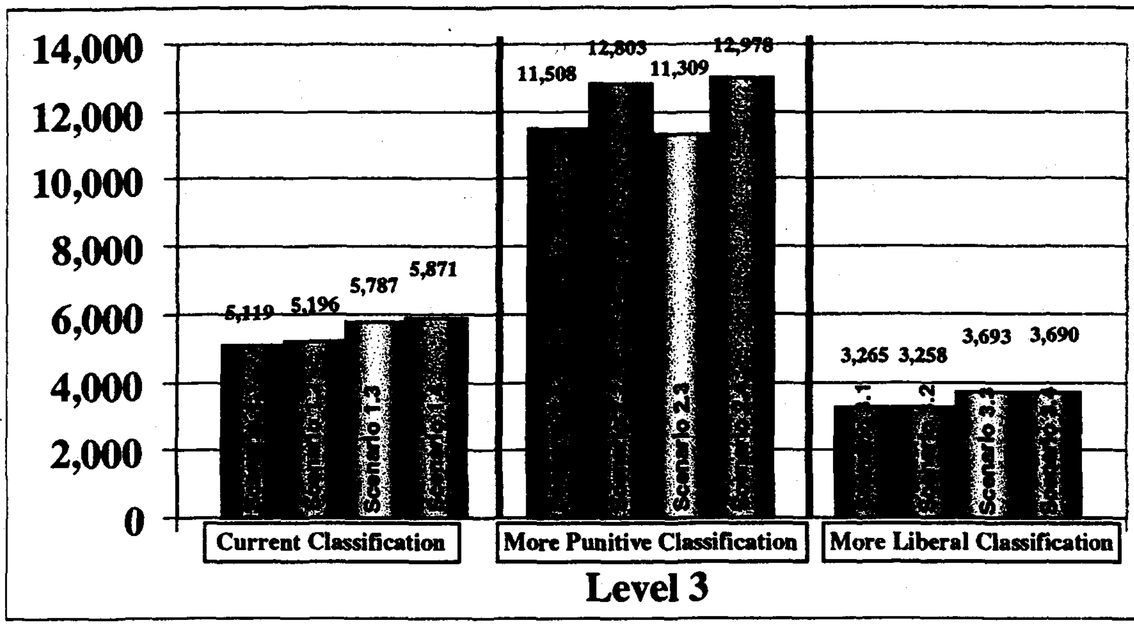


FIGURE 8

YEAR TEN

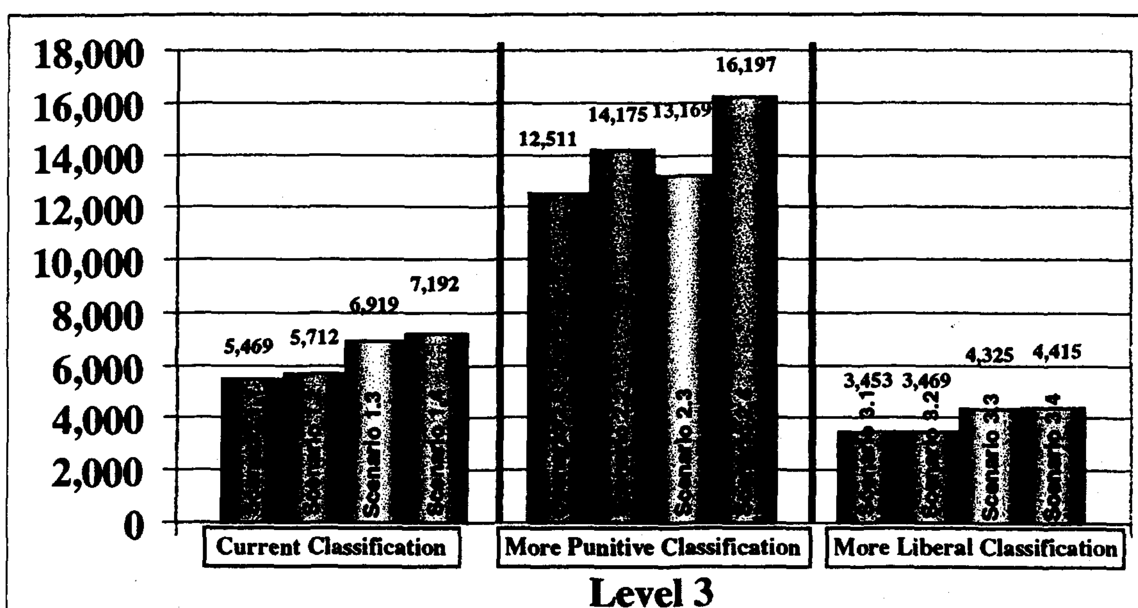


FIGURE 9

Project Limitations

This project was not undertaken to recommend classification policy changes or the nature of such change. Rather, it delivers a tool suitable to assess the impact on bed type demand as correctional administrators deliberate on classification policies -- with due consideration to other salient factors such as risk assessment, public opinion, victim reactions, statutory requirements, and budget constraints. Currently, the South Carolina Department of Corrections is undertaking a classification validation study with technical assistance from the National Institute of Corrections to ensure sound theory and practice based upon the employment of objective risk factors. Application of this simulation model will complement and supplement the validation effort and aid in striking an appropriate balance between risk and cost of operating/constructing prisons.

This project focuses on the dynamics of classification, inmate behavior and sentencing structure, model construction and data presentation. It cannot embody all facets of classification, which is an extremely complex process involving both quantitative and qualitative information, as well as professional judgement. By necessity, this model focuses primarily on factors which affect proportionally larger numbers of inmates (e.g., hypothetical changes are introduced to alter "time to serve" criterion rather than criteria relating to detainers or escapes [which pertain to a very low number of inmates in the population]). Similarly, because of the complex issues related to *overrides*, the model does not directly address the dynamics of overrides at this time.

The South Carolina Sentencing Guidelines Commission provided the designated guideline sentence for individuals processed by the South Carolina adult court system in CY 1996 (the latest year for which such data is available). To maintain comparability, more recent SCDC admission data (CY 1999 admissions) could not be used. It is felt that simulation results are not jeopardized, particularly given that admission levels have remained relatively stable over the past several years.

Not surprisingly, simulation results primarily focus on the demand for high cost maximum-security prison beds. Therefore results consciously omit a comparison of minimum-security level beds given that decisions relating to minimum beds are more often driven by non-quantifiable factors.

Future Direction/Research

This Practitioner/Academic partnership proposes the following enhancements, which will hopefully increase model functionality and integrate its application with other management and/or policy objectives -

Integrate Classification Policy Simulation with Prison Population Projection Methodology

- Expand the data loader to include more extensive history of admissions and departures from the prison system.
- Extend the simulation modules to process offender flow from crime commitment through recidivism (return to prison after release).
- Elaborate on arrival and departure assumptions or rules.

Extend Data Architecture Simulation and Rule-Based Processing to Offender Classification at Sentencing

- Expand the data warehouse to address sentencing guideline scenarios.
- Extend algorithm and simulation processing to judicial decisions.
- Customize reports to address impact of changing sentencing grids for non-corrections audiences.

Integrate Classification Simulation with Offender Risk Analysis to Identify Salient Factors for Optimum Classification Policy

- Add an inferential statistical component to determine predictive relationship between institutional behavior and offender attributes.
- Create algorithms to either translate inferential statistical results into a classification scenario or to guide classification policy analysts in their formulation of classification scenarios.
- Attach risk rating, warning signals, and constraints for individual classification scenarios as rules are promulgated and inputted into the model.
- Generate two-dimensional tables to illustrate risks and costs associated with individual classification scenarios.

With enhancements included, but not limited to them, the partnership's simulation model would constitute a complete suite of tools for developing, monitoring, and evaluating classification policy and practices for correctional administrators.

PROJECT GOALS AND REPORT OBJECTIVES

The South Carolina Department of Corrections-COMPETE Center partnership conducted research, constructed a data warehouse, and developed a PC based model to simulate the effect of classification criteria/process changes on prison bed type mix at various junctures in the future as a new mix of inmates evolves under implementation of truth-in-sentencing/sentencing guidelines. The software is intended to be a "tool" to enable prison administrators to be more keenly aware of the impact of classification practices on bedspace demand - in particular the type of beds. Such awareness and the application of modeling and impact analysis tools can be deployed, along with other appropriate considerations for risk management, to facilitate the development of cost efficient and cost effective classification strategies.

To deliver the software "tool" and demonstrate results of software applications, the project embodies a multi-disciplinary approach, deploys extensive skill sets, and examines a multitude of topics, many of which independently constitute critical areas of research in the corrections arena today.[1] This report focuses only on those aspects which are relevant to executing the partnership goals and presents data which impact on simulation outcome. The organization and presentation of materials seek to meet these objectives:

- Illustrate the dynamic factors, which control bedspace "mix" or configuration (i.e., the allocation of heads and beds in various levels of security).
- Present early evidence of the impact of Truth-in-Sentencing on Inmate Behavior and the implications for classification and capital planning.

[1] Criminal justice research topics relevant to this partnership project include: prison population projection technologies; operations research and simulation modeling; offender risk prediction; classification monitoring and evaluation; sentencing guidelines; mandatory minimum sentences; violent offender management and criminal justice program evaluation. Information technology issues examined by project staff pertain to data warehousing; executive information systems; criminal justice management information; and "rule based" information processing.

- Provide a brief, but relevant overview of dynamic modeling concepts, relating corrections operations to operations research terminology and rule-based information processing.
- Compare simulation results to illustrate the dynamic relationship between sentencing guidelines/TIS implementation, inmate behavior, and classification criteria to demonstrate the impact of varying classification policies in prison management.
- Discuss the utility, conjunctive application, limits and constraints of the research product.
- Recommend future enhancements and integration with other corrections and/or classification specific research endeavors.

Under separate cover, a user manual documents the process and technical procedures undertaken to complete this PC simulation model. Terminology and how to deploy this rule-based information system are defined and detailed.

It is hoped that the final products from this project do exemplify the merits of practitioner-researcher partnerships - highly complex and specialized knowledge and experiences from multiple academic disciplines and the criminal justice system are thereby successfully integrated to ensure the state-of-the-art technologies are applied on a timely basis to solve critical and pragmatic problems.

THE DYNAMICS OF TRUTH-IN-SENTENCING, SENTENCING GUIDELINES, AND PRISON CLASSIFICATION SYSTEMS

In the last two decades, truth-in-sentencing (TIS), sentencing guidelines, offender risk prediction, and prison classification systems dominate discussions among criminal justice professionals. The National Institute of Justice's recent series of papers, *Sentencing and Corrections, Issues for the 21st Century,* succinctly recaptures the evolution and application of various sentencing philosophies and structures in the United States.[2] The shifts in sentencing policy are generally characterized by the decline (or termination in some states) of indeterminate sentencing, the extensive implementation of truth-in-sentencing,[3] and the emergence or adoption of sentencing guidelines.[4] Shifts in sentencing policy and practices affect who goes to prison and for how long, and thus are prompting a generation of forecasting methods and tools to conduct prison population projections and statutory/policy impact analysis. Prevailing projection models predict the level of prison admissions under various legislative/sentencing policy assumptions, estimate their expected length of stay in prison by offender groups, and thus estimate population

[2] The National Institute of Justice and Corrections Program Office, United States Department of Justice sponsored a series of Executive Sessions on Sentencing and Corrections in 1998 and continuing the year 2000 to deliberate on the purposes, functions, and interdependence of sentencing and correctional policies. By September, 1999, four papers were published by Sentencing and Corrections, Issues for the 21st Century : Tonry (1999, September) wrote "The Fragmentation of sentencing and corrections in America", and "Reconsidering indeterminate and structured sentencing, Kurki (1999, September) wrote "Incorporating Restorative and Community Justice Into American Sentencing and Corrections", and Smith & Dickey (1999, September) wrote "Reforming Sentencing and Corrections for Justice Punishment and Public Safety."

[3] Ditton & Wilson (1999, January) reported in Truth in sentencing in state prisons that "nearly 7 in 10 state prison admissions for a violent offense in 1997 were in states requiring offenders to serve at least 85% of their sentence". The United States Congress passed the Violent Crime Control and law Enforcement Act of 1994 and in 1998, awarded incentive grants to 27 states and the District of Columbia that met the eligibility criteria for the Truth-in-Sentencing Program. As reported by RAND, between FY 1996 and FY 1999, a total of $1,366,373,487 was dispersed to states and U.S. territories for implementing truth-in-sentencing for violent offenders.

[4] The Bureau of Justice Assistance (1996, February) reported in National assessment of structred sentencing that sentencing guidelines (synonymous to structured sentencing) were implemented in 16 States. Among those with Voluntary/Advisory guidelines were Arkansas, Louisiana, Maryland, Michigan, Virginia, and Wisconsin. States with Presumptive sentencing guidelines were: Delaware, Florida, Kansas, Minnesota, North Carolina, Oregon, Pennsylvania, Tennessee, Utah, and Washington.

counts at future junctures in times. From the perspective of the correctional manager, especially prison administrators, while this generation of projection models may address the size or expected size of prison populations, it rarely provides guidance on pragmatic issues of prisoner and prison management -- in particular, what "type" of inmates to expect and what might be the desired bed-type mix. This partnership project seeks to develop tools to support solutions to such pragmatic issues and, in the process, to identify strategies for informed decision making in the overall management of inmates and the planning/operations of prisons.

Offender Classification - at Sentencing and in Prisons

Decision making at each juncture of the criminal justice system embodies some form of offender classification, i.e., subjectively and/or objectively categorizing the offender by a set of criteria or "rules" to define his/her actual/potential "dangerousness" or "risk," as measured most often by the severity of his/her crimes/behavior. Structured sentencing and objective prison classification systems, in fact, are the manifestos of a pursuit of objectivity and consistency in offender classification at sentencing and during incarceration. Both processes generally examine similar attributes: offense attributes to include severity of the offense and aggravating/mitigating circumstances, etc.; and offender attributes to include criminal history, behavioral patterns, and response to "treatment", etc. Together, offense and offender attributes, in conjunction with the respective classification schemas within/by which these factors are weighted, determine total prison time in sentencing decisions and the total length of incarceration at each type of prison. The first set of offender classification schema at sentencing controls the size and composition of prison admissions, alters the flow of individuals in and out of the prison system, and thus affects the size and composition of future stock populations. Accordingly, even given no changes in prison classification practices, a new bed type-mix (the corollary of inmate composition) will emerge when a new sentencing schema is introduced (such as guidelines or truth-in-sentencing). Sentencing guidelines and truth-in-sentencing (controlling total length of stay and/or remaining time to stay at future points in time) constitute predominant dynamic factors, which affect outcomes of prison classification practices.

While at the sentencing phase, an offender is classified for a single time according to the "rules" of sentencing guidelines or statutes governing truth-in-sentencing implementation, the same offender would be "classified" for numerous times during his stay in prison -- the frequency and outcome being governed by prison classification "rules," his/her length of stay in the prison system, and his/her behavior. Even if sentencing guidelines/TIS had not been implemented, the accepted professional practice of re-classification and the incorporation of behavioral factors in prison classification schemas would, in most cases, result in an inmate having different institutional assignments at different times during his incarceration. To generate bed type estimates, even for the same set of classification rules, one must be able to estimate an offender's remaining time to serve and how it relates to the classification rules - *the dynamics of time affecting the outcome of classification review.* (To illustrate, if a classification schema should require an offender with more than 10 years remaining to serve to be housed in maximum security prison, an inmate with 15 years to serve will not qualify for lower security placement until he/has served 5 years, or at the 4th annual reclassification review.) Similarly, though with less certainty, one must also be able to estimate how the inmate's behavioral history would have measured in the context of the classification rules - *the dynamics of behavior affecting the outcome of classification review* (To illustrate, if a classification schema should require an offender to be disciplinary free for the previous 12 months of incarceration before he/she can be placed in minimum security, an inmate who acts out every six months will not qualify irrespective of his/her number of reclassification reviews and irrespective of his/her standing in relation to other eligibility criteria). The question then arises as to whether current behavioral patterns would remain unchanged, given that the dynamics of sentencing, prison in-out flow, and future stock population composition, were significantly disturbed because of sentencing guidelines and TIS - *the dynamics of behavior interacting with sentencing structure over time* (To illustrate, if an inmate behaves more "badly" because he/she is serving time under TIS, his/her more frequent "misbehavior" would result in less favorable outcome in his/her reclassification review). If inmate behavior patterns in prisons are expected to shift, implementing the same classification schema would not yield the same aggregate results relating to bed type mix requirements.

To summarize, even if classification policy/practices are held constant, the demands for different types of prison beds can and do fluctuate to respond to the dynamics of sentencing guidelines (and/or TIS implementation) and inmate behavioral patterns in prison, as well as the compounded or catalytic effect of both dynamic factors. To graphically illustrate these concepts, three charts are presented to show how even under the same set of classification rules, an inmate's location assignment (by security level) could differ at various junctures in future time because of the dynamics of sentence structure and behavior over time. Figure 1.1 illustrates the shifts of classification outcomes over time for an individual inmate whose time to serve is lengthened because of sentencing guidelines/TIS. Figure 1.2 illustrates the impact of "worse" behavior without the effect of TIS. Figure 1.3 depicts the results when length of stay is increased and behavior deteriorates.

TRUTH-IN-SENTENCING IMPACT ON INMATE LOCATION UNDER THE SAME CLASSIFICATION POLICY

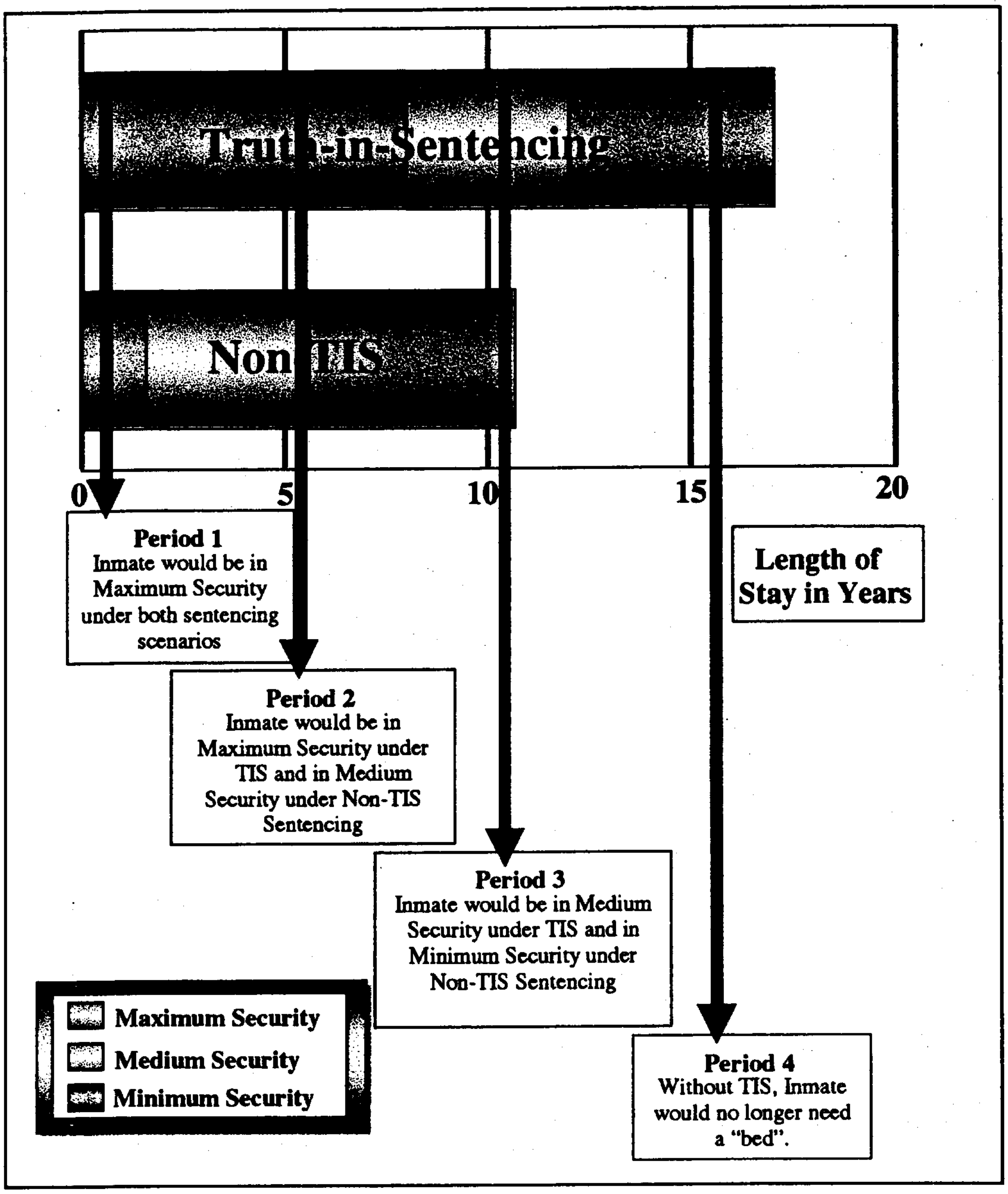


FIGURE 1.1

BEHAVIOR IMPACT ON INMATE LOCATION UNDER THE SAME CLASSIFICATION POLICY

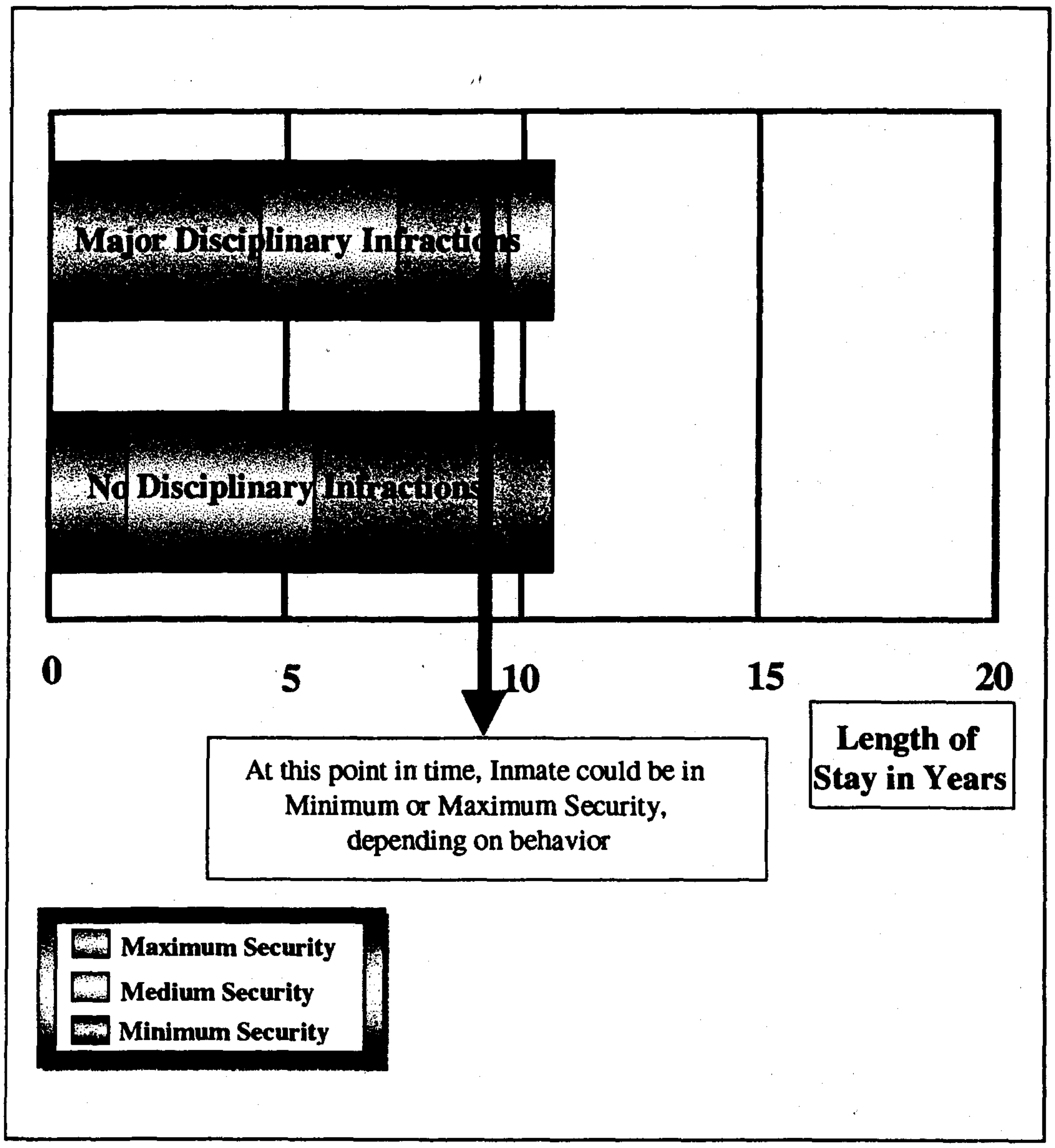


FIGURE 1.2

INTERACTIVE IMPACT OF TRUTH-IN-SENTENCING AND BEHAVIOR ON INMATE LOCATION

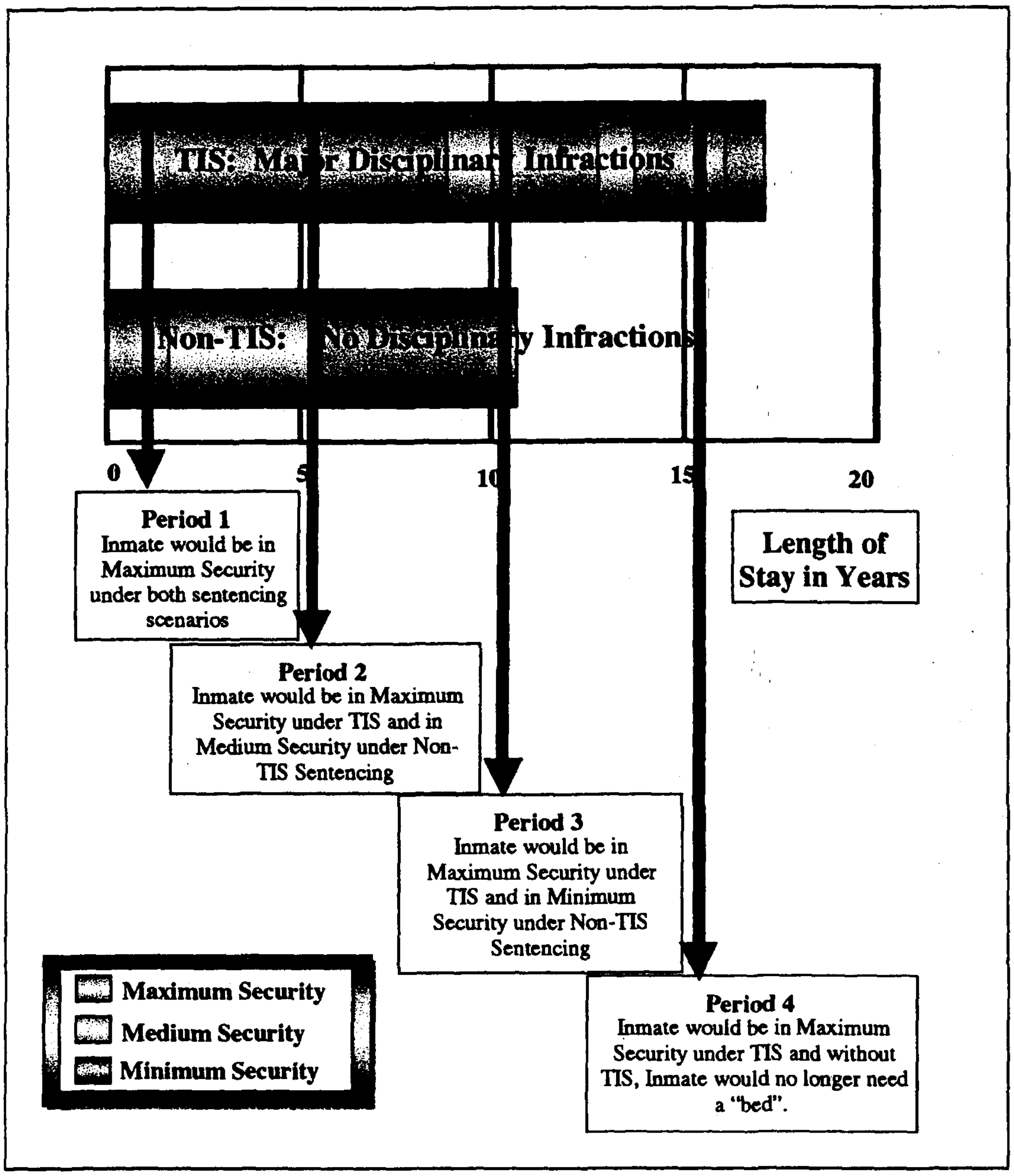


FIGURE 1.3

Prison Classification Systems - Dynamics of Policy and Outcome

Besides and beyond the dynamics of sentencing, behavior, time and their interactions, the prison classification system is, in itself, a dynamic factor on its own in individual bed assignment, and thus impacts on the aggregate outcome to derive prison bedspace configuration. Prison classification systems encompass an array of policies and procedures which, under ideal situations, define inmate risks and institutional missions and match inmates, according to their "risks" and/or "needs", with appropriate beds or vice versa. At each jurisdiction, its prison classification system amalgamates ideology, philosophy, public opinion, past empirical data and experiences, innovations, and correctional staff's anticipation, reception and/or reactions to inmate behavior. Accordingly, as administration changes hands and public opinions oscillate, prison classification systems were often *re-engineered* with changes in classification rules and outcomes. Despite variations across jurisdictions and dynamic changes within prison management and classification, the fact remains that an effective inmate classification in the prison system should support the missions of the correctional system - public safety and protecting inmates and the staff from "dangerous" inmates. Furthermore, classification practices should be objective and consistent -- enforcing behavior conformity among inmates and facilitating decision efficacy among correctional staff. Equally important, prison classification policies should be cost effective - optimizing resource utilization, i.e. minimizing 'risk' with a given set a beds and/or controlling cost without jeopardizing protection of the public, staff and inmates.

While most correctional systems across the nation utilize similar factors in their prison classification criteria, they differ substantially in their rules, which embody a specific combination (scenario) of weighing the factors and differentiating risk levels. A recent National

Institute of Corrections Survey identified these common demographic, offense and criminal history criteria in jail and prison objective classification systems: severity of offenses (or most serious offense) in current convictions; escape history; prior felony convictions/commitments; sentence length/time to serve/expected time to serve; prior conditional release violations; age at first felony conviction; detainers; and history of institutional violence. Some states, but not a significant number, also include program participation factors, employment history, and alcohol and/or drug abuse. [5] While these objective systems do commonly focus on prior behavior (crime commitment and institutional behavioral history) as predictors of possible future misbehavior, the methods with which the factors are embodied in the classification system vary. Some states have evolved their weighting and score categorization schemas from sophisticated inferential statistical analysis.[6] Other states apply a simpler arithmetic structure to direct how points should be assigned to each classification factor/variable and to specify the corresponding security level for each range of total points (i.e. the sum of points derived from each criterion). On the other hand, some states prescribe eligibility conditions for each type of facilities (thereby including/excluding certain types of inmates in/from certain types of beds). This format emerged to make the rationale of classification decisions more straightforward, explicit, self-explanatory, and more understandable to both prison caseworkers, inmates and the public. This format could still be compatible and consistent with the concept of risk assessment provided that the criteria have evolved from risk analysis and continued validation and monitoring processes.

need to cite the report

[5] Correspondence with Ms. Sammie Brown, Prisons Division, National Institute of Corrections, January 11, 2000.

[6] As a generalization, statistical techniques such as regression, logistic regression and cluster analysis are applied to analyze prison infractions and escape data to identify factors which are "good" predictors of risk. The coefficients from acceptable statistical models are used as guidelines to determine the weights given to the salient factors to be included in the classification system. Certain factors, while "statistically insignificant" in the statistical models (because of their relatively small numbers, e.g. incidents of escapes), are given weights as seen appropriate by prison administrators to reflect justifiable public and security concerns.

The South Carolina Department of Corrections, over the years, has applied a combination of various approaches. In the 1980's through the mid-1990's, the South Carolina Department of Corrections deployed an objective classification system derived from regression and cluster analysis. Since 1996, SCDC moved to a system, which specifies inclusionary/exclusionary criteria for each level of security. Both sets of systems, as illustrated by the on-line screens for classification reviews, are included in Appendix A and B to illustrate these two formats of prison classification.

To pictorially illustrate the concept of classification policy dynamics on an individual inmate, Figure 1.4 compares the location assignments over time of an inmate whose criminal/behavior attributes are not expected to change, but the classification schema embodies a different "remaining time to serve" requirement for minimum security placements: (1) 6 years remaining to serve; (2) more punitive - 9 years remaining to serve; (3) less punitive - 3 years remaining to serve.

IMPACT OF CLASSIFICATION POLICY CHANGE

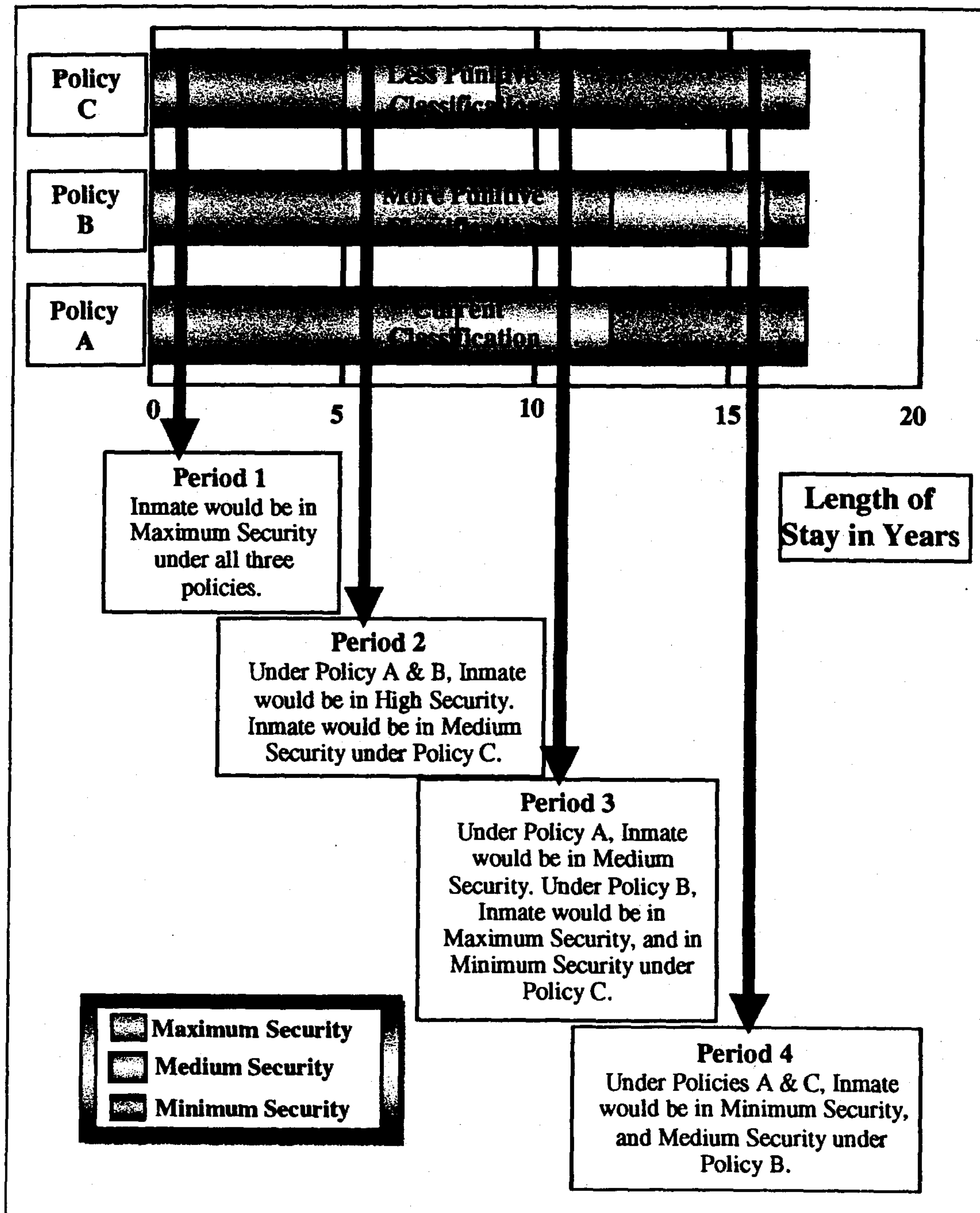


FIGURE 1.4

Implementation of Objective Classification Systems - Dynamics of Overrides

Generally and very often, prison administrators evaluate their classification systems by the extent to which the criteria are in fact adhered to in the inmate institutional assignment process -- overrides, their reasons and frequencies. Overrides inject another dynamic dimension to the impact analysis of classification policies and the variation in bed-space configuration. An analysis of override frequencies and reasons should identify the extent of staff acceptance, the degree of compatibility between bedspace demand (determined by offender attributes) and supply (determined by current/available bedspace), and probably can suggest, to some extent, the direction of desired policy change. The management of overrides constitutes another dynamic aspect of evaluating classification policy scenarios and predicts future bedspace configuration.

Simulate the Dynamics of Prison Classification and the Impact on Prison Bed-type Mix

In conjunction, evolving offender attributes (because of TIS/sentencing guidelines implementation) and classification policy/practices determine bed type. Accordingly, projecting bed type configurations necessitates calculations in a dynamic context, where changing sentencing structures and behavior patterns can be addressed. As a corollary, given resource constraints, classification options must also be responsibly assessed in a dynamic context to project capital construction requirements and costs requirements. To derive optimum classification policies, correctional administrators must assess the relative "risk" and "cost" of various combinations of criteria. To supplement and complement the current risk assessment technology to develop objective risk-based classification schemas, another set of tools needs to be deployed to translate each classification scenario into bedspace configurations. ***Within acceptable risk tolerance levels***, the bedspace configuration and the associated capital and operational cost implications, in the short and long runs of various classification options scenarios, can thus be evaluated.

Under the premises heretofore postulated, the SCDC-COMPETE practitioner-researcher partnership applied operational research concepts to construct an infrastructure for simulating the dynamics of prison classification policies, using the most recent version of classification criteria in South Carolina -- sentencing structure, classification decision rules, and inmate behavior independently and/or simultaneously changing over time. The dynamics of overrides is consciously omitted to facilitate a more direct and explicit assessment of the relationship between TIS/sentencing guidelines implementation, classification policies, and inmate behavior. For the same reason, the infrastructure and the specification of classification schemas as presented in this product, by necessity, focus on the dominant classification criteria and rules which affect larger (or large) numbers of offenders in the system. Because of the structure and composition of the South Carolina classification criteria, the simulation results uniquely reflect the theoretical relativity among classification scenarios (not necessarily practice, because overrides, bed capacity limitations, and public opinion considerations are NOT factored into the analysis). Therefore, applying the model to other systems with modifications to reflect alternate formats of prescribing classification criteria, can/would produce different results.

A RULE-BASED SIMULATION MODEL FOR CLASSIFICATION POLICY ANALYSIS AND PROJECTION OF PRISON BED-TYPE MIX

This chapter presents the guiding principles for developing this PC-based simulation model, discusses how operations research theories and concepts are applicable to correctional systems, and comments on the essential features and efficiency of a rule-based information system environment to assess classification policy impact on bedspace configuration.

Guiding Principles for Model Development

To develop the infrastructure for classification policy evaluation in the context of projecting prison bed-type mix, the research partnership identified these guiding principles:

(1) Application of classification criteria to both stock population and future admissions.

(2) Input of classification rule changes - The model must allow the input of changes in classification criteria to re-compute bedspace mix for both existing and future populations.

(3) Input of criminal justice policy changes that alter the flow of offenders into and out of prisons - the model must allow the input of data to vary the timing and manner under which truth-in-sentencing and sentencing guidelines are implemented.

(4) Input of inmate behavior changes which affect the outcome of individual classification, and thereby collective system - the model must allow entry of data to reflect assumptions/data changes relating to inmate institutional behavior, as a result of sentencing structure changes over time.

(5) Use of state-of-the-art PC system software technologies to include friendly user interface, direct user input, and graphical evaluation and tools.

(6) Flexible model infrastructure and programming to enable technology transfer across jurisdictions - model rules input are independent of different classification criteria formats.

Principle (1) required the partnership to analyze the dynamics of sentencing and classification in an operations research theoretic context. Model design and program structure addressed principles (2) through (4) - the user interface permits direct rule changes that reflect the dynamics of prison admission and releases, sentence lengths, and initial and re-classification. To satisfy principles (5) and (6), sophisticated computer software was employed to provide user-friendly multi-level menus, generate tables and graphs, and provide on-line dictionaries and look-ups. While the program logic currently accommodates various formats for delineating South Carolina Department of Corrections classification criteria, its structure accommodates modification to reflect a regression based equation, a point assignment system, or a collection of eligibility rules.

Sentencing and Classification in the Context of Dynamic Modeling

Simulation modeling has become one of the most powerful tools available to model physical or social phenomenon. The skilled modeler, whether based in the physical or social sciences, builds models that reflect the behavior of some system of interest - the criminal justice system's sentencing and classification practices are the subject of study in this partnership project.

While there are numerous approaches to simulation, this project relies on *discrete event simulation*. In this form of simulation, the researcher focuses on the changes that occur to an entity of interest as time passes and as environmental conditions change. More specifically, this study is interested in the changes that occur to an inmate as time passes and conditions for sentencing/classification change.

The simulation process begins by precisely translating prison operations into simulation modeling terms. Below we provide a list of essential modeling terms and describe the application of these terms to the corresponding corrections counterpart, specifically addressing classification transactions in the prison system.

State: A collection of variables used to characterize the system - a picture of the system at a given time. A prison system can be characterized by the number of inmates with TIS requirements, the distribution of inmates within various demographic groups, or inmates housed under varying degree of security.

Entity: An object of interest that resides within or passes through the model. For this model, inmates are entities.

Event: An occurrence at some point in time that may affect the entities and may or may not change the state of the system. Classification reviews and inmate infractions constitute events in this simulation model.

Arrival: The arrival of an entity to the system at some point in time. The Department of Corrections admitting an inmate from the courts or via probation or parole revocations is an arrival.

Scheduling: Process of assigning a future event to an existing entity. In this model, a future classification review or a future disciplinary infraction has to be scheduled for each inmate; i.e. specifying at what point in time the review or infractions will occur for a particular inmate (entity).

Random Variable: A quantity that is uncertain by nature. In this model, the time between infractions and escapes are random variables because they represent unknown future events.

Random Variate: Process of generating a random variable. In this model, it is the process of randomly generating the time between infractions and escapes to schedule reclassifications.

Distributions: A law that governs the probabilistic behavior of a random variable. The frequencies or cumulative frequencies of time between prison admission and first infraction as generated from past empirical data, suggests distributions for assigning the events of infractions in the future. In this modeling effort, the time between disciplinary infractions are assumed to be distributed exponentially.

The Monte Carlo Simulation Approach

Discrete event simulation utilizes a numerical technique known as the Monte Carlo method. This method generates sequences of random numbers that are used to represent events in the simulation. The Monte Carlo method creates distributions of possible outcomes for each of the probabilistic events in the simulation. The selected random numbers are used to sample from that distribution. If the distribution is representative of the probabilistic event being modeled and the Monte Carlo method accurately describes the distribution, then a modeler can use the approach to mimic reality.

In the design of any discrete event simulation, the basic flow of the simulation model must be clearly stated and understood. This requires that the underlying events must be accurately modeled, the data used as the basis for prescribing probabilistic events must be collected and analyzed, and the nature of the user interaction must be planned. Figure 2.1 provides a schematic view of the simulation processing steps of this model.

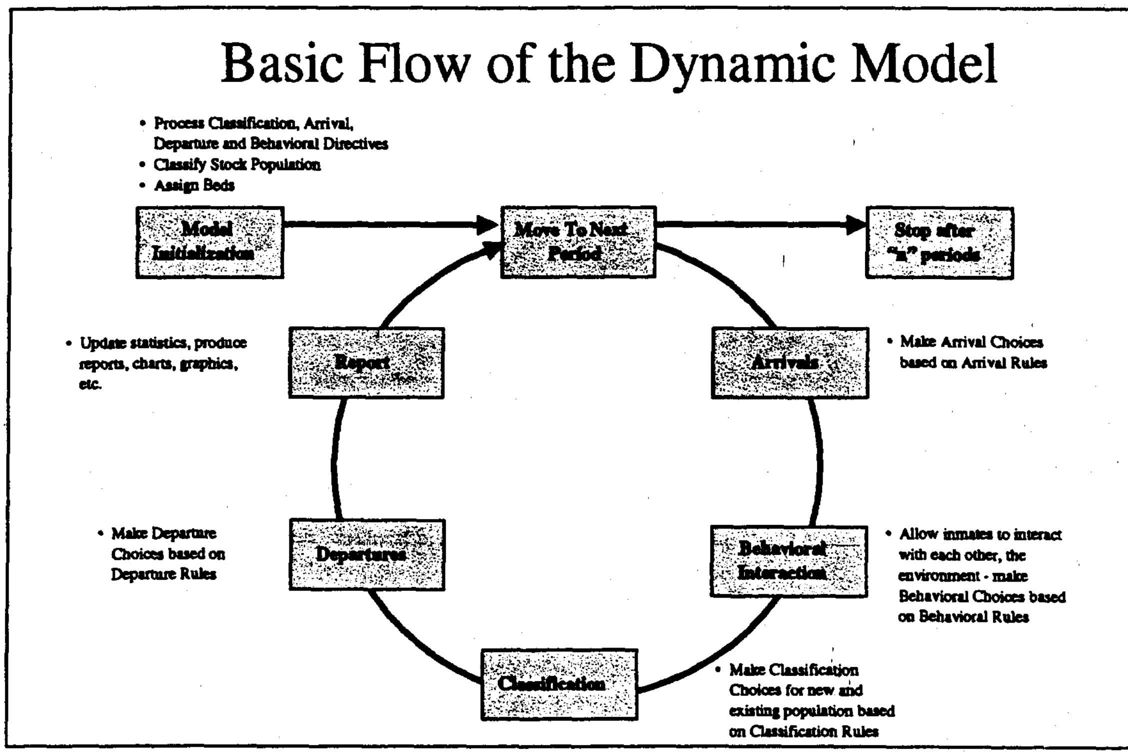


FIGURE 2.1

Definition of "Events"

In addition to these processing steps, it is also necessary to define the events that can be attributed to the entities in the model. For example, the arrival (e.g. parole revocation or new court admissions) and departure (e.g. parole or sentence expiration) of inmates under numerous conditions, as well as the interaction (e.g. Addition of detainer or the commission of an infraction) of the inmates within the incarcerated population must be determined. Figure 2.2 provides a table of the events relevant to this study. This list can be expanded and/or modified depending on how the criminal justice system/prison administration operates in each jurisdiction, as well as the level of detail/combination of factors to be incorporated in the classification criteria. Simulation model users can define events according to their needs.

Event Summary

Event Description	Event Type
Inmate arrives	Arrival
Initial Classification and bed	Classification
Re-classification	Classification
Disciplinary	Behavioral
Maxout	Departure
Parole hearing – parole granted	Departure
Addition of detainer	Behavioral
Removal of detainer	Behavioral
Addition of conviction	Behavioral
Removal of conviction	Behavioral
Supervised Furlough	Departure
Escape	Behavioral
Execution	Departure
Death by natural causes	Departure

FIGURE 2.2

It is important to model the occurrence of events as realistically as possible. In many cases, historical data from South Carolina Department of Corrections has been used to create probability distributions for the events, such as commitment of disciplinary infractions. Thus, we use standard techniques for developing empirically based probability distributions for some events (e.g. Death by natural causes), as well as assuming Poisson arrival processes with empirically determined parameters for others (e.g. Disciplinary). In either case, the user of the model has the option of incorporating their assumptions into the model framework if they feel their conditions are sufficiently different. This flexibility in model configuration is one of the most important features of the model.

Rule Based Information Processing

A decision support system (DSS) that incorporates the elements of artificial intelligence should be user friendly and also permit the capability to change model conditions governing computation. To enable criminal justice or correctional policy analysts to efficiently determine sentencing and classification impact, the DSS must allow the direct input of policy changes. In an effort to categorize and organize these policy changes, the partnership identified four areas for incorporating sentencing, behavioral, and classification dynamics.

Arrival Scenarios: This term embodies system and/or policy changes that affect the in-flow of inmates into the correctional system. For example, ensuring that certain crimes are identified as TIS offenses and become effective at some point in time constitutes an arrival scenario. Similarly, implementing a particular sentencing grid in a specified time frame can also be considered a new arrival scenario. Depending on the size of the database and desired performance (i.e., execution time), these scenarios may be inputted as changes to data tables.

Departure Scenarios: Embodied in this term are policies/practices that alter the time to serve before release or change the existing method of release. For example, implementing TIS can also be considered in a departure scenario change (i.e., departing upon serving 85% of sentence versus upon having served 55%). A new policy requiring inmates to stay in a pre-release center 30 days prior to release also illustrates a departure scenario change. Depending on the size of the database and desired performance, changes may be inputted by changing data tables or modifying event calculations.

Behavior Scenarios: Observed or assumed changes in inmate behavior can be incorporated into the simulation exercise under the category of behavior scenario modifications.

For example, behavior scenario changes can be expressed as a parametric change in the average time between disciplinary infractions; or similarly, the use of an entirely different form of probability distribution (e.g. movement from exponential to uniform) of time between disciplinary infractions.

Classification Scenarios: Since the impact of classification policy is the focus in this project, the model allows users to directly input new classification scenarios as new rules.

Translating A Classification Schema Into an Interactive Model

In order to create a system of classification that permits a DSS user to implement a simulation model a *schema* must be created. A schema of classification delineates the rules by which an inmate is classified and placed into a specific type facility. In the process of model development, certain terms evolve that enable the user to input classification policy/instrument specifications and/or changes. The following terms are used to describe the infrastructure of the classification schema:

Scenario: A single set of rules relating to the classification of inmates. Thus when some of the rules change, a new set emerges, resulting in a new scenario. Each scenario has a separate bed space configuration, which may or may not be similar, depending on the modifications that are made in the rules.

Choices: Options or type of beds an inmate can be assigned to-- the possible outcomes of classification reviews. There are as many bed choices as there are bed types in a prison system. For example, a jurisdiction that decides to segregate HIV inmates has this type of facility as a choice in its classification schema. Similarly, age-specific facilities also represent choices. Choices can also be eliminated, as in the case of the elimination of restitution centers. Choices can be considered to represent "buckets" used for storing individual outcomes in classification reviews -- the counts in these buckets are summed to derive the demand for beds in a particular type of facility.

Property Variables: Factors being considered in the promulgation of rules. The severity of current offenses, criminal history, time remaining to serve, disciplinary infraction history, and escapes, etc. constitute property variables in most states' classification systems. In order to introduce a new element in a classification, the addition of a property variable is required. For example, a prison system initiating age specific institutions can introduce a new property variable of age and specify conditions for placement. An existing property variable can also be eliminated if it is no longer considered applicable in the classification system or data are not available to permit inmate evaluation - e.g. participation in a particular type of program.

Directives: Instructions relating to the processing of variable values. For example, many states provide guidance relating to violent crimes or crimes of notoriety. Specifying which offenses are considered violent crimes or crimes of notoriety constitute directives in the simulation model.

Rules: Conditions that must be met in order to qualify for a particular choice in a particular classification scenario (or schema). For example, among many *rules* for placement in minimum security institutions (a *choice*) are the following: the inmate has no history of escape; the inmate has 3 years or less remaining to serve.

Figure 2.3 illustrates the concepts/terms being utilized in this simulation model

A SCENARIO :
A single collection of rules relating to the classification of Inmates.

Criteria	Level 1 Labor Crew and Work Crew	Level 1 (Minimum)	Level 2 (Medium)	Level 3 (Maximum)
Severity of Current Offense	No Sex Offenses Current Offense not higher than Category 3	No Sex Offenses Current Offense in Category 1 - 3; If Current Offense in Category 4 or 5, must be first offender	Current Offense in Category 4 and 5 and not first offender	Current Offense in Category 4 and 5 and not first offender
Expected or Remaining Time to Serve	3 years or less till maxout	6 or less years to serve till maxout	More than 9 years to maxout	9 years or less to maxout
Prior Criminal History	No convictions (i.e. with or without incarceration) for violent crimes No more than 4 prior commitments for non-violent crimes No Prior Sex Offenses	No convictions (i.e. with or Without incarceration) for violent crimes No Prior Sex Offenses	If current commitment is for non-violent crimes, 1 or more violent prior commitments If current commitment is for violent offense, no violent prior commitments	If current commitment is for non-violent crimes, 2 or more violent prior commitments If current commitment is for violent offense, 1 or more violent prior commitments
Disciplinary Infractions	Disciplinary infraction free within the past 6 months No more than 2 disciplinary infractions in the last 12 months, no more than 10 in last 3 years No convicted disciplinary infraction relating to drugs during current incarceration No assaultive disciplinary conviction during current commitment	Disciplinary infraction free within the past 6 months No more than 2 disciplinary infractions in the last 12 months No convicted disciplinary infraction relating to drugs during current incarceration No assaultive disciplinary infractions in the last 3 years	Any disciplinary history	Any disciplinary history
Detainers	0 or Category 1 Detainers only	Detainer(s) not higher than Category 2	Up to Category 4	Up to Category 4
Escapes	No Escape History	No Escape History	No Class I Escape and no more than 1 Class II Escape	More than 1 Class II Escape and any number of Class I Escapes

PROPERTY VARIABLES:
Factors being considered in the promulgation of Rules (In this SCENARIO, 6 factors are considered. Another SCENARIO may introduce additional RULES relating to additional VARIABLES such as notoriety of inmates.)

CHOICES:
Options or type of beds an inmate can be placed - (In this SCENARIO), there are 4 possible CHOICES. CHOICEs can be deleted, e.g. if prison systems no longer furnish labor crew; or new CHOICES can be added, such as, the introduction of super maximum segregation units. When new CHOICES are introduced, new RULES must be promulgated.

RULES:
Conditions which must be met in order to qualify for a particular CHOICE in a SCENARIO (In this case, one of the requirements for Level 1, minimum is that the inmate cannot have a history of escape.)

DIRECTIVES:
Instructions relating to the processing of VARIABLE values (In this case, specifying which offenses are category 3 offenses. Another DIRECTIVE is specifying which crimes are sex offenses.)

FIGURE 2.3

These terms clarify how classification policy changes can be conceptualized, categorized and transformed as user input to the simulation model. They allow computation of bed-type configuration for a specific classification scenario. Varying input repetitively creates multiple classification scenarios (representing different policy emphasis and practices) and simulating each set of input produces a specific bed-type configuration. The outcomes of the various classification scenarios can be assessed and *compared in the context of acceptable system/public risks* to support informed decision making - balancing costs (operational and capital construction costs of various types of prisons differ considerably) and benefits (degree of protection for the public, inmates and staff cannot be jeopardized).

It should be noted that Figure 2.3 illustrates the general "construct/approach" of SCDC's classification criteria (effective as of July 1998). This particular combination of rules is labeled a "classification scenario" in the simulation model. **(Because of the developmental nature of this project and the focus on software and model production, the model results are intended for conceptual illustration and are NOT definitive of SCDC bed requirements.)**

Introducing Classification Policy Change—an Illustrative Example

We now introduce a simple example of the types of changes that are possible with the model. Figure 2.4 illustrates a more punitive classification scenario by modifying the "remaining time to serve" and disciplinary infraction criteria. Instead of a nine-year (9) or less remaining time to serve before moving from maximum to medium security, it is now 6 years or less remaining time to serve. It should be noted that the disciplinary infraction rule primarily distinguishes inmates with respect to eligibility for Level 1 versus Level 2.

More Punitive Classification

More than ~~9~~ 6 years to serve

No disciplinary conviction within last ~~6~~ 36 months

Criteria	Level 1 Labor Crew and Work Crew	Level 1 (Minimum)	Level 2 (Medium)	Level 3 (Maximum)
Severity of Current Offense	No Sex Offenses Current Offense not higher than Category 3	No Sex Offenses Current Offense in Category 1 - 3; If Current Offense in Category 4 or 5, must be first offender	Current Offense in Category 4 and 5 and not first offender	Current Offense in Category 4 and 5 and not first offender
Expected or Remaining Time to Serve	3 years or less till maxout	6 or less years to serve till maxout	More than 9 years to ma[illegible]	
Pr[illegible] Cri[illegible] His[illegible]	No convictions (i.e. with or without incarceration) for [illegible] No Prior Sex Offenses		If current commitment is for [illegible] prior commitments	If current commitment is for [illegible] violent prior commitments
Disciplinary Infractions	[illegible] no more than 10 in last 3 years No convicted disciplinary infraction relating to drugs during current incarceration No assaultive disciplinary conviction during current commitment	[illegible] infractions in the last 12 months No convicted disciplinary infraction relating to drugs during current incarceration No assaultive disciplinary infractions in the last 3 years	Any disciplinary history	Any disciplinary history
Detainers	0 or Category 1 Detainers only	Detainer(s) not higher than Category 2	Up to Category 4	Up to Category 4
Escapes	No Escape History	No Escape History	No Class I Escape and no more than 1 Class II Escape	More than 1 Class II Escape and any number of Class I Escapes

FIGURE 2.4

A more liberal classification scenario (as illustrated in Figure 2.5) allows inmates with longer "remaining time to serve" to move to lower security levels. These types of changes are quite easily handled by this model.

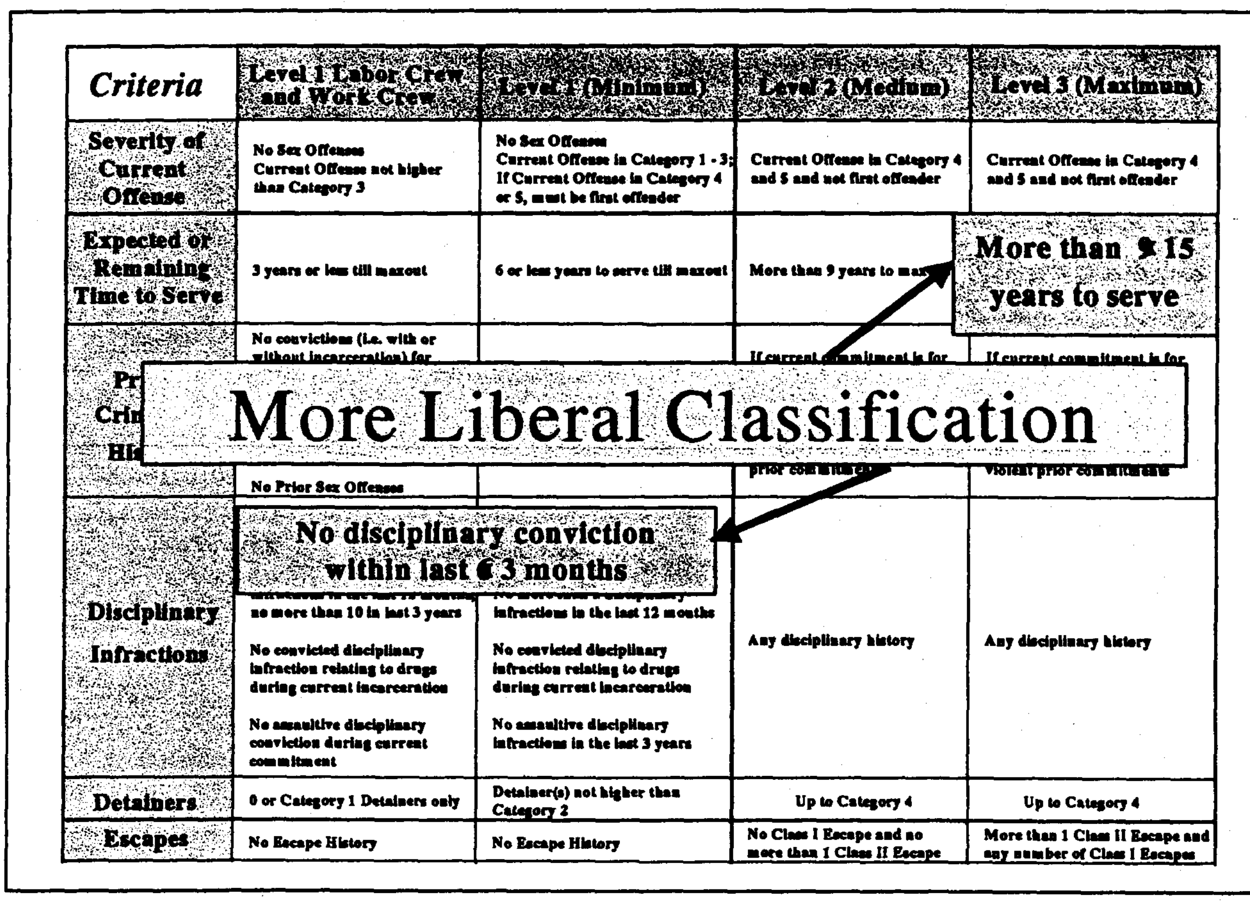


FIGURE 2.5

An Overview of Classification -Bedspace Configuration Simulation Model: Infrastructure, Data Input and Algorithm

This chapter summarizes the infrastructure, data input, algorithm, and products of the partnership's simulation model. (A detailed user and technical manual accompanies the simulation software [program codes and data] and is submitted under separate cover to the National Institute of Justice.)

Model Infrastructure and Data Architecture

Figure 3.1 compares the data architecture of SCDC's normal information processing in the mainframe environment, with the new data architecture emerging from the implementation of the PC based data warehouse, the foundation of the classification policy simulation model. In the current technological platform, classification policy evaluation functions are performed on the stock population (in a static way – that is, with no consideration for the evolution of the population through time) using a combination of Statistical Analysis System, Culprit, and COBOL programs to retrieve data from the mainframe CA-IDMS database. Presentation of data and analysis findings are then transposed manually via data entries onto EXCEL and ACCESS. To construct the simulation model involved three phases: extracting data from the current mainframe database; construction of a PC data warehouse; and development of next-generation applications.

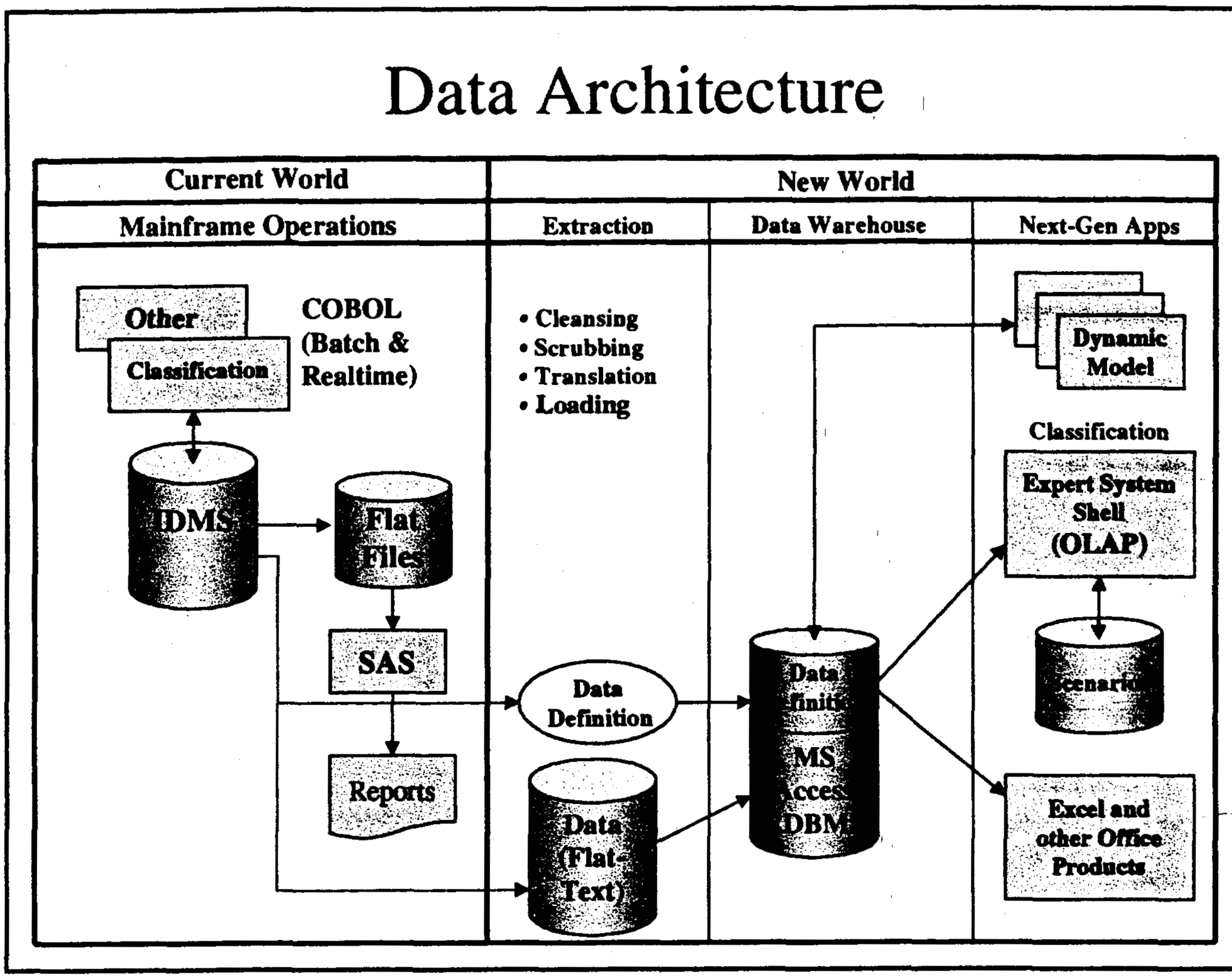


FIGURE 3.1

Hardware and Software Specifications

The partnership applied state-of-the-art information processing technology to develop the simulation model. In the preliminary phase of the project, SCDC's offender management information system was thoroughly examined - its hardware/software platform, the structure of automated inmate database, the scope and quality of data, and the suite of mainframe and personal computers programs and reports. The partnership evaluated the potential suitability of various PC platforms in satisfying the following technical design objectives: user friendliness; speed; flexibility; generic availability; decision support characteristics; cost effectiveness; and speed; flexibility; generic availability; decision support characteristics; cost effectiveness; and ease of purchase/transferability. To leverage on existing PC skills among researcher/analyst communities and to anticipate technology transfer, the partnership deliberately chose relatively common and inexpensive hardware and software to construct the simulation model. The minimum hardware and software requirements to run the resultant simulation model are described in Figure 3.2. The model itself is distributed as an "installable" package that is fully self-contained.

Hardware and Software Specifications	
Hardware	400MHz PC or higher, with at least 256M of memory Zip disk or Network Connection
Software	Microsoft Windows 98 or later, or NT Microsoft Excel 97 or later Microsoft Access 97 or later (optional)

FIGURE 3.2

Either a *Zip disk* or network connection is required to provide access to large data files required by the model. Microsoft Excel is required to construct and maintain data formatting definitions. Microsoft Access is useful for examining files, but is not strictly required.

Data Warehouse and Data Mining Concepts

Prior to building a specific classification policy simulation model, a data warehouse must be constructed to warehouse all necessary, relevant data. Data warehousing, a relatively new concept in information technology, generally includes the following:

- Integration of data from multiple sources (or data bases imported from different platforms and/or data updated by different sources),

- Construction of a relational data base to reduce data redundancy and facilitate updates, and
- Creation of a dynamic relationship so as to add flexibility and support ad hoc queries.

Such a database (warehouse) very often lends itself to object-oriented computing, where data and procedures are stored together so that they can be retrieved and shared. Furthermore, end-users (knowledge workers) can deploy Structured Query Language (SQL) to retrieve and manipulate data in the data warehouse, thus reducing their dependence on programmers.

Data warehousing is also a prerequisite for Online Analytical Processing (OLAP). OLAP provides a suite of high level tools for the relatively unsophisticated knowledge user, and includes decision support front-ends, data access front-ends, and visual information access systems. An OLAP system allows users to "slice and dice" the data contained in the warehouse without defining specific analytical needs before hand.

OLAP systems permit support of *data mining*-- knowledge discovery and extraction. It is generally accepted that information is often embedded deeply in volumes of data. Therefore, knowledge discovery and extraction requires clever data access, sophisticated data dredging (including advanced visualization tools), and powerful query tools. Data mining concepts and procedures have proven to be particularly useful in areas such as prison population forecasts and statutory/classification policy evaluation. Figure 3.3 graphically illustrates the concept of a data warehouse.

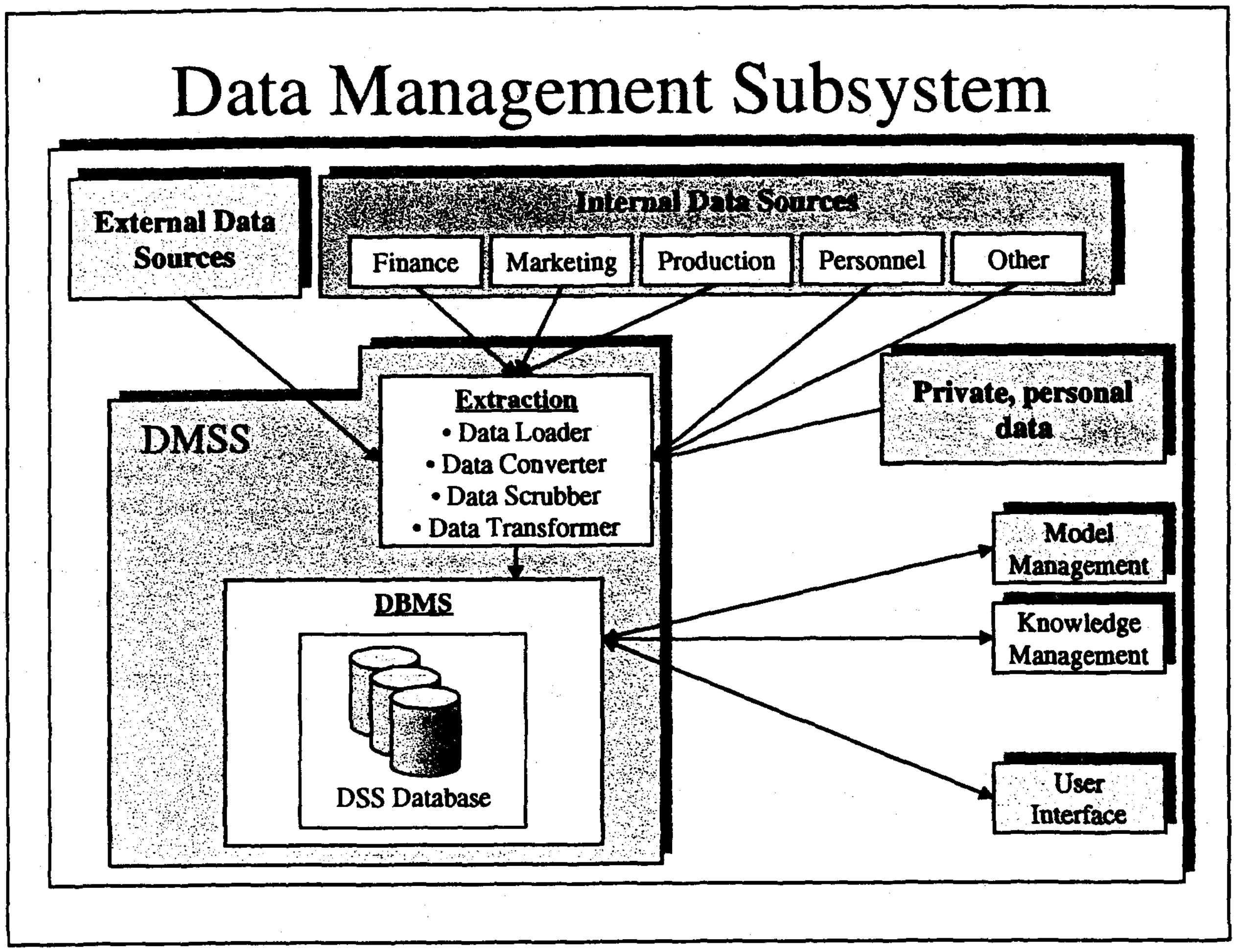


FIGURE 3.3

Data Warehouse Construction - Data Propagation

Employing existing extraction programs, rather than outputted SAS files, SCDC staff created input for the PC data warehouse. The data propagation process is initiated when data is retrieved from the mainframe IDMS database and undergoes the various steps of data warehouse creation processes - loading, conversion, scrubbing, and transformation. The steps are performed by "objects" or "models" (i.e., a collection of program codes organized in standard formats) referred to as "data loader", "data converter", and "data scrubber". The "data loader" handles the operational issues by locating and moving the required data to the warehouse at the appropriate time. The "data converter" translates data formats and codes (such as ASCII, EBCDIC, etc.). The "data scrubber" cleanses data - fixing errors and dealing with omissions (e.g., those that occur when a crime is inaccurately categorized with respect to whether it is a statutorily violent crime). Finally, the "data transformer" aggregates and summarizes data into appropriate dimensions that will permit effective and useful analysis.

SCDC staff applied its existing set of CULPRIT and SAS programs to create data files in preparation for loading into the data warehouse, and several Visual Basic Programs were developed to perform the loading, conversion, cleansing and transforming functions. A user-friendly front-end employing multiple tables with comprehensive data definitions are incorporated to support on-line retrieval of data definitions and an associated glossary, thus enabling users to interface with the meaning and possible value of data for rule specifications in the simulation process. To illustrate, classification policy necessarily addresses the severity of current crime; thus severity of crime as a property variable, if chosen, will display a description or a definition of its meaning. Similarly, its possible values, in SCDC's case of 1 to 5, are also attached to data definitions.

These data import procedures involved intensive data scrutiny, cleansing and scrubbing, but are essential and effective steps to ensure the model is useful to non-programmers. (More detailed illustrations of these data warehouse terms and procedures are contained in the user manual and technical documentation submitted under separate cover.)

Next-Generation Applications

Next generation applications refer to programming by knowledge workers who are non-programmers focusing on the *content* rather than the *syntax* of programming. Forecasters, statisticians, evaluators, budget analysts, planners, and researchers are knowledge workers who manipulate data by varying input and interpreting output. Next generation applications are intended to de-emphasize programming and focus on analysis, and are at the core of delivering expert systems for On-Line Analysis Programs (OLAP). This project delivers a set of applications for processing classification scenarios and transporting the results into other Microsoft Office products (such as Access -- database, Excel -- spreadsheets) to facilitate production of reports.

Figure 3.4 pictorially illustrates the relationship between the data warehouse and power users or knowledge workers, who, by virtue of their functions, are more focused on the business content of information, and less inclined to be involved with detailed programming technicalities.

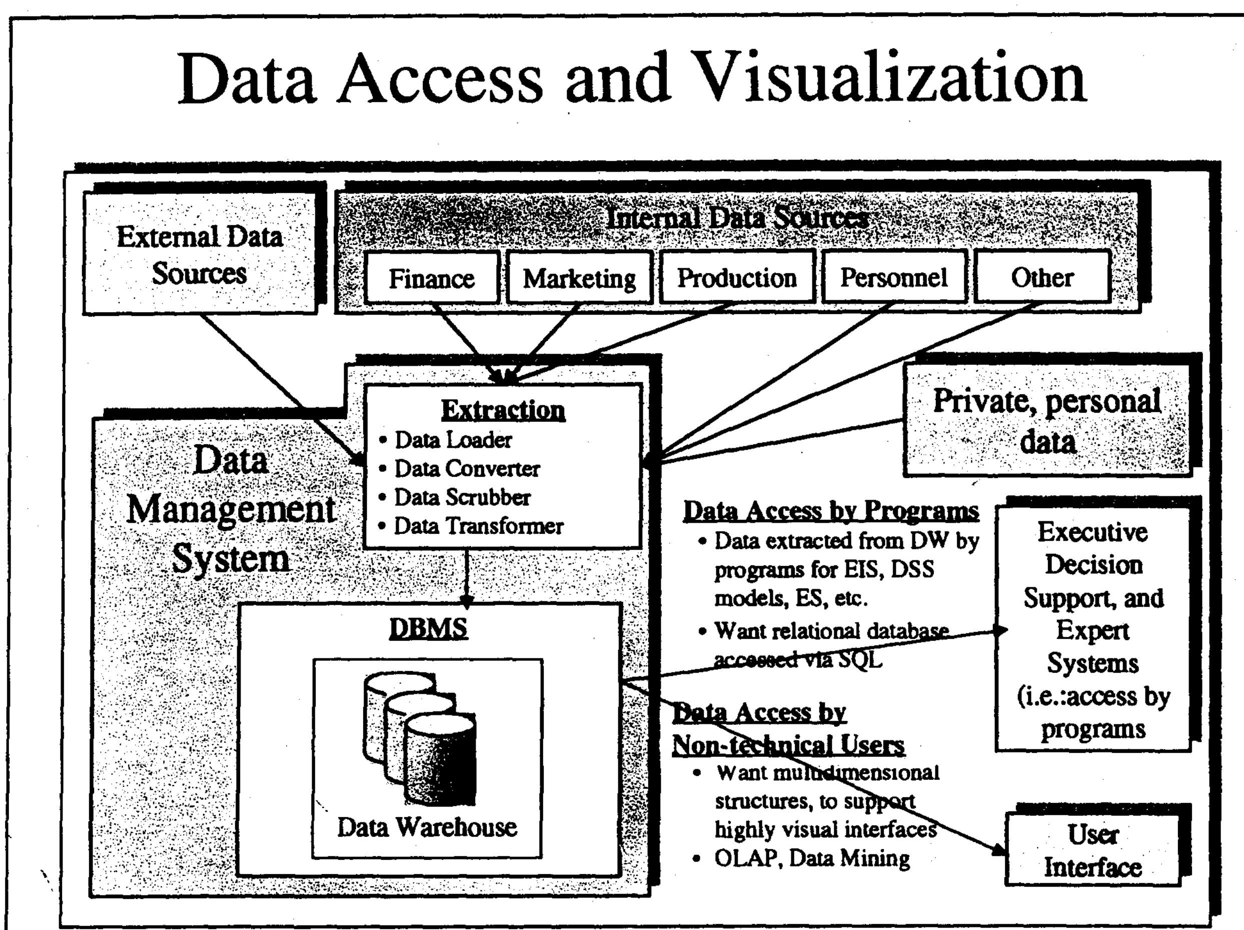


FIGURE 3.4

Input Model Parameters

Parameters are specified to the model in the form of "rules" and "directives". A user-friendly interface is provide for the construction of both.

Rules are consulted during the execution of the model to perform tasks such as classification. This rule consultation process uses a technique called "backward chaining", a recursive mechanism that systematically attempts to make "choices" by testing the truth value of premises of rules and asserting their conclusions in the case where the premises are true. This technique is a common one in Artificial Intelligence (AI) systems, and is the basis for an important subset of AI systems called Expert Systems.

The model is constructed to allow rules for controlling inmate arrivals, departures and behavioral dynamics, although only classification policies are specified by rules in the present implementation. Arrival, departure and behavioral dynamics are presently controlled by directives.

Directives are simply assertions that are executed at the beginning of the model's operation. They direct the model to alter certain global parameters that will influence the subsequent evaluations and simulations. Examples of parameters that are set using directives are:

- the probabilities and frequency of disciplinary infractions for various inmates groups;
- the date when sentencing guidelines will become effective; and
- the probability of a successful parole hearing outcome for various inmate groups.

Input of Classification Scenarios

As previously indicated, the users of the model can use rules to specify classification policies. Figure 3.5 displays a simplified version of a classification policy. Rules are constructed by reading across each row in this grid, as illustrated in Figure 3.6 (in this case, the rule being created relates to the severity of current offense). The model provides users with the capability of creating these sophisticated, but logical, rules through a user-friendly front end.

Typical Classification Decision Criteria

	Level 1A	Level 1B	Level 2	Level 3
Severity of Current Offense	• No Sex Offenses • Current offense category not higher than 3	• No Sex Offenses • Current offense category not higher than 3, or first offender for category 4 or 5	• Current offense category 4 or 5 • Not first offender	• Current offense category 4 or 5 • Not first offender
Remaining Time To Serve	• 3 years or less until Maxout	• 6 years or less until Maxout	• 9 years or less until Maxout	• More than 9 years until Maxout
Prior Criminal History	• No violent convictions • No more than 4 prior convictions • No prior sex offenses	• No violent convictions • No prior sex offenses	• If current is non-violent, 1 or more violent priors • If current is violent, no violent priors	• If current is non-violent, 2 or more violent priors • If current is violent, 1 or more violent priors
Disciplinary Infractions	• None within 6 months • No more than 2 within 12	• None within 6 months • No more than 2 within 12	• Any Disciplinary History	• Any Disciplinary History
Detainers	• Category 0 or 1 only	• Category 0, 1 or 2 only	• No category 5	• Category 5
Escapes	• None	• None	• No Class I's • No more than 1 Class II	• Any number of Class I's • More than 1 Class II

FIGURE 3.5

Typical Classification Decision Criteria

	Level 1A	Level 1B	Level 2	Level 3
Severity of Current Offense	• No Sex Offenses • Current offense category not higher than 3	• No Sex Offenses • Current offense category not higher than 3, or first offender for category 4 or 5	• Current offense category 4 or 5 • Not first offender	• Current offense category 4 or 5 • Not first offender

IF
No Sex Offenses
AND
Current offense category not higher than 3
THEN Classification if Severity of current offense were the only criteria is Level1A
ELSEIF
No Sex Offenses
AND
Current offense category not higher than 3
OR
Current offense category 4 or 5
AND
First Offender
THEN Classification if Severity of current offense were the only criteria is Level1B
ELSEIF
Current offense category 4 or 5
AND
Not First Offender
THEN Classification if Severity of current offense were the only criteria is Level2
ELSE
Classification if Severity of current offense were the only criteria is Level3

FIGURE 3.6

Discrete Event Simulator

As described in Chapter 2, the discrete event simulation utilizes a numerical technique known as *Monte Carlo* method. This method generates sequences of random numbers that are used to represent events in the simulation, doing so by sampling from distributions or using parameters that represent the characteristics of a process. Thus the simulator becomes this model of reality, a reality that can be manipulated for the purposes of answering "what if" questions.

Once the end-user has defined a scenario to investigate, the discrete event simulator uses the data contained in the data warehouse and the scenario to generate a model of the system's behavior and evolution. The results are then converted to report form.

Summary

Figure 3.7 summarizes the data architecture and functions of the simulation model previously discussed. The terminology "New World" refers to the new capability that is provided to the end-user -- the capability to examine the dynamic characteristics of the modeled system. Obviously, this "New World" provides a significant improvement in analytical capability from that contained in the prior system. By employing the state-of-the-art in information technology --data warehousing, expert systems, discrete event simulation, OLAP, etc.-- this project has provided a greatly enhanced capability to examine issues and questions that would have been difficult, if not impossible, before such technologies were available.

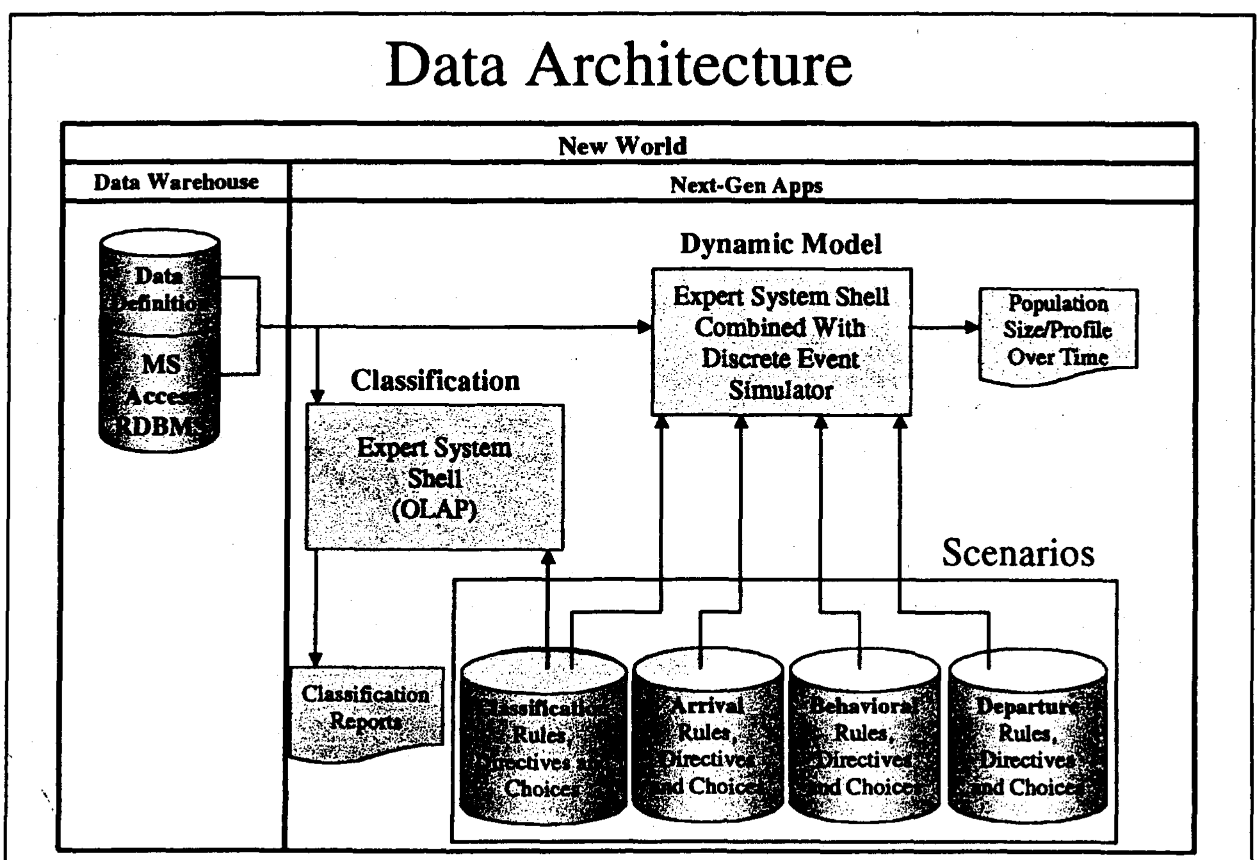


FIGURE 3.7

MODEL APPLICATION AND SIMULATION RESULTS
A CASE STUDY IN SOUTH CAROLINA

Because of recent and pending sentencing and classification reforms, and to plan proactively for programs and capacity construction, the South Carolina Department of Corrections (SCDC) pursued a dynamic model to estimate bed-type mixes under various classification scenarios. The adult prison system operated by SCDC, a separate agency from probation and parole, consists of approximately 22,000 inmates, over 6,000 employees, and 31 prisons. In its ongoing system analysis and program monitoring functions, SCDC identified system dynamics, which must be addressed to determine future operational and capital planning needs. SCDC has identified sentencing changes, classification modifications, and behavior trends, all of which suggest that a status quo approach to managing inmates and facilities will no longer be possible or realistic.

Sentencing Dynamics in South Carolina

The criminal justice system in South Carolina underwent significant structural changes in the last decade. This includes the passage of Truth-in-Sentencing (TIS) for selected offenses (primarily violent offenses, henceforth referred to as "non-parolable" crimes as stated in South Carolina statute), and life without parole for 2-strike and/or 3-strike convictions. Further sentencing reform is anticipated as the State Legislature is deliberating the passage of sentencing guidelines which will result in Truth-in-Sentencing for all offenders (versus only those having been convicted of "non-parolable" crimes per current statute). Since TIS statute was passed in 1995 and only applied to those "non-parolable" crimes committed on or after January 1, 1996, inmates currently incarcerated in South Carolina prisons fall into one of three categories (according to sentence structure): serving time for parolable crimes (committed before or after January 1, 1996); serving time for "non-parolable" crimes but still eligible for parole (Non-TIS because crime was committed before January 1, 1996); and serving time for "non-parolable" crimes but sentenced under TIS (TIS because crime was committed on or after January 1, 1996). Should sentencing guidelines be passed, the number of admissions to the prison system is expected to decrease but the length of stay for individual admissions could decrease or increase depending on his/her crime and criminal history. Existing sentencing grids being considered are intended to modify time to serve by violent offenders and divert non-violent offenders from incarceration when appropriate. TIS will then apply to all future admissions; in other words, all crimes will become "non-parolable." Accordingly, the composition of inmates in the prison system is anticipated to differ from that of the existing population. Upon the passage of sentencing guidelines, SCDC's future stock population would fall into one of five groups.

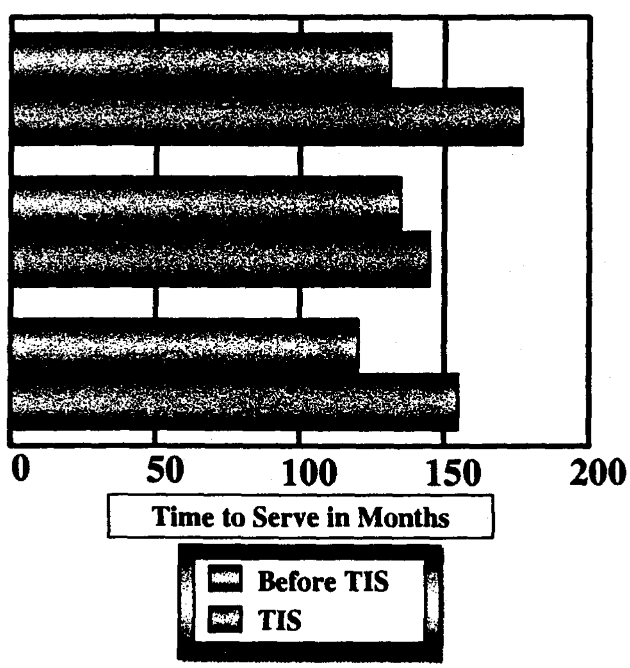
	Sentencing Patterns				
	Pre-Guidelines Implementation			**Post-Guidelines Implementation**	
SCDC Population Groups	**"No Parole" Type Crimes (TIS)**	**"No Parole" Type Crimes (Non-TIS - Crime Committed before 1/1/96)**	**"Parole" Type Crimes**	**"No Parole" Type Crimes (TIS)**	**"Parole" Type Crimes (TIS)**
	Time to Serve Rule				
	85%	**55%**	**55%**	**85%**	**85%**
1	**X**[7]				
2		**X**			
3			**X**		
4				**X**[7]	
5					**X**

[7]While both groups one and four would be similar offenders having committed similar crimes and having to serve 85% of their sentences, their sentences could differ in varying degrees depending on which guideline grid is adopted by the judiciary and the offenders' criminal history.

FIGURE 4.1

Presently, without sentencing guidelines, inmate admissions convicted of "violent" crimes received similar sentences, regardless of falling under the purview of the 1995 Crime Statute – time to serve is increase to 85% on similar sentence lengths thus resulting in significantly longer prison time. Sentencing may or may not reduce sentence length depending on individual criminal history. Figures 4.2 – 4.4 compare pre-TIS and post –TIS expected time to serve by crime, thereby illustrating the impact of the 1995 Crime Statute in the absence of sentencing guidelines.

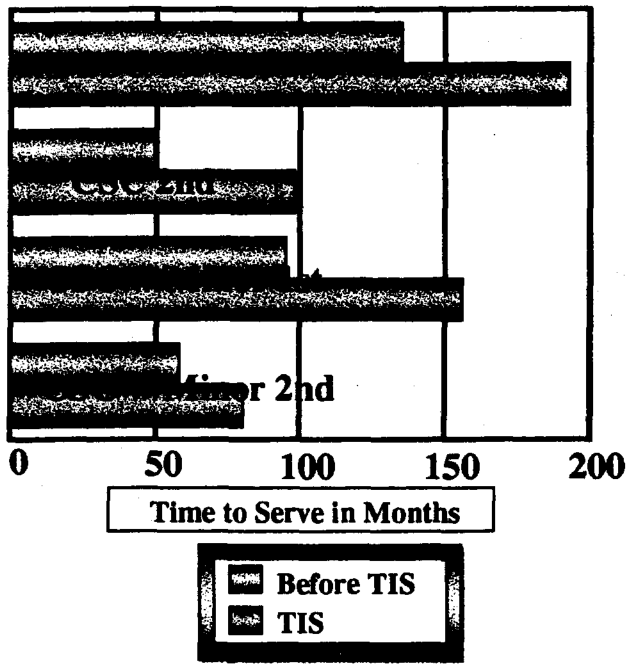
TIME TO SERVE: BEFORE AND AFTER IMPLEMENTATION OF TRUTH-IN SENTENCING



- For manslaughter, TIS prison time is 35% longer or 46 more months
- For kidnapping, TIS and Pre-TIS prison time remains relatively similar, with an increase of 7% or 10 months
- For armed robbery, TIS prison time increased by 29% or 35 more months

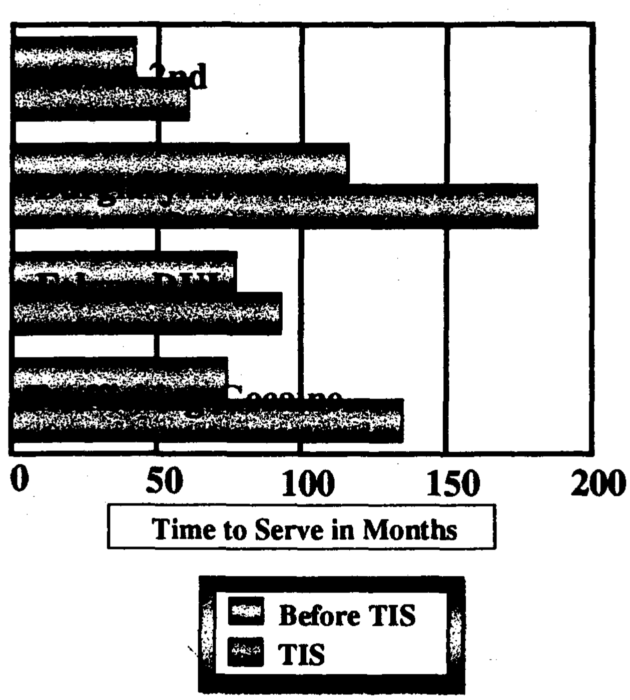
FIGURE 4.2

TIME TO SERVE: BEFORE AND AFTER IMPLEMENTATION OF TRUTH-IN SENTENCING



- Notable increases in time to serve for Criminal Sexual Conduct (CSC) crimes
- TIS prison time for 1st Degree, CSC is 43% or 58 months longer (64% or 61 months longer if victim is minor)
- TIS prison time for 2nd Degree, CSC is 100% or 49 months longer (38% or 22 months longer if victim is minor)

FIGURE 4.3



- TIS prison time for burglars and arsonists is expected to increase 56% (65 more months) and 43% (18 more months), respectively
- TIS prison time for Felony DUI - where death results is expected to be 21% longer (serving 16 more months)
- Prison time for drug dealers is expected to increase by 82% (serving 61 more months)

FIGURE 4.4

Figures 4.5 – 4.6 compares the number of TIS inmates in SCDC in the current population and the projected number and proportions three years from now.

TIS AND NON-TIS INMATES IN SCDC POPULATION

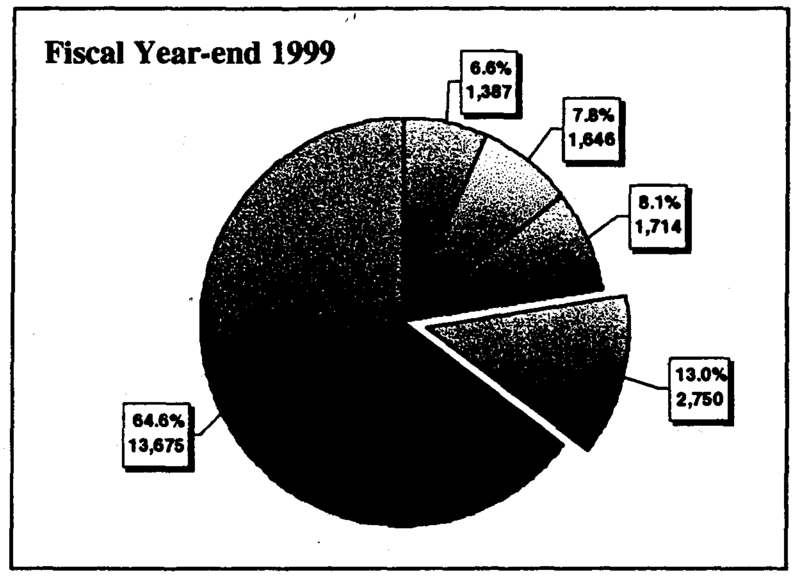
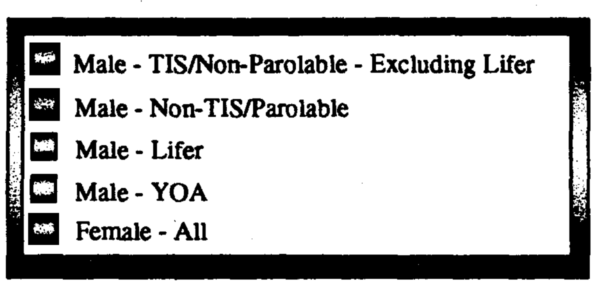


FIGURE 4.5



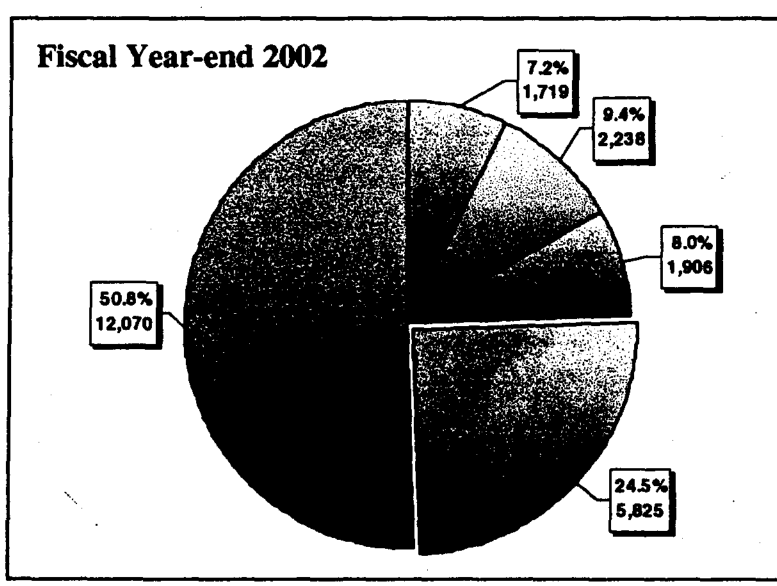


FIGURE 4.6

Sentencing guidelines implementation is also expected to alter sentencing results – an offender can receive a longer or shorter sentence for the same crime depending on his/her criminal history and mitigating/aggravating circumstances. He/she will serve 85% of the guidelines sentence. Figure 4.7 shows summary statistics comparing pre-guidelines and projected post-guidelines admissions level and average sentences, based on "new" (guidelines) sentences as calculated by the South Carolina Sentencing Guidelines Commission (using the version of sentencing grid, being considered by the South Carolina Legislature at the time).

Sentencing Pattern Dynamics - Sentencing Guidelines Modifying Sentences and Time to Serve										
		"1995" Parole Type Crimes				"1995" No Parolable Type Crimes				
		Excluding "Lifers", Deathrow, Revocators, Resentenced, and YOA's								
Sentencing Guidelines Implimentation	Number of Prison Admissions	Prison Admissions Under Guidelines Purview		Average Prison Sentence	Estimated Time to Maxout of Sentence	Prison Admissions Under Guidelines Purview		Average Prison Sentence in	*Estimated Time to Maxout of Sentence
		#	%	Months		#	%	Months	
Pre-Sentencing Guidelines	10,857	4,199	85.52%	38.40	20.35	711	14.48%	194.83	165.60
Post-Sentencing Guidelines	8,622	2,502	78.11%	48.29	41.05	701	21.89%	141.26	120.07
Effect of Guidelines	**-2,235**	**-1,697**	**-7.41%**	**9.89**	**20.70**	**-10**	**7.41%**	**-53.57**	**-45.53**

***Currently, with Truth-in-Sentencing (TIS), and no Sentencing Guidelines, inmates are serving 85% instead of 55% (no changes in sentencing patterns after implementation of TIS in 1995). The 120.07 months average (Post-Guidelines and TIS) is still higher than 107.16 average months (55% of 194.83) (Pre-TIS and No Guidelines).**

FIGURE 4.7

Classification Dynamics in South Carolina

Not only have sentencing dynamics affected the SCDC future stock population, management also initiated a series of classification changes in response to political and public sentiments. Besides program modifications, which alter housing needs, a series of reforms were launched to introduce new concepts in inmate management such as: creating mission specific institutions (such as for young offenders and HIV positive inmates); and transition from a regression analysis based scoring format to an eligibility specific format in the practice of inmate classification. To accommodate the shift in inmate attributes under TIS and the probable implementation of sentencing guidelines, and to facilitate strategic planning, it is necessary to create a new methodology, which addresses the dynamics of sentencing, behavior, and classification.

To illustrate the dynamics of classification policies, Figure 4.8 shows three hypothetical classification scenarios with different treatment of these factors: remaining time to serve, number of disciplinary infractions, and the creation of mission specific facilities. These hypothetical scenarios were used to test the dynamics of classification in the simulation model, as compared to current practice, (labeled as Policy 1).

Classification Dynamics - Security Criteria Changes				
Classification Scenario	**Time Remaining to Serve for Level 3 Security**	**Severity of Current Offense**	**Disciplinary Infraction Convictions**	**Special Mission/Needs**
Policy 1 - Current Practice	At least 9 Years *(No Change)*	No Change	No Change	No Change
Policy 2 - More Conservative	At least 6 Years *(increase length of stay in Level 3)*	Move some Category 4 offenses to Category 5 *(increase in severity)*	No disciplinary conviction within last 36 months *(Level 1)*	No Change
Policy 3 - More Liberal	At least 15 Years *(decrease length of stay in Level 3)*	Move some Category 5 offenses to Category 4 *(decrease in severity)*	No disciplinary conviction within last 3 months *(Level 1)*	No Change
Policy 4 - Special Mission	At least 9 Years *(No Change)*	No Change	No Change	Segregate Offenders More than 55 Years of Age in "Special" Units

FIGURE 4.8

Inmate Behavioral Dynamics in South Carolina

As postulated in earlier chapters, inmate behavior patterns impact significantly on individual classification outcome and thus bedspace configuration in the correctional system. An analysis of behavioral patterns among TIS and Non-TIS inmate cohorts who have committed similar crimes in the South Carolina adult correctional system suggests that TIS inmates not only tend to commit more infractions but also commit them more frequently. This trend, if continued, could mean a more difficult to manage population which would require more secure incarceration options. Therefore, the challenge is to estimate the elasticity of such trends in the demand for high security beds.

To investigate if TIS has made a difference in inmate behavior, SCDC extracted data on 3,643 violent offenders who were sentenced between January 1, 1996 and December 31, 1998 and admitted to SCDC. Among them, 1,253 committed "non-parolable" crimes before January 1, 1996 and were non-TIS by statute. On the other hand, 2,390 offenders committed similar "non-parolable" crimes on or after January 1, 1996, and were designated as TIS inmates. The former group would serve about 55% of their sentence while the latter would serve a statutorily specified 85% of sentence. Both groups share similar attributes (age, criminal history, and sentence length), except that Non-TIS versus TIS requirements would result in longer time to serve for the TIS inmates. Infraction rates (number of infractions per 100 days of incarceration) were calculated for both groups of inmates. Tabulating average infraction rates by age and actual/expected time to serve groups reveals that TIS inmates – despite similarities in critical attributes - are more prone to disciplinary infractions than non-TIS inmates. These data and comparisons are presented in Figures 4.9 - 4.11. Besides demonstrating that TIS inmates have higher infraction rates, controlling for age and expected/actual time to serve/time served, the data also illustrates that younger inmates have higher infraction rates -- infraction rates decline as inmates age.

AVERAGE DISCIPLINARY INFRACTION RATE BY AGE
TIS VS. NON-TIS ADMISSIONS WHO COMMITTED SIMILAR VIOLENT CRIMES

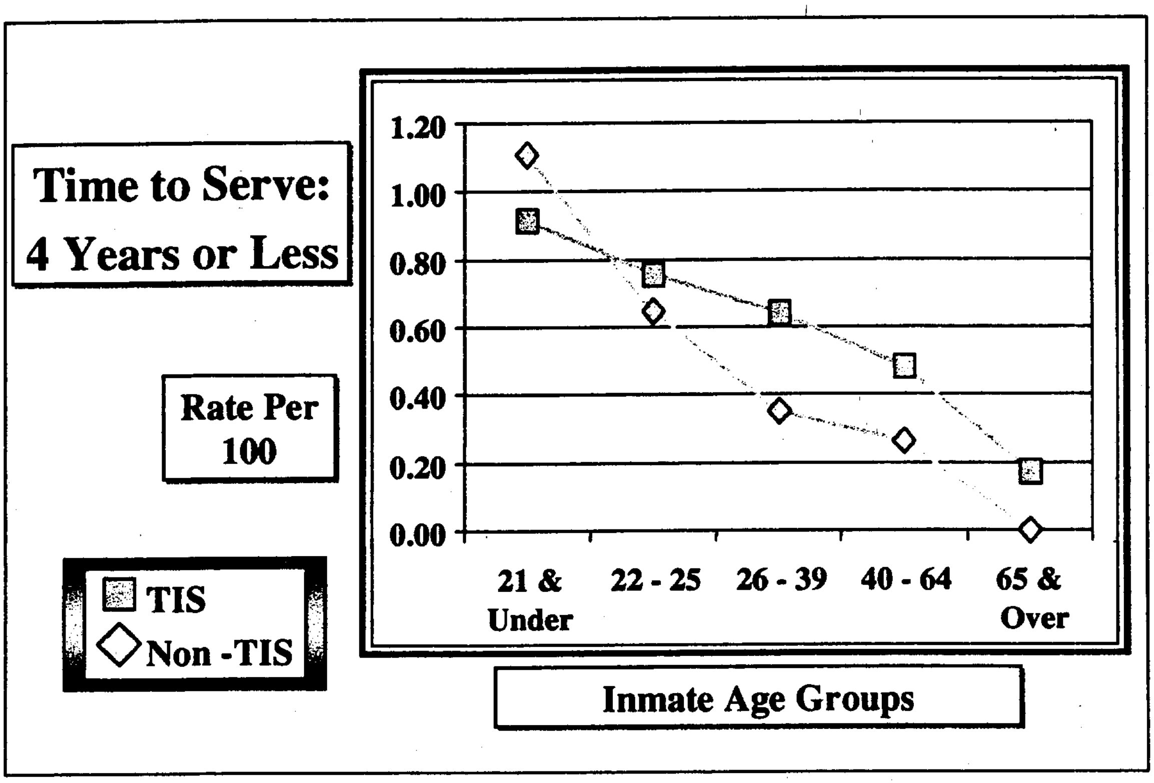


FIGURE 4.9

AVERAGE DISCIPLINARY INFRACTION RATE BY AGE
TIS VS. NON-TIS ADMISSIONS WHO COMMITTED SIMILAR VIOLENT CRIMES

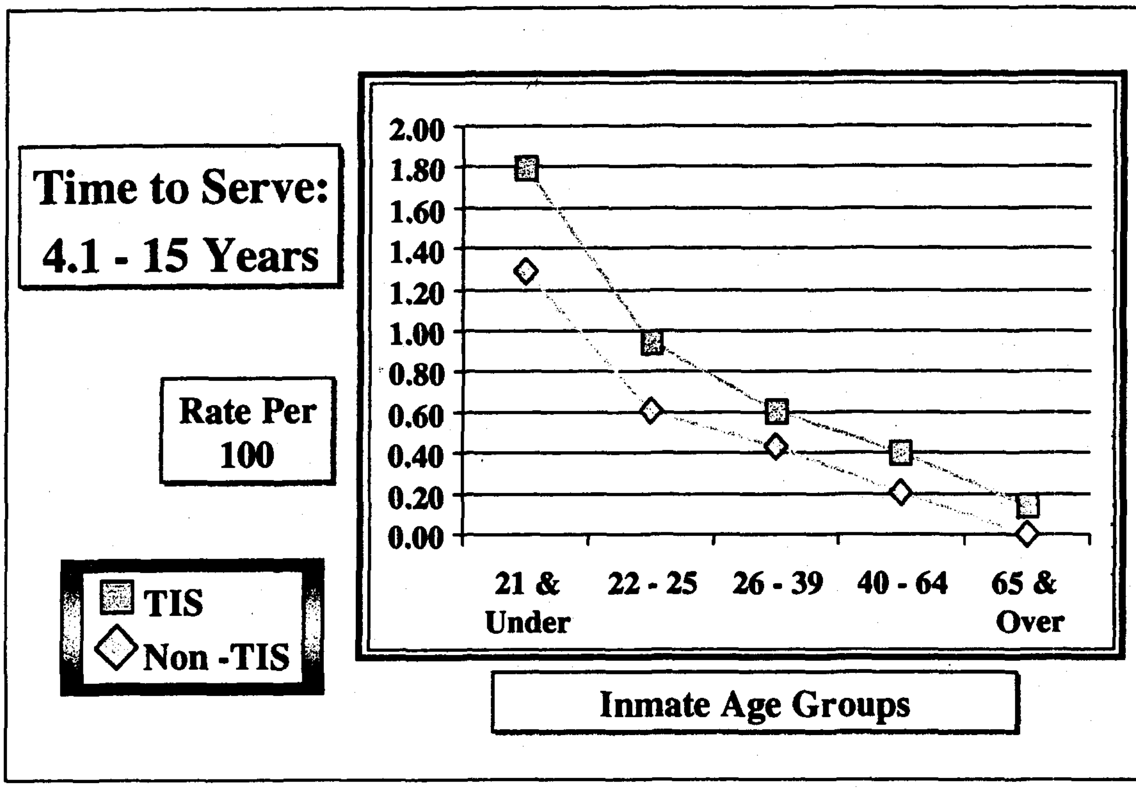


FIGURE 4.10

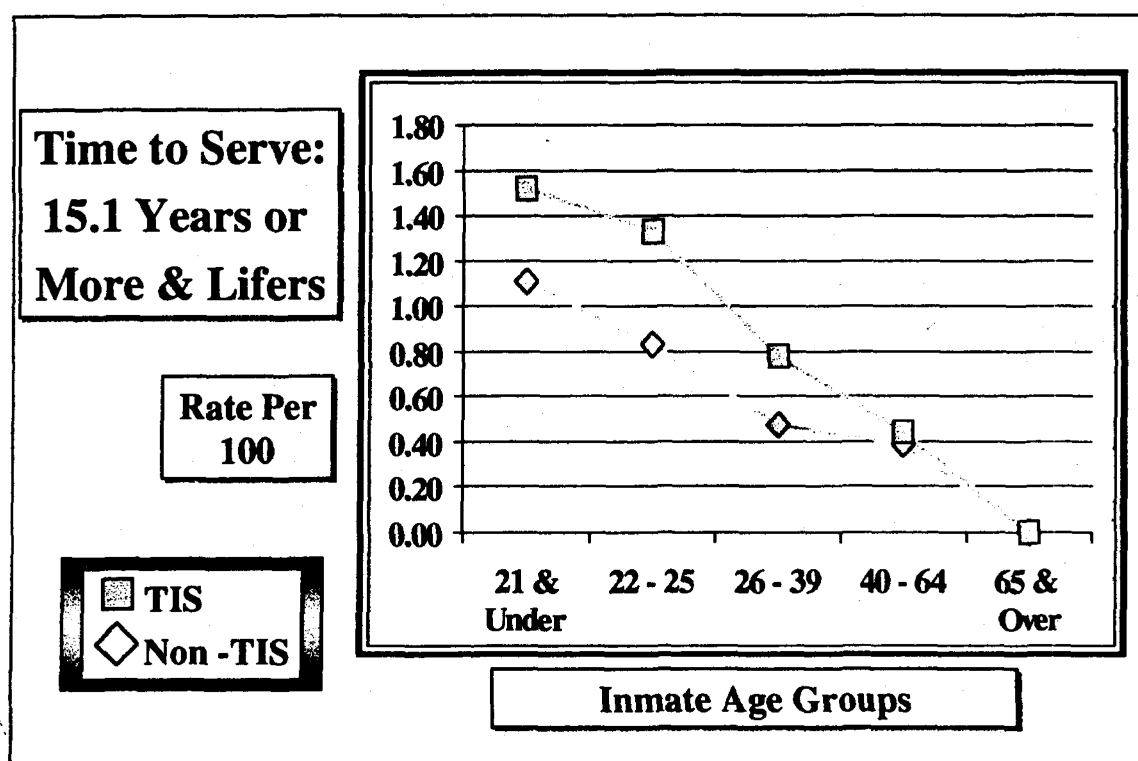


FIGURE 4.11

To test the impact of behavior dynamics on future bedspace demand, simulation is performed on two scenarios of future institutional behavior patterns. One scenario applies the institutional behavior patterns of past releases to offenders in the future stock population. The other scenario incorporates the observed behavioral "differentials" between TIS and Non-TIS admissions. . Applying the "differentials" to past release behavior patterns derives a scenario of aggravated institutional behavior.

A comparison is made of the overall distributions of the numbers of disciplinary infractions among TIS and non-TIS admissions having committed similar "non-parolable" type crimes. The probabilities of "NO" disciplinary infractions are established for both groups by age and time to serve. The ratios between the two groups are established. Similarly, a comparison is made of the mean times between admission, first and subsequent disciplinary infractions for the same TIS and non-TIS cohorts. Again differentials (expressed in term of ratios) between the two groups are established. These differentials, termed multipliers, are applied to the detailed infraction data of releasees by age and time served groups to project the behavior pattern of inmates in the future stock population. Application of this multiplier is supported by the observed empirical evidence of aggravated behavior among TIS inmates, as presented in Figure 4.12. Figure 4.13 illustrates a comparison of statistics generated to denote the two scenarios of behavior pattern - one assuming behavior patterns remain similar to past releases, and another incorporating recent empirical data suggesting aggravated institutional behavior among TIS inmates. It should be noted that Figure 4.13 shows aggregate statistics to illustrate the overall difference between the two scenarios of inmate behavior. In the actual simulation runs, each inmate falls into subgroups, denoted by their time to serve and age combinations, and each subgroup takes on a different probability for "NO" infractions and different means for the time between infractions. In the simulation runs for the "aggravated behavior" scenario, the corresponding "multiplier" is applied to the distributions and means for each group. Applying the multiplier results in the downward adjustment of the probability of an offender having "NO" institutional infractions and lower average time between disciplinary infractions – i.e., more inmates committing infractions and committing infractions more frequently (shorter interval).

Derivation of "Multipliers" for All Disciplinary Infractions Truth-in-Sentencing (TIS) versus Non-Truth-in-Sentencing (Non-TIS) Admissions with Same "1995 Non-Parolable" Type Crimes						
		Average Lag-Time Between Infractions in Months				
Inmate Groups	% of Inmates with Zero Infractions	Admission and First Infraction	First and Second Infraction	Second and Third Infraction	Third and Fourth Infraction	Third and Fourth Infraction
Truth-in-Sentencing	34.90	7.96	3.74	3.22	2.44	2.20
Non-Truth-in-Sentencing	43.30	13.09	6.64	4.85	5.00	4.06
Adjustment Multiplier	**0.81**	**0.61**	**0.56**	**0.66**	**0.49**	**0.54**
Derivation	*34.90/43.30*	*7.96/13.09*	*3.74/6.64*	*3.22/4.85*	*2.44/5.00*	*2.20/4.06*

FIGURE 4.12

Behavior Dynamics						
	Average Lag Time Between Infraction in Months					
Inmate Behavior Pattern	% of Inmates with "No" Disciplinary Convictions	Admission and First Infraction	First and Second Infraction	Second and Third Infraction	Third and Fourth Infraction	Third and Fourth Infraction
"1995" Parole Type Crimes						
Current Behavior *(Based on Release Data)*	66.50	9.55	6.33	5.44	5.25	4.55
Aggravated Behavior *(Based on Admissions Data)*	66.83	8.21	4.45	3.91	3.38	2.95
"1995" No Parole Type Crimes						
Current Behavior *(Based on Release Data)*	40.70	22.43	13.29	11.30	10.57	10.27
Aggravated Behavior *(Applying Mutiplier to Release Data)*	32.80	13.64	7.50	7.51	5.17	5.57
Derivation	*(.81)(40.70)*	*(.61)(22.43)*	*(.56)(13.29)*	*(.66)(11.30)*	*(.49)(10.57)*	*(.54)(10.27)*

FIGURE 4.13

Applying South Carolina Data to the Simulation Model

To demonstrate the impact of classification policy variations on bed type mix, three classification scenarios were tested in the simulation model under two alternatives of sentencing dynamics (with and without guidelines implementation) and two assumptions of inmate behavior (same as past releasees and aggravated institutional behavior). Thus twelve combinations of results are generated (3 X 2 X 2 =12). Two other alternatives focus on older inmates - age 55 or older, to identify the potential population size and explore possibilities of a geriatric unit. These combinations of sentencing, behavior, and classification scenarios are summarized in Figure 4.14.

	Sentencing Scenarios				
	Pre-Guidelines Implementation		Post Guidelines Implementation		
	Behavior Scenarios				
Scenarios	Similar to Recent Releases	Aggravated Behavior	Similar to Recent Releases	Aggravated Behavior	Definition of Scenarios
Classification Scenario One - Current Practice					
1.1	X				Current Classification Policy with No Sentencing Guidelines and No Changes in Current Behavior
1.2		X			Current Classification Policy with No Sentencing Guidelines and More Aggravated Behavior
1.3			X		Current Classification Policy with Sentencing Guidelines and No Changes in Current Behavior
1.4				X	Current Classification Policy with Sentencing Guidelines and More Aggravated Behavior
Classification Scenario Two - More Punitive					
2.1	X				More Punitive Classification Policy with No Sentencing Guidelines and No Changes in Current Behavior
2.2		X			More Punitive Classification Policy with No Sentencing Guidelines and More Aggravated Behavior
2.3			X		More Punitive Classification Policy with Sentencing Guidelines and No Changes in Current Behavior
2.4				X	More Punitive Classification Policy with Sentencing Guidelines and More Aggravated Behavior
Classification Scenario Three - More Liberal					
3.1	X				More Liberal Classification Policy with No Sentencing Guidelines and No Changes in Current Behavior
3.2		X			More Liberal Classification Policy with No Sentencing Guidelines and More Aggravated Behavior
3.3			X		More Liberal Classification Policy with Sentencing Guidelines and No Changes in Current Behavior
3.4				X	More Liberal Classification Policy with Sentencing Guidelines and More Aggravated Behavior
Classification Scenario Four - Special Mission-Geriatric Unit for 55 Years of Age or Older					
4.1	X				Special Mission Classification Policy (Geriatric Unit for Inmates 55 Years or Older) with No Sentencing Guidelines and No Changes in Current Behavior
4.3			X		Special Mission Classification Policy (Geriatric Unit for Inmates 55 Years or Older) with Sentencing Guidelines and No Changes in Current Behavior

FIGURE 4.14

Figures 4.15, 4.17 and 4.19 present a comparison of the simulation results for all the fourteen scenarios for Year Three, Year Seven, and Year Ten, respectively. Interpretation of results focuses on Level 3 inmate and older inmate counts, given these would require maximum security housing or possibly a geriatric unit, the operations and construction of which are the most costly. Furthermore, inmates scoring to Level 1 will be subjected to further screening involving less data-driven, or somewhat subjective, decisions -- such as residence stability, and information not necessarily contained in the automated inmate system (such as arrests without dispositions). This practice is not unique to South Carolina because of the nature of inmate management and public opinion, and also because of the "unquantifiable" nature of Level 1 placements. Therefore this analysis/data interpretation focuses on the number and proportions of Level 3 – maximum beds, which are also more costly to construct and operate.

A Comparison of Bedspace Configuration for 14 Scenarios of Classification, Sentence, and Behavior Dynamics For Year Three

	Pre-Guidelines Implementation		Post Guidelines Implementation		Bed Type Mix									
	Behavior Pattern													
Scenarios	Similar to Recent Releases	Aggravated Behavior	Similar to Recent Releases	Aggravated Behavior	Level 1		Level 2		Level 3		Special Mission Institution		Total	
					#	%	#	%	#	%	#	%	#	%
Classification Scenario One - Current Practice														
1.1	X				8,105	32.7%	11,561	46.6%	5,119	20.7%	0	0.0%	24,785	100.0%
1.2		X			7,667	31.0%	11,900	48.1%	5,196	21.0%	0	0.0%	24,763	100.0%
1.3			X		8,711	35.5%	10,064	41.0%	5,787	23.6%	0	0.0%	24,562	100.0%
1.4				X	7,073	28.8%	11,604	47.3%	5,871	23.9%	0	0.0%	24,548	100.0%
Classification Scenario Two - More Punitive														
2.1	X				6,434	26.0%	6,843	27.6%	11,508	46.4%	0	0.0%	24,785	100.0%
2.2		X			6,121	24.7%	5,839	23.6%	12,803	51.7%	0	0.0%	24,763	100.0%
2.3			X		6,924	28.2%	6,329	25.8%	11,309	46.0%	0	0.0%	24,562	100.0%
2.4				X	5,792	23.6%	5,778	23.5%	12,978	52.9%	0	0.0%	24,548	100.0%
Classification Scenario Three - More Liberal														
3.1	X				11,012	44.4%	10,508	42.4%	3,265	13.2%	0	0.0%	24,785	100.0%
3.2		X			9,907	40.0%	11,598	46.8%	3,258	13.2%	0	0.0%	24,763	100.0%
3.3			X		11,616	47.3%	9,253	37.7%	3,693	15.0%	0	0.0%	24,562	100.0%
3.4				X	9,688	39.5%	11,170	45.5%	3,690	15.0%	0	0.0%	24,548	100.0%
Classification Scenario Four - Identify a Geriatric Unit for 55 Years and Older Inmates (Irrespective of Classification Criteria)														
4.1	X										752	3.0%	24,785	100.0%
4.3			X								738	3.0%	24,562	100.0%

FIGURE 4.15

Interpretation of Results – Year Three

- In the third year, sentencing guidelines, by diverting non-violent offenders with little prior criminal history from prison, would decrease total prison count slightly, from about 24,800 to 24,500.

- <u>Without guidelines and without behavioral changes</u>, depending on the classification scenario, the number of inmates scoring to Level 3 eligibility could vary from 3,265 (liberal policy), to 11, 508 (more punitive policy).
- <u>With guidelines implementation, and if behavior pattern remains unchanged</u>, the number of inmates scoring to Level 3 eligibility could vary from 3,693 to 11,309 depending on the classification scenario.
- <u>Without sentencing guidelines implementation, if behavior pattern worsens</u>, the number of inmates scoring to Level 3 eligibility could vary from 3,258 to 12,803, depending on the classification scenario.
- <u>If sentencing guidelines were to be implemented and inmate behavior deteriorates</u>, the number of inmates scoring to Level 3 eligibility could vary from 3,690 to 12,978, depending on the classification scenario.
- The above results on total population level reflect the fact that sentencing guidelines effects are not immediately felt because inmate composition does not significantly change in the immediate future following sentencing guidelines implementation. Nevertheless, the numbers do reflect the dramatic impact of classification policy/scenario on the size of Level 3 eligible inmates as a result of altering the "remaining time to serve" criterion in classification scenarios (policy options).
- As a corollary, the number of inmates eligible for Levels 1 and 2 security placements decrease with more punitive policies/scenarios and increase under more liberal policies/scenarios.
- The number of inmates aged 55 or older would increase to 752 without sentencing guidelines and to 738 with sentencing guidelines implementation.

- The results for year 3 are graphically illustrated in Figure 4.16.

A COMPARISON OF BEDSPACE CONFIGURATION FOR 12 SCENARIOS OF CLASSIFICATION, SENTENCE, AND BEHAVIOR DYNAMICS FOR YEAR THREE

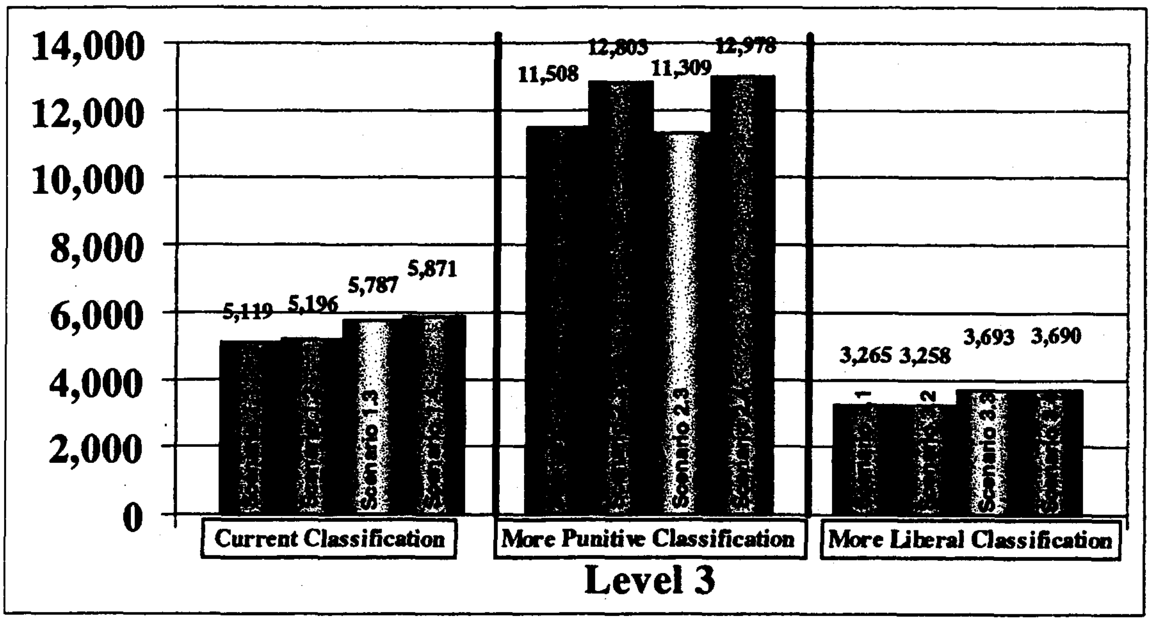


FIGURE 4.16

A Comparison of Bedspace Configuration for 14 Scenarios of Classification, Sentence, and Behavior Dynamics For Year Seven

	Pre-Guidelines Implementation		Post Guidelines Implementation		Bed Type Mix									
	Behavior Pattern													
Scenarios	Similar to Recent Releases	Aggravated Behavior	Similar to Recent Releases	Aggravated Behavior	Level 1 #	Level 1 %	Level 2 #	Level 2 %	Level 3 #	Level 3 %	Special Mission Institution #	Special Mission Institution %	Total #	Total %
Classification Scenario One - Current Practice														
1.1	X				9,642	37.0%	11,041	42.3%	5,402	20.7%	0	0.0%	26,085	100.0%
1.2		X			9,004	34.5%	11,503	44.1%	5,582	21.4%	0	0.0%	26,089	100.0%
1.3			X		11,267	41.1%	9,711	35.4%	6,446	23.5%	0	0.0%	27,424	100.0%
1.4				X	8,467	30.9%	12,242	44.7%	6,661	24.3%	0	0.0%	27,370	100.0%
Classification Scenario Two - More Punitive														
2.1	X				7,326	28.1%	6,475	24.8%	12,284	47.1%	0	0.0%	26,085	100.0%
2.2		X			7,022	26.9%	5,377	20.6%	13,690	52.5%	0	0.0%	26,089	100.0%
2.3			X		8,498	31.0%	6,421	23.4%	12,505	45.6%	0	0.0%	27,424	100.0%
2.4				X	6,498	23.7%	5,774	21.1%	15,098	55.2%	0	0.0%	27,370	100.0%
Classification Scenario seven - More Liberal														
3.1	X				13,208	50.6%	9,557	36.6%	3,320	12.7%	0	0.0%	26,085	100.0%
3.2		X			11,872	45.5%	10,903	41.8%	3,314	12.7%	0	0.0%	26,089	100.0%
3.3			X		15,469	56.4%	7,782	28.4%	4,173	15.2%	0	0.0%	27,424	100.0%
3.4				X	12,298	44.9%	10,882	39.8%	4,190	15.3%	0	0.0%	27,370	100.0%
Classification Scenario Four - Identify a Geriatric Unit for 55 Years and Older Inmates (Irrespective of Classification Criteria)														
4.1	X										1,071	4.1%	26,085	100.0%
4.3			X								1,117	4.1%	27,424	100.0%

FIGURE 4.17

Interpretation of Results – Year Seven

- In year seven, the impact of sentencing guidelines implementation would begin to impact on Level 3 bed requirements. SCDC projected total count is anticipated to increase -- about 26,000 without guidelines versus about 27,400 with guidelines (an increase of about 1,400 beds total).

- Without guidelines and without behavioral changes, depending on the classification scenario, the number of inmates scoring to Level 3 eligibility could vary from 3,320 (liberal policy), to 12, 284 (more punitive policy).
- With guidelines implementation, and if behavior pattern remains unchanged, the number of inmates scoring to Level 3 eligibility could vary from 4,173 to 12,505 depending on the classification scenario.
- Without sentencing guidelines implementation, if behavior pattern worsens, the number of inmates scoring to Level 3 eligibility could vary from 3,314 to 13,690 depending on the classification scenario.
- If sentencing guidelines were to be implemented and inmate behavior patterns deteriorate, the number of inmates scoring to Level 3 eligibility could vary from 4,190 to 15,098.
- Sentencing guidelines effects will become more prominent in year 7 and increase the proportion of Level 3 beds required with or without any behavior change. If the current classification policy continues with "remaining time to serve" criteria (9 years – being the cut-off between Level 2 and Level 3) with sentencing guidelines implementation, 23.5% of inmates would fall under Level 3 criteria. Without sentencing guidelines implementation, the proportion would have been 20.7%. If behavior had worsened, the corresponding percentages would have been 24.3% and 21.4%, respectively.
- Thus if behavior does not change, sentencing guidelines would cause an increase in Level 3 beds by 3 percentage points. Because Level 3 and Level 2 eligibility relating to infractions are similar, a shift in behavior would not affect the above percentage shift.
- Under the aggravated behavior scenario, without guidelines, the proportion for Level 3 is 52.5%, whereas with sentencing guidelines implementation, the proportion for Level 3 is

55.2%. This result suggests that behavior patterns exert considerably more impact on the demand for high security beds. Since early evidence of aggravated behaviors were identified to be related to TIS implementation (TIS indicator is a significant independent variable in regression analyses of disciplinary infraction data), the behavior impact of TIS becomes a catalyst for higher demand for higher security beds.

- Under Scenario 3, a more liberal scenario, the remaining time to serve cut-off between Level 3 and Level 2 beds is increased from 9 to 15 years --i.e., everything being equal, inmates with less than 15 years to serve can be housed in non-maximum facilities. This could potentially reduce the proportion of maximum security beds for the current classification scenario (a range between 20.7 and 24.3% depending on whether guidelines sentence is implemented and whether behavior worsens) to a new range of 12.7% (no guidelines and behavior patterns do not deteriorate) to 15.3% (guidelines sentence implementation and behavior worsens).
- The number of older inmates, aged 55 or older would reach 1,071 without sentencing guidelines implementation and 1,117 with sentencing guidelines implementation. These numbers are twice the size of the current older inmate population.
- Figure 4.18 depicts the range of Level 3 "eligible" inmates under the various combinations of sentencing, behavior, and classification dynamics in year 7.

A Comparison of Bedspace Configuration for 12 Scenarios of Classification, Sentence, and Behavior Dynamics For Year Seven

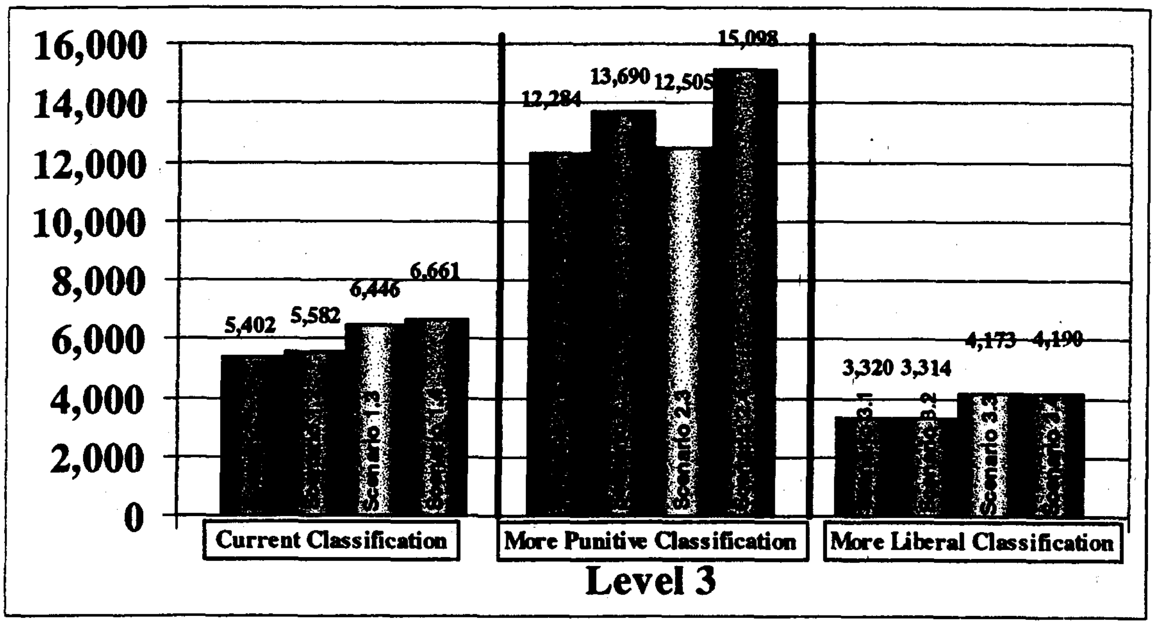


FIGURE 4.18

A Comparison of Bedspace Configuration for 14 Scenarios of Classification, Sentence, and Behavior Dynamics for Year Ten

	Pre-Guidelines Implementation		Post Guidelines Implementation		Bed Type Mix									
	Behavior Pattern													
Scenarios	Similar to Recent Releases	Aggravated Behavior	Similar to Recent Releases	Aggravated Behavior	Level 1		Level 2		Level 3		Special Mission Institution		Total	
					#	%	#	%	#	%	#	%	#	%
Classification Scenario One - Current Practice														
1.1	X				10,478	39.1%	10,883	40.6%	5,469	20.4%	0	0.0%	26,830	100.0%
1.2		X			9,584	35.8%	11,487	42.9%	5,712	21.3%	0	0.0%	26,783	100.0%
1.3			X		12,441	42.7%	9,766	33.5%	6,919	23.8%	0	0.0%	29,126	100.0%
1.4				X	9,186	31.6%	12,687	43.7%	7,192	24.7%	0	0.0%	29,065	100.0%
Classification Scenario Two - More Punitive														
2.1	X				8,510	31.7%	5,809	21.7%	12,511	46.6%	0	0.0%	26,830	100.0%
2.2		X			7,934	29.6%	4,674	17.5%	14,175	52.9%	0	0.0%	26,783	100.0%
2.3			X		9,961	34.2%	5,996	20.6%	13,169	45.2%	0	0.0%	29,126	100.0%
2.4				X	7,348	25.3%	5,520	19.0%	16,197	55.7%	0	0.0%	29,065	100.0%
Classification Scenario ten - More Liberal														
3.1	X				14,584	54.4%	8,793	32.8%	3,453	12.9%	0	0.0%	26,830	100.0%
3.2		X			12,754	47.6%	10,560	39.4%	3,469	13.0%	0	0.0%	26,783	100.0%
3.3			X		17,264	59.3%	7,537	25.9%	4,325	14.8%	0	0.0%	29,126	100.0%
3.4				X	13,569	46.7%	11,081	38.1%	4,415	15.2%	0	0.0%	29,065	100.0%
Classification Scenario Four - Identify a Geriatric Unit for 55 Years and Older Inmates (Irrespective of Classification Criteria)														
4.1	X										1,349	5.0%	26,830	100.0%
4.3			X								1,429	4.9%	29,126	100.0%

FIGURE 4.19

Interpretation of Results – Year Ten

- In year 10, the impact of sentencing guidelines implementation would be magnified. SCDC projected total count is anticipated to increase more in year 10 versus previous years - about 27,000 without sentencing guidelines to about 29,000 with sentencing guidelines, a difference of about 2000 inmates. The reason is that overall guidelines implementation would extend truth-in-sentencing to offenders who commit the currently parolable offenses and the affected inmates would serve more time.
- Without sentencing guidelines and without behavioral changes, depending on classification scenarios, the number of inmates scoring to Level 3 eligibility could vary from 3,453 (liberal policy), to 12,511 (more punitive policy).
- With sentencing guidelines implementation, and if behavior pattern remains unchanged, the number of inmates scoring to Level 3 eligibility could vary from 4,325 to 13,169 depending on the classification scenario.
- Without sentencing guidelines implementation, if behavior pattern worsens, the number of inmates scoring to Level 3 eligibility could vary from 3,469 to 14,175 depending on the classification scenario.
- If sentencing guidelines were to be implemented and inmate behavior patterns deteriorate, the number of inmates scoring to Level 3 eligibility could vary from 4,415 to 16,197 depending on the classification scenario.
- While sentencing guidelines effects on total count will be higher in year 10, the impact on the proportion of Level 3 beds required remains similar to year 7 across all scenarios.
- By year 10, older inmates, aged 55 or over, would reach a new high of 1,349 without sentencing guidelines implementation and 1,429 if sentencing guidelines were implemented.

- Figure 4.20 illustrates the various sizes of Level 3 population based on different combinations/interactions of classification, sentencing, and behavior dynamics.

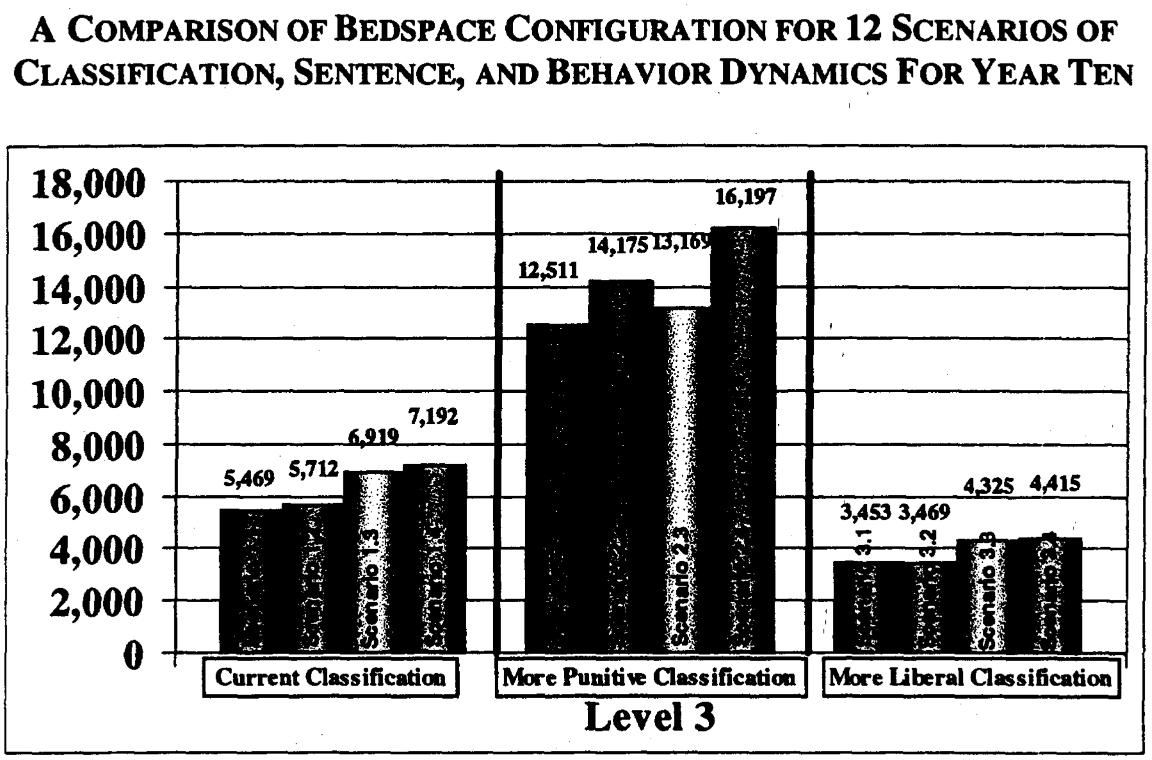


FIGURE 4.20

SUMMARY AND CONCLUSIONS

Summary

This partnership was able to accomplish its mission to develop and deliver a PC based model to simulate the effect of classification criteria/process changes on prison bed types. Project tasks focused on analyzing and illustrating the dynamics of classification, sentencing structure and inmate behavior patterns, and exploring creative ways to incorporate these dynamics, either as parameter changes or as input of rule changes in the PC simulation model. The project applied operations research concepts and modern information system development methodology, which included data warehouse construction, object-oriented computing, Monte Carlo simulation, and On-Line Analysis Processing (to name a few). By simulating classification policy/scenario changes, the model provides interactive data access and decision support "front ends" for inputting and evaluating classification criteria. The data, procedures, algorithms, and technical documentation, which constitute the simulation model software, are submitted to the National Institute of Justice separately; this final report elaborates on the conceptual framework and presents the relevant data input and output of the model.

Analysis of South Carolina inmate infraction data was also performed. The study unveils early evidence of worsening institutional behavior among TIS (versus Non-TIS) inmates who committed similar crimes and were admitted during the time period.[8] Disciplinary infraction data analysis focused on methods to translate these data into meaningful model parameters to simulate the dynamics of inmate behavior pattern

[8] Similar findings were reported by Collins, J.J., Spencer, D.L., Dunteman, G.H., Gogan, H.C., Siegel, P.H., Lessler, B.A., & Parker, K. (1999, September) in the Final Report: Evaluation of North Carolina's Structured Sentencing Law.

changes, independently or in conjunction with sentence structure changes. Numerous measures for various age and time served/time to serve groups were generated and examined-- including infraction rates, distributions by number of infractions, and time distributions between disciplinary infractions.

To illustrate the performance of the simulation model, a simplified version of the South Carolina Department of Corrections' current classification policies was used as the base line to produce Level 3 bed estimates. Classification policy modifications focusing on the "remaining time-to-serve" criterion for Level 3 - Maximum security eligibility/placement were introduced and simulated to generate results for a more conservative and a more liberal classification scenario. The former requires inmates with remaining time to serve of 6 years or more (instead of 9 years or more) to be housed in maximum security facilities. The latter requires inmates with remaining time to serve of 15 years or more (instead of 9 years) to be housed in a maximum-security facility. Another line of hypothetical classification scenario testing focuses on age. This line of testing attempts to identify the size of the *very young* and *older* inmate populations. These three hypothetical classification scenarios along with the base scenario are applied to four combinations of assumptions - whether sentencing guidelines are implemented and whether inmate behavior patterns in prison would worsen. The wide range of results presented in Chapter 4 demonstrate <u>that classification policy, as much as inmate attributes and behavior, controls the demand for bedspace by bed type</u>. For example, seven years into the future, level 3 bed demand can range from a low of 3,314 to 13,690, depending on which classification scenario is applied, whether sentencing guidelines are implemented, and if inmate behavior remains the same, as recent data suggests. These numbers are presented to illustrate the dynamics and the interactions of classification policies, inmate behavior and sentencing structure. As older inmates are more costly to maintain because of growing medical needs, two special scenarios are tested to compare the projected growth of the older inmate population (55 or older.) By year 10, with or without sentencing guidelines implementation, SCDC expects the older population to reach approximately three times the current level. This projected count is higher if sentencing guidelines are implemented.

The goal of this project was not to recommend classification policy changes or the nature of such change. Rather, it provides a tool suitable to assess the impact on bed type demand as correctional administrators deliberate on classification policies -- with due consideration to other salient factors such as risk assessment, public opinion, victim reactions, statutory requirements, and budget constraints. Currently, the South Carolina Department of Corrections is undertaking a classification validation study with technical assistance from the National Institute of Corrections to ensure sound theory and practice based on the employment of objective risk factors. Application of this simulation model will greatly complement the validation effort and aid in striking an appropriate balance between safety risk and cost of operating/constructing prisons.

Limitations

While the efforts of the partnership to apply the most current and relevant data and employ leading-edge information technology within the scope and resource constraints of the project have been achieved, the following limitations must be acknowledged:

- Because this product focuses on the dynamics of classification, inmate behavior and sentencing structure, model construction and data presentation are focussed on parameters and policy conditions which affect proportionally a larger number of inmates. For example, hypothetical changes are introduced to alter "time to serve" criterion rather than criteria relating to detainers or escapes (which pertain to a very low number of inmates in the population.)
- Since this project seeks to illustrate the relationship between sentencing, behavior and classification, the resultant model does not address the dynamics of *overrides* - an issue important in classification across state prison systems. Overrides (classification workers do not agree with policy recommendation and place inmates in other security levels), especially when they are excessively high, could alter significantly the demands for a particular security level of beds. While overrides are often the results of bed type constraints, they can also signify other management issues such as philosophical disagreement as well as lack of training and understanding by caseworkers. Despite the exclusion of override analysis, the simulation results provide base comparisons, from which adjustments can be made to reflect override practices.
- Because alternate sentences under a particular format of sentencing guideline implementation must be available for the simulation analysis, the partnership used the South Carolina Sentencing Guidelines Commission's calculated "guideline" sentence for offenders processed in

the criminal justice system in 1996. A more recent update is not available because of the extensive details and manual intervention involved in the calculation of guideline sentences for individual offenders.

- The presentation of results consciously omits a comparison of results pertaining to inmates eligible for minimum-security level beds because decisions relating to minimum beds are more often driven by non-quantifiable, or at least quantitative factors. The practice of placing inmates in minimum-security facilities has become quite "cautious" in more conservative political environment due to increasing sensitivity for victims and witnesses, for example, NO sex offenders (prior or current) is allowed in minimum security institutions.
- To focus on the dynamics (and their interactions) of sentence structure, behavior, and classification, offender processing at the 1996 level was applied. Thus, the model results do not incorporate statistical analysis to predict future criminal justice processing level. This tacit assumption of no change in crime, arrest, and disposition rates, is often the common practice in statutory impact analysis. It permits the effect of a specific policy/practice to be isolated, without being confounded by a growth or decline in criminal activities.

Future Directions

Integrating Classification Simulation with Prison Population Projection

Population projection attempts to derive an estimate of what the future will be, given a set of realistic or consensual assumptions, while impact analysis tests the effect of injecting change to the system (for this study the subject is classification policy). The simulation results presented herein assume no disturbance to the current level of criminal justice processing; thus, factors, which ultimately affect admission levels such as demographics, crime trends, judicial dispositions, and emergence of drug courts, etc. are not addressed

Predicting future prison admissions challenges forecasters to examine trends in demographics, crimes, arrests, disposition, and judiciary. Statistical procedures commonly employed include time series analysis (ARIMA), regression analysis, incarceration rates, and/or demographically disaggregated models to mimic offender flow in prior stages of the criminal justice system. Indeed, the General Accounting Office has produced an Internet accessible report on virtues/shortcomings of currently used models and techniques. Very often, to derive realistic assumptions regarding system dynamics, forecasters are guided by a formal group of criminal justice planners and professionals who develop a common set of expectations. While this partnership also conducted projection, it focused on a form of "what-if" analysis. Thus correctional administrators concerned with prison/prisoner classification issues are better equipped to deal with questions of "*heads and beds*" management. It is believed that this new perspective will provide management with a new, very useful analytical tool.

This model can be extended to create a **comprehensive** prison population projection model that addresses population level, inmate composition, and bed type mix over time. Specifically, the recommended extensions are:

- Expand the data loader to include more extensive history of admissions and departures from the prison system.
- Extend the simulation modules to process offender flow from crime commitment through recidivism (return to prison after release).
- Elaborate arrival and departure rules or scenarios to incorporate criminal justice trends and expectations.

These extensions would integrate the dynamics of inmate behavior and classification policy/practice with the dynamics of the prior stages of the criminal justice system. Presently, projected prison admissions/departures derived from other procedures are imported as changing model parameters.

Extending Rule-Based Processing to Offender Classification at Sentencing

In South Carolina, as in many states, sentencing guidelines are administered by a commission, the research staff of which develops and/or monitors a set of sentencing grids to project or determines sentencing options for offenders based on their offense and criminal history attributes. Sentencing policy simulations are done on different technology platforms. In the course of developing this PC based simulation model, partnership staff imported the "resultant" data for one given sentencing grid. To test the effect of choosing an alternate sentencing grid, SCDC must obtain another set of outcome data from the Sentencing Guidelines Commission. Since applying sentencing guidelines is essentially offender classification by the judiciary (versus by prison administrators), a logical and efficient enhancement would be to expand the rule-based processing infrastructure and algorithm to guideline sentence computation. Thus, dynamics of offender classification at the sentencing phase will also be modeled and integrated with offender classification in prisons. These enhancements are recommended:

- Expand the data warehouse to address sentencing guideline scenarios - this would include loading, scrubbing and transforming offense and offender classification data (such as creating designation of felony and misdemeanor classes; loading data from the courts and probation and parole (separate agencies from SCDC))
- Extend algorithm and simulation processing to judicial decisions
- Customize reports to address impact of changing sentencing grids for non-corrections audiences.

<u>Integrating Classification Simulation with Offender Risk Analysis to Derive a Suite of Classification Development/Evaluation Tools</u>

Presently, this partnership's simulation model allows users to input a classification scenario to reflect any combination of factor weights and criteria as options. Throughout this report, the partnership has alluded to <u>the responsible and appropriate use of the model in the context of offender risk and the paramount mission of prison management to protect the public from dangerous offenders</u>. Thus, a critical and perhaps the most useful and meaningful enhancement, would be the integration classification policy simulation with risk analysis procedures. Such a model would allow the creation of parameter constraints to caution the caseworker in their variation of classification scenarios.

Similar in concept to financial portfolio software that explicitly considers risk, this simulation model can be expanded to provide a resulting *risk score* for each scenario considered. The following conceptual possibilities are proposed, the exploration of which would require considerable research, creative software design, and additional resources.

- Addition of an inferential statistical component to determine predictive relationship between institutional behavior and offender attributes.
- Creation of algorithms to either translate inferential statistical results into a classification scenario or to guide classification policy analysts in their formulation of classification scenarios.
- Include risk rating, warning signals, and constraints in the process of creating classification scenarios to explicitly address risks.
- Associate cost (capital and possible social) with risk in the form of simple two dimensional charts.

This would extend the model to provide decision-makers with a powerful decision support system, in the form of a complete suite of tools for developing, monitoring, and evaluating classification policy and practices for correctional administrators.

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APPENDIX

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CLSF020D              SCDC OFFENDER MANAGEMENT SYSTEM                 05/19/00
                          INITIAL CLASSIFICATION              STAT01
SCDC# 1                       SECURITY SCORE                              INQ
WILLIAMS, JIMMY HOWEY                                        CUST/SEC  INL5
CURR.LOC: UNK        AIMS: ALPHA I   REVIEW INST: TURBEVIL    AS OF: 04/04/96
1. ASSIGNMENT GOVERNED BY MINIMUM SECURITY SCREENING GUIDELINES>  N       SCORE
2. MOST SERIOUS CURR.OFFENSE... 0999 MURDER                               0100
   OFFENSE CATEGORY............ 5
3. NUMBER OF CURR. OFFENSES.... 18                                        0040
4. CURRENT SENTENCE............  999 YRS.  00 MOS.  000 DYS.              0040
5. MAND.TIME TO SERVE (YRS)....  020                                      0020
   VIOL.OFF. W/ PRIOR VIOLENCE> Y
6. ALCOHOL/DRUG W/ CURR. OFF... Y                                         0004
7. CURRENT AGE................. 55                                        0030
8. PRIOR CONVICTS.OVER 90 DAYS> 01                                        0008
9. HISTORY OF THREATENING/ASSAULTIVE/VIOLENT BEHAVIOR:                    0042
   DATE OF LAST MAJOR INCIDENT: 01/14/95   NUM. OF MAJOR INCIDENTS: 006
   DATE OF LAST MINOR INCIDENT: 04/01/79   NUM. OF MINOR INCIDENTS: 001
   REMARKS> 10/87--CSC 2ND--10 YRS
10. TOTAL SECURITY SCORE...............................** 0284
                    RESPONSE.>
REVIEW IS COMPLETE...
 PF11-QUIT    PF10-MENU    PF16-PRIOR    PF18-DRUG     PF12-PRINTINT
 PF8-INITADM  PF13-OFFENSE PF17-DISCIP   PF21-VIOLHIST
4-©                 1 Sess-1    167.7.50.33                             6/68
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CLSF030D              SCDC OFFENDER MANAGEMENT SYSTEM                 05/19/00
                         INITIAL CLASSIFICATION                STAT01
SCDC # 1                 ADMINISTRATIVE REVIEW                              INQ
WILLIAMS, JIMMY HOWEY                                           CUST/SEC. INL5
CURR.LOC: UNK         AIMS: ALPHA I  REVIEW INST: TURBEVIL   AS OF: 04/04/96

      SECURITY SCORE... 0284       CUSTODY/SEC. RECOMMENDATION..  CL4

KNOWN CAUTIONS/NOTIFIES/HOLDS.: Y
KNOWN ESCAPES/RELATED OFFENSES> Y

COORDINATOR DECISION..........> A  AGREE
   PRIMARY OVERRIDE REASON (1)...>
   SECONDARY OVERRIDE REASON (2).>
   OTHER OVERRIDE REASON (3).....>
REMARKS> MURDER
RECOMMENDED CUSTODY/SEC....>  CL4
RECOMMENDED INST.PLACEMENT.> 0211  BROAD RI    NEXT SCHEDULED REVIEW: 10/04/96
NAME OF COORDINATOR.> A DIXON                  CENTRAL MONITORING CASE> N
DEP.WARDEN APPROVAL.> Y  REASON> - APPROVED            APPROVED CUST/SEC>  CL4
                      RESPONSE.>
REVIEW IS COMPLETE...
 PF11-QUIT              PF10-MENU           PF12-PRINTINT
 PF14-DETAINER          PF9-SEPREQ          PF15-ESCAPE
4-©                1 Sess-1    167.7.50.33                                10/34
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CLAI100D                 SCDC OFFENDER MANAGEMENT SYSTEM               05/19/00
CLAI100M                   STATE CLASSIFICATION REVIEW                 STAT01
SCDC #>  00000001                     (PART I)           LOCATION: KIRKLAND
   WILLIAMS,JIMMY HOWEY                                REVIEW DATE: 01/01/00
PART I:  CLASSIFICATION CRITERIA                       REVIEW TYPE: STATUS
--------------------------------------------------------------------------------
1)  CURRENT OFFENSE WITH HIGHEST CATEGORY.: 1104  CRIM SEX COND W/MINOR(1ST
                                                 CATEGORY: 5              LE
2)  L  REMAINING TIME TO SERVE          : 999 99 999  (YRS-MOS-DYS)       L3
3)  PRIOR COMMITMENTS > 90 DAYS...........: VIOL: 00    NV: 05            L3
4A) PREVIOUS ASSAULTIVE DISCIPLINARY CONV.: N                             L2
4B) CURRENT  ASSAULTIVE DISICPLINARY CONV.: Y    DRUG DIS.: L
4C) MINOR WITHIN 6 MOS/MAJOR WITHIN 12 MOS:
4D) PENDING DISCIPLINARY..................: O
5)  DETAINER OFFENSE/HIGHEST CAT: 2002   ARSON RESID ENDNG   CATEGORY: 4  L2
6)  ESCAPES...............................: CLASS I: 03    CLASS II: 03   L2
CONSIDERING ALL CRITERIA, INMATE IS ELIGIBLE FOR SECURITY  LEVEL 3

RESIDENT STABILITY..............................:  U
VIOLENT OFFENSE WITH PRIOR VIOLENT CONVICTION?..: N
INMATE LABOR CREW ELIGIBILITY DATE..............: 99/99/99
RECOMMEND SCREENING FOR LABOR CREW NOW?.........: N

STATE CLASSIFICATION PART I DISPLAYED... PRESS <PF8> FOR PART II ...
4-©               1 Sess-1     167.7.50.33                              1/1
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CLAI150D                 SCDC OFFENDER MANAGEMENT SYSTEM            05/19/00
                           STATE CLASSIFICATION REVIEW               STAT01
SCDC #:  00000001            (PARTS II AND III)      REVIEW LOC.: KIRKLAND
        WILLIAMS,JIMMY HOWEY                         REVIEW DATE: 01/01/00
PART II: SERVICE NEEDS & OTHER CONSIDERATONS         REVIEW TYPE: STATUS
--------------------------------------------------------------------------------
1) SPECIAL NEEDS PER INTAKE ASSESSMENT/MEDICAL
   MENTAL HEALTH..: N       MENTAL RETARDATION: N
ASSESS SEX OFF IND: N       SUBSTANCE ABUSE...: Y
   SPECIAL MEDICAL: N       MEDICAL CLASS:
2) SECURITY THREAT GROUPS.................: CONFIRMED
3) SEPARATION REQUIREMENT.................: Y
4) RESIDENT STABILITY.....................: UO  UNSTABLE OUT-OF-STATE
PART III:
1) RECOMMENDED SECURITY.........: LEVEL 3
2) ASSIGNED SECURITY............: LEVEL 2  APPROVED BY:
3) INSTITUTIONAL OVERRIDE.......:
4) STATE CLASS APPROVED SECURITY: LEVEL  2 APPROVED BY:                01/01/00
5) STATE CLASS OVERRIDE.........: 5   CIRCUMSTANCES OF DISCIPLI
6) REVIEW REASON................:
NYDKFJDKLFJDLFJL

STATE CLASSIFICATION PART II DISPLAYED...
4-©                  1 Sess-1    167.7.50.33                              1/1
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GLOSSARY

Admissions
A cohort of offenders who are processed and placed into the custody of a correctional system during a given period. In the concept of a dynamic system, it represents the in-flow into the system. In the context of the classification policy simulation model, prison admissions are arrivals to the system. Admissions to prison can be new court convictions or conditional release violators returned to prison.

Arrival
A term in the simulation model to denote admissions to prison.

AS-OF Population
Analogous to the stock population on a given day. When the data warehouse is updated frequently, the As-of population or stock population in the simulation model will represent the most current snap shot of the prison population on a given day, thus allowing the model to be used to test the immediate effect of classification policy changes on the current population.

Backward Chaining
A technique used in Expert Systems (a sub-field of Artificial Intelligence) to resolve rules. See Appendix 5 for a description of the backward chaining algorithm as it is implemented in this series of Expert System models.

Behavior Directives
Instructions specified in the simulation model to reflect inmate behavior patterns in prison, for example the presence or absence of infractions and escapes, and the likelihood of being granted parole, or the date upon which sentencing guidelines are imposed. The directives may be general or specific, relating to all offenders or relating to specific offender groups according to demographic and criminal history attribute. An example of behavior directive: younger offenders are more likely to commit disciplinary infractions; this behavior directive is reflected in the relatively lower probability of having no infractions among offenders who are less than 25 years old.

Choices
Outcomes resulting from applying classification criteria to an individual inmate, i.e. the security level to be assigned to an inmate according to the classification criteria being specified. With different classification criteria, an inmate may be assigned to different security levels. In the South Carolina example, the choices in the simulation model are the three levels of security. When the prison system introduces new levels of security or special types of facilities such as geriatric units, new choices need to be specified in the simulation model. Rules and directives governing the conditions for the new choice would have to be input into the simulation model.

Classify
The process of examining each inmates in the stock population in the context of a given classification and assigning him/her to a particular "choice" of security level.

Client
In data processing terminology, client denotes the "part" or "Party" being served in the data architecture by a server. In this simulation model, applications residing in the PC environment are clients of the data warehouse server, which contains algorithms to perform common functions for all PC applications and/or files. Similarly, personal computers and/or desk top applications are clients in a network environment where common processing functions such as security, file management, transfers, etc. are performed by the mainframe or intermediate servers.

Code Table
A reference to explain the meaning of numerical or character values assigned to variables or data elements, usually containing two columns – one containing the possible values (can be numeric or character) assigned to data elements or variables, and the other containing a description explaining the meaning of the value being designated (see Appendix 4 for the layout of code tables in the data warehouse). To illustrate, a code table for gender may show that M is assigned to designate males and F for females. Or it may be 1 for male and 2 for female. Variables can share the same tables if similar values can be taken on by different variables. In this simulation model, code tables are interactively displayed to facilitate the specification of rules to describe classification criteria.

Comma Separated Value (CSV) File
In such a file, values of data elements can take on different lengths and are separated by commas. Accordingly, it is not necessary to designate displacements for each variable. Creating and reading comma separated value files are data warehouse construction techniques, which facilitate the transformation of data from the mainframe or other platforms to the PC platform where the data warehouse and simulation applications reside. Code tables and Doc tables, for example, are read by createDB.exe as CSV files.

Command Button
Command buttons are one of many controls used in Visual Basic to implement a user interface. Others are List Boxes, Text Boxes and Grids. These are the familiar icons that Windows users are accustomed to.

Culprit
A fourth generation programming language which is used to navigate the CA-IDMS network database, to retrieve data from the transactional records, and output information in flat file format. The flat file thus produced can then be used for loading data into the data warehouse, for transfer to other processing units, or for reading/analysis by other software, such as statistical analysis packages – SAS and SPSS.

Data Warehouse
A collection of relational data tables loaded from multiple sources and residing in the same physical/processing environment to facilitate information retrieval, analysis, and presentation. Often data derived from multiple platforms or sources require cleansing and scrubbing before they can be loaded into the warehouse. Besides data tables, the data warehouse also provides a server component, which is a set of common algorithms/programs to perform file management functions on behalf of clients, such as transforming data from relational databases to the object oriented computing environment.

DBMS
Database Management Systems, many of which are proprietary, are a collection of highly complex and integrated programs which govern/facilitate the input, processing, security, storage, and output of enterprise data. Microsoft Access, CA-IDMS and ORACLE are examples of DBMS's.

Dialog Box
An element of the user interface intended to allow the user of a system to interact in some way with an executing program.

Directives
In the context of the simulation model, directives are instructions relating to the processing of variable values. For example, specifying the severity category for each offense is a directive.

Disciplinary Lag
Disciplinary Lag is the time span between the commitments of disciplinary infractions in prison by an inmate. Given the same duration of imprisonment, shorter lags are analogous to a greater number of disciplinary infractions and are indicative of worse behavior in prison. Disciplinary lag may be a function of an inmate's age, and his/her time served or remaining to be served. Lag time can increase, decrease, or remain the same depending on the sequence of infractions. In the simulation model, disciplinary lag data are used to schedule disciplinary infraction events within the inmate population. Multiple variable values were generated to denote time span between admission and first infraction, between first and second infractions, between second and third, etc. for various combinations of age, remaining time to serve and parolability.

Disciplinary Probability
The likelihood of an inmate committing a disciplinary infraction at a given time period, given his/her age, actual/remaining time to serve, and depending if he/she has already committed one or more infractions. These probabilities are generated from empirical data based on released or current population and their behavior history during imprisonment. Probability distributions are adjusted, based on empirical data or assumptions, to reflect better or worse behavior expected of the prison population in the future in order to test the effect of classification policy changes when inmate behavior patterns change interactively with sentencing and classification policies.

Discrete Events
An operational research term to denote an occurrence at some point in time that may affect the entities (inmates in the simulation model) and may or may not change the state of the system (the prison system and the distribution of offenders in various security statuses). For example, classification reviews and inmate infractions constitute discrete events in the simulation model.

DOC Files
These files are used to describe the contents of data warehouse and admissions database tables (see Appendix 4 for the layout of Doc files). This system has been designed to be adaptable to other correctional jurisdictions where field names, types etc. about stock and arriving inmates will differ from those used by SCDC. To accomplish this, a utility (createDB.exe) is provided to construct the databases dynamically from text files extracted from legacy systems. For each text file there is a corresponding Doc file that describes the field names, data types, descriptions, position on the text file etc. of the base text data. CreateDB.exe uses the Doc files to parse the incoming text data and to define and populate the tables in the data warehouse and admissions database accordingly.

Dynamic Data
Data that are not static or are functions of time. For example, counts of disciplinary infractions within a given time period are dynamic data (versus gender as static data, i.e., value does not change over time, or is not a function of time).

Entity
An operations research term to denote an object of interest that resides within or passes through the model. For the classification policy simulation model, inmates are entities.

Escape Lag
Time span between an inmate's first escape and admission, between his/her first and second escape, and so on. Computed escape lags, along with escape probability, are applied to schedule probable escapes in the classification simulation.

Escape Probability
The likelihood of an inmate escaping from prison custody given his/her age and time served/to serve. Escape probability distributions are computed from historical empirical data. Escape probability and escape lag together determine when and if an escape will occur.

Event
In the operations research context, an event is an occurrence at some point in time that may affect the entities and may or may not change the state of the system. Classification reviews and inmate infractions constitute events in this classification policy simulation model.

Executable Program
A collection of computer algorithms that would perform various functions on numeric and/or text data to include access, retrieval, transformation, mathematical manipulation, and output.

Expert System
In an Expert System (often referred to as a Rule Based System), rules are used to specify the often-complex decision making processes that experts routinely use to solve problems within a particular (usually narrow) problem domain. Expert Systems are usually considered to be a subset of Artificial Intelligence. See Backward Chaining for an explanation of how Expert Systems operate on rules to make choices.

IDMS (CA-IDMS)
A transaction processing data base management system licensed by Computer Associates, operating primarily in the mainframe environment.

List Box
List boxes are one of many controls used in Visual Basic to implement a user interface. Others are Command Buttons, Text Boxes and Grids. These are the familiar icons that Windows users are accustomed to.

Log File
A data file created by a program to track input, output, and errors.

Message Box
An element of the Visual Basic user interface that allows a program to obtain input through the keyboard or mouse from the user.

Method
In the object oriented computing environment, each object has properties and methods. Properties are fixed attributes of the object. Methods are actions that the object can perform, and are normally implemented in code as sub-routines or functions.

Monte Carlo Simulation
A numerical technique frequently utilized in discrete event simulation. The Monte Carlo method uses random draws from pre-specified probability distributions to determine the nature of uncertain events. This model uses this technique, for example, to determine when and if an inmate will escape or be guilty of a disciplinary infraction, two events that are inherently uncertain.

Object
A term used in programming to denote abstract entities that have properties, exhibit behaviors, and are arranged in a hierarchy (objects are the basis for object-oriented programming). In the context of the present model, for example, inmates are objects that have properties (age, sex) and exhibit behaviors (they arrive, move around, escape, commit infractions, etc.). Windows facilitates the creation of programs that use objects to represent reality – indeed, many of the familiar Windows applications are object-oriented. Objects in Excel are a cell in a worksheet, and a worksheet in a workbook; objects in Access are a row in a table or a table in a database; objects in Visual Basic are forms, the text boxes, or control buttons.

Object Orientation
Refers to a programming technique that represents data as objects.

Offender Group
An entity to denote offenders who share common values in selected variables. In the classification simulation model, age, actual/expected time to serve, and type of crime/sentencing are the three major criteria for offender grouping. Five (5) age categories (21 or under, 22-25, 26-39, 40-64, 65 or over), five (5) actual/expected time serve categories (2 years or less, 2.1 - 4 years, 4.1 - 7 years, 7.1 - 15 years, 15.1 or more), and three (3) crime/sentence groups (parolable/non-violent crimes, non-parolable type crimes not under Truth-in-Sentencing Statute, and non-parolable/violent crimes under Truth-in-Sentencing Statute) were identified. This combination produces 75 offender groups. Escape and infraction rates are computed for each offender groups for analysis and simulation application.

Parole Probability
The likelihood of an inmate being approved for parole when he/she appears before the parole board, controlling for the number of times he/she has been heard and the type of crimes (violent versus non-violent) for which he/she was convicted for the current commitment to prison. Parole probability data were generated from historical parole review data.

Poisson Distribution
Poisson distribution describes the probability of events where random, independent events occur within a large population. The decision parameter of importance is the average arrival rate of the occurring events.

Properties
Properties are attributes of Objects in the object-oriented environment. To illustrate: forms and text box are objects in Visual Basic programming. Properties of a form include: Name, Height, Width, Left, Top, Backcolor. Properties of a text box include: name, text, font, backcolor, and forecolor etc. In the present system, inmates are modeled as objects with properties such as date-of-birth and sex.

Query
A mechanism to extract information from a database. Typical operations performed by queries include sub-setting, performing computation/transformation functions, and returning formatted output to meet user specified criteria. In relational database systems, queries are conducted via Standard Query Language (SQL), which allows users to specify ad hoc conditions without the technical details of data base structure and programming syntax.

Radio Button
Radio buttons are one of many controls used in Visual Basic to implement a user interface. Others are Command Buttons, Text Boxes and Grids. These are the familiar icons that Windows users are accustomed to.

Relational Databases
A database is a collection of data organized to service many applications at the same time by storing and managing data so that they appear to be in one location. In relational databases, data are presented as tables with rows and columns and data can be "related" on the basis of common fields in the tables. Among the advantages of relational databases are the following: less data

redundancy, easier updates, more flexibility by creating data relationships dynamically, and enabling ad hoc queries.

Relational Tables
Refers to the manner in which data are presented in relationship databases. Data are presented rows and columns and can be "related" on the basis of common fields in the tables. To illustrate, disciplinary data tables have each occurrence of infractions as rows and attributes of each infraction (such as date of incident, infraction code, hearing date, hearing outcome, and penalty etc) as columns, the common field being the inmate's identifier (inmate's assigned number in the prison system). In relational tables, observations or records are rows while data values for variables are columns.

Rules
In the classification simulation model, rules are conditions that must be met in order to qualify for a particular choice (of security level) in a specific classification scenario. For example, among many rules for placement in minimum security institutions (a choice) are the following rules: the inmate has no history of escape; the inmate has 3 years or less remaining to serve.

SAS (Statistical Analysis System)
A software package first developed in the early 1970's for statistical analysis, and since then expanded and updated on an ongoing basis to accommodate new information technology challenges. Currently SAS includes a vast spectrum of data base management, data processing, data warehouse, and statistical analysis tools.

Scenario
In the context of the classification simulation model, a scenario is a single set of rules relating to the classification of inmates. When some of the rules change, a new set emerges, resulting in a new scenario. Each scenario has a separate bed space configuration, which may or may not be similar, depending on the modifications that are made in the rules.

Sentencing Guidelines
A set of conditions relating to the meting out of sentencing of offenders by the judiciary, usually addressing offense severity and offender criminal history. Sentencing guidelines are intended to achieve parity, consistency, and objectivity in sentencing so that judges would give out similar sentences to offenders with similar history of crime commitment and having committed crimes of similar severity. Sentencing guideline concepts emerged in the 1970's and in 1996, the Bureau of Justice Assistance reported that 16 states have implemented sentencing guidelines.

Server
In computing environments, components are frequently identified as servers and clients to distinguish between the relative roles performed. Hardware or software components, in which common functions reside and provide repetitive services, are called servers. To illustrate, the mainframe computer is a server in a networked computing environment while the PC's are clients, since the former performs file management functions for common files that reside in the mainframe. The PCs become clients, running specialized programs against mainframe-resident files. In the simulation model, the data warehouse server conducts file management functions for the clients, which are the Visual Basic, OLAP, and Excel applications involved in the Classify and Simulate functions.

Simulation
The overall function of applying classification scenarios to both the stock population and future admissions.

Static Data
Data which do not change values over time (versus dynamic data where data values are functions of time). An example of static data is gender of an inmate (age is dynamic).

Text Files
A format of outputting data in character format.

Title Window
The window/screen that displays the simulation "title page", with Researcher and Practitioner logos.

Variable
When constructing scenarios, user-defined data elements may be created to hold constant information required by the classification or simulation models, or for use in computations and comparisons performed by rules. There are two types of variables:

Global Variables
Variables relevant to the overall operation of the simulation model and not associated with individual inmates. For example, the date that sentencing guidelines are to be imposed is contained in a global variable.

Local or Property Variables
Variables associated with individual inmates. For an example of local variables, see the discussion in Appendix 6.

Visual Basic (VB)
A Windows-based object oriented programming language on the personal computer platform. Visual Basic is the programming language used in the classification policy simulation model.

Warehouse Server
A component of the system that provides commonly used services associated with the data warehouse to clients (Simulation.exe, createDB.exe and Excel are clients). Examples of these services include connection to the data warehouse, retrieval of inmate data from the warehouse, and construction of memory-resident inmate objects in support of the object-oriented programming structure of the simulation client. See Appendix 5 for a more complete description of the Warehouse Server.