Title of Paper: Performance Measurements – The Cartwheels of the Modern Court System

Author: Dr. Denarto Dennis

Institution of affiliation:

The Court Statistics Unit
The Supreme Court of Jamaica
Public Building East
Kings Street, Kingston
Position: Chief Statistician

Email addresses: denarto.dennis@supremecourt.gov.jm

Telephone number: (876)488-3684

Year: 2019

Abstract

The purpose of this study was to establish a comprehensive framework for the statistical measurements of the performance and the state of affairs in court systems. It draws on the studies of judicial systems in various countries, which propose useful metrics for quantifying and informing court efficiency, and supplements such metrics with a range of measurements emerging from a three-year study of the Jamaican court system. This three-year study relied on a combination of observations and unstructured interviews, which were administered in several court locations, business lines and jurisdictions. The result is the compilation of twenty three (23) statistical measurements, classified into four broad but complimentary categories, namely productivity metrics, resource allocation metrics, time lag metrics and miscellaneous measures. Together, these metrics provide a wide-ranging means through which scientific applications can be made to monitoring and evaluating court performance and the state of resources in courts, thus creating the structure for informing the operational decisions and policy design apparatus, which are necessary for optimizing court efficiency.

Keywords: Productivity, Efficiency, Resource, Time, Decisions.

TABLE OF CONTENTS

1. Introduction

The use of statistical measures to assess judicial performance and the efficiency of courts is a relatively new and understudied area. It is not until the last three decades that interest in quantitative law and the measurement of court efficiency started to grow. Much of the study of court systems and the judiciary before that time was focussed on qualitative assessments. The use of statistics as both a measuring and monitoring tool for court and judicial performance provides an objective avenue through which courts can monitor and evaluate the efficiency and effectiveness with which their responsibility to the public is being discharged. The Jamaican court system, like many others across the world, in particular in the developing world has suffered from a dearth of statistics to guide judicial reforms and to monitor performance, both historically and contemporarily. Such dearth often impaired the ability of judiciaries to successfully diagnose weaknesses in judicial processes and to effect the interventions, which are necessary to attain the most optimal and sustainable outcomes. For example, without the necessary metrics, a trial court wanting to improve trial date certainty and thus improve rates of disposition and the timely delivery of justice to the public is unable to achieve the maximum results from this well-intended policy unless their approach is empirically driven. Such scientific approach is needed to first establish a baseline trial date certainty rate and to constantly monitor this rate and evaluate the policy outcomes against it. As the wheels are vital in giving both direction and buttress to the cart, so are statistical measures to the modern, accountable court system.

The aim of this paper is to summarize and propose a series of inter-related quantitative measurements, which can be effectively used to assess the needs of courts and court performance and potentially form the basis for assessing the efficiency of judicial systems worldwide. These measures represent an amalgamation of reviews of the metrics used in various jurisdictions and new augmentations resulting from insights gleaned from a three-year study of and work in the Jamaican court system, which spanned August 2016 through July 2019. The Jamaican court system uses common law, is the largest, most diverse in the English speaking Caribbean, and thus offers a dynamic basis for this type of study. It is one of few studies that successfully articulate such an extensive range and blend of measurements. It further represents a profound step in the evolution of quantitative law, once a lonely outpost when John E. Merryman published the Merryman Report in 1979, the ground breaker for the application of mathematical quantifications to the study of court performance.

2. Theoretical background

This section presents an analysis of a range of court literature, which speaks to the importance of statistical data and measurements in enhancing efficiency and the timely delivery of case resolutions. Although the discipline of court statistics and quantitative law is relatively new, a number of studies have emerged in recent time, which has focussed on court performance, leading to a preponderance of literature emphasizing the importance of data and statistics in monitoring, evaluating and influencing judicial performance. The Economist (2017) opines, "In today's economy, data has replaced oil as the most valuable resource." In their exposition on the global measures of court performance, the International Framework for Court Excellence (2017) offered an important pivot for this argument by purporting that: 'A foundation stone of excellent court planning and performance is the maintenance of accurate, comprehensive and reliable information and databases. It is essential, not only to assessing the performance of a court but also to assessing whether its strategies or activities for improvement are having a positive effect'

Indeed, more and more court systems across the world are relying on statistical data as the basis of informing operational interventions and policy design, which are necessary to efficiently align resources in their judicial systems and to re-engineer case process flows with a view to reducing delays and expediting the timely delivery of justice to citizens. In his assessment of the guiding principles of trial court performance standards, Keilitz (2002) offers four reasons why courts should focus on consistent, scientific performance management. The first of these reasons, Keilitz argues is based on the notion that courts are foremost accountable for their performances and for the benefits, they attain. Secondly, he argues that

courts should be operated and managed with a definitive focus on the people who are being served by it rather than those operating the court. He further argues that courts are vital facets of the governance of communities and the citizens in their jurisdiction and must thus seek to contribute positively to social order through the timely and fair delivery of justice. Keilitz anchors his four-point argument by highlighting that courts are complex public organizations whose functions are much more than simply Judges hearing and resolving cases. He argues that this importance renders the court as an entity which must be managed in a responsible way and whose allotted resources must be marshalled in the most optimal way possible.

On the matter of the responsible management of resources, Ostrom and Hanson (2010) argues that quantitative performance measurements provide essential information that is critical to equipping courts with the ability to marshal scarce state resources, establish priorities and channel such resources in areas where they are most critically needed. In similar manner, Lepore, Metallo and Agrijoglio (2012) opines that data driven performance management systems are used to describe ways in which courts can vary their administrative and managerial undertakings until their targeted objectives are achieved. The author further argues that these systems are essential tools of "monitoring and sanctioning" such that various operational interventions, which are undertaken by a court's leadership, can be effectively tracked to gauge their results against the established objectives, ultimately to improve performance. Statistical measurements are indeed the pillars of the modern court system and can therefore be extremely effective in assessing the efficiency of a court in moving cases through the system from filing to final resolution and maintaining control over internal procedures, budgeting practices, cost apportionment and the overall court environment (Lepore, Metallo and

Agrijoglio, 2012). In this regard, the authors further opine that quantitative performance measurements can guide judges and court administrators in achieving their intended objectives in as far as the timely resolution of cases and delivery of justice to the public is concerned. At the core of the evolution of court systems towards the use of quantitative data to guide effective decision-making is the digitization of court procedures, thereby allowing for seamless exchange and access to information by administrators and judges. In the Italian judicial system, such digitisations have been the ethos of three basic principles, which were introduced to guide the judiciary, namely, autonomy, responsibility and evaluation (Lepore, Metallo and Agrijoglio, 2012). According to author, "Information systems have allowed for the digitization and streamlining of organizational procedures, allowing for the integration of existing databases and improvement in data capture and exchange." In this respect, courts are outfitted with the ability to access case information in a timely manner, void of the constraints of delays and spatial limits. Such provisions reduce the time taken to complete cases and improve court performance. According to the author, sound information systems provide an effective avenue through which case activity and court performance can be constantly tracked to improve results. In this regard, the author proffers that there are three internal measures of the operating efficiency, which such systems allow courts to monitor, namely the case clearance rate, the case turnover rate and the disposition time. The author defines the case clearance rate as the number of cases resolved as a percentage of the number of incoming cases. The case turnover rate is further defined as the ratio of resolved cases to unresolved cases, which can in turn be used to calculate the expected disposition time for unresolved cases in the court system. The author opines that these three measurements are vital management tools that

evaluate the length of time it takes a court to process and dispose of cases, thereby empowering the efficient discharging of judicial responsibility to the public.

Clements (2006) in a study on court performance standards in the State of Nevada, USA, identifies that Trial Court Performance Standards (TCPS) utilizes a myriad of standards to establish goals for effective court performance in the areas of access to justice, expedition and timeliness, equality, fairness, integrity, independence and accountability and public trust and confidence. These goals, the author argues are critical interrelated facets of any modern court system and must be seen as central to discharging of judicial responsibility to the public. In this regard, the author opines that undue delays in the court system causes injustice and hardship and is the ethos of the public's lack of confidence and trust in the court system. In the view of the author, the use of established statistical measures to track court performance is fundamental to discharging the goals outlined and hence assuring the accountability of the judiciary. He argues that the absence of statistical performance measures impaired the ability of the Nevada courts to effectively monitor court performance and the timeliness of the delivery justice. The author highlights that Judges were resistant to statistical measures out of fear that it would be deemed as metrics of their performance, moreover Judges and Masters perceive the performance of the court at a superior level to that perceived by court administrators and defence attorneys.

The International Framework for Court Excellence (2017) in establishing the importance of a reliable system of measurement to the performance and accountability outlines eleven core measures of Global Court Excellence, which are required to provide vital management information. In this respect, the authors argue that 'the way in which we measure success,

drives the very success we achieve'. The eleven core measurements of global court excellence outlined by the authors are: court user satisfaction, access fees, case clearance rate, the on-time case processing rate, the case backlog, the trial date certainty rates, the case file integrity rate, the duration of pre-trial custody, compliance with court orders, employee engagement and the cost per case. The authors outline that the case clearance rate provides a measure of the ratio of incoming cases to resolved cases in a given period. Hence, a clearance rate of under 100% implies that there are more incoming than outgoing cases and therefore courts which sustain overall average clearance rates of fewer than 90% but especially less than 80% will inevitably experience a build up their case backlog. Concerning the case file integrity rate, the authors define this measure as the number of case files that can be located and retrieved in a timely manner while meeting the standards of accuracy and organizational completeness. They proffer that guaranteeing high case file integrity rates is vital to reducing the incidence of case adjournments, which are attributable to administrative deficits in courts. This in turn contributes positively to the timely disposition of cases and promotes hearing date certainty, which enhances accountability to the public. One of the most important hearings in any court system is trials. According to the authors, the trial date certainty rates speaks to the likelihood that a date scheduled for trial will start without postponement to a future date. This rate, they argue is critical to enhancing confidence in the judicial process, to enhance the efficiency of court operations and to a healthy case clearance rate. As an institution of decision-making, one factor, which undoubtedly has an impact on efficiency, is the rate of compliance with court orders (International Framework for Court Excellence, 2017). The authors liken trial date certainty to setting a doctor's appointment where a client considers the maximum possible

number of delayed appointments he may be able to tolerate. The parallel drawn here is that the public seeking justice is like the patient seeking medical care. The authors further propose that the trial date certainty rate could be computed as the ratio of the number of cases with no more than the prescribed or targeted sittings and the total number of closed trial cases.

Dakolias (1999) of the World Bank conducted an extensive comparative study on court performance across the world in which it is stated that: 'Many developing countries find that their judiciaries advance inconsistent case law and carry a large backlog of cases, thus eroding individual and property rights, stifling private sector growth and in some cases even violating human rights...' In this regard, the author opines that the most effective judiciaries in the world are those, which are predictable, guarantee public access and are able to conclude cases in a reasonable period. According to the author, in an effort to resolve problems associated with public access to courts, governments have been embarking on critical judicial reforms which are geared towards enhancing fairness and the efficient resolution of disputes. In so doing, the author argues, governments are exploring the existing weaknesses of their judiciaries and to assess the effects of past reforms. Dakolias proffers that in this regard, the advancement of performance monitoring metrics are necessary. Furthermore, the author opines, civil society and intergovernmental entities across the world have increased the demand for judicial accountability and transparency. This point gains added relevance against the background that national judiciaries across the world were not historically concerned with performance data as the collation of such information on a systematic basis has only gained force in recent decades.

According to Dakolias, the internationalization of economics across the world has created a serious interest in the issue of judicial efficiency, predictability and cross border litigation costs.

Additionally, she argues, the increased democratization of countries has heightened the role and function of civil society groups, which are demanding democratic reforms and increased judicial transparency and accountability. Such global trends, the author proffers, have spawned the need for comparative statistics on judicial efficiency. The assessment of judicial efficiency extends to judicial administration, which according to the author is measured by the concepts of efficiency, access, fairness, public trust and judicial independence. Statistical metrics are needed to keep track of judicial efficiency in all these areas, as the void of such efficiency is deleterious to public access and trust. Dakolias identifies that court congestion, financial burden and delays are among the most frequent factors complained about by the public when assessing court performance. Thus, the author opines that these are the most pressing issues to be addressed in court management. In this respect, it is imperative that courts focus on the issue of efficiency in discharging administration. Dakolias identifies seven quantitative measurements of court efficiency, which are deemed essential monitoring and evaluation metrics. These are there – the number of cases filed per year, the number of cases disposed per year, the number of cases pending at year-end, the case clearance rate, the case congestion rate, the average duration of each case, and the number of Judges per 100,000 inhabitants. In explaining these measures, the author outlines that the number of cases filed per year encompasses new cases filed and reopened cases while the number of cases disposed per year refers to all cases resolved in a given year by various methods of disposition such as dismissals, guilty outcomes, withdrawals and mediated settlements. Dakolias further defines the number of cases pending at year-end to be the number of unresolved cases for which future dates of court appearance have been established. As for the clearance rate, the author argues that this

measure is computed by taking a ratio of incoming to outgoing cases in a given period, which provides an indication of whether a court is building up or reducing its backlog. The case congestion rate, Dakolias proffers, gives an indication of how onerous the caseload carriage of a court is at any given time. Dakolias proposes that it is computed by dividing the sum of pending and new cases by the number of cases disposed in a given period. The author's work further suggests that a case clearance rate of over 100% implies that courts are making progress in backlog reduction while the converse is true of a court with a case clearance rate consistently under 100%. It is further suggested that a case congestion rate of over 100% may be an indication that a court may be carrying a pending caseload that is above its capacity.

For the author, each of these indicators measures some aspect of judicial efficiency, particularly as it relates to timeliness. The number of cases filed in a given period for example measures the demand on the court system and the ability of courts to satisfy this demand can be had by assessing the number of pending cases at the end of the year and the changes in the pending caseload. Dakolias outlines that the ability of the courts to satisfy the public's demand for judicial services is also provided by the clearance rate, as is court productivity in dispute resolution and the future growth of pending cases. The author also outlines that court efficiency may also be measured by the time taken to resolve cases which has a direct effect on a court's clearance rate.

Aside from the issue of timeliness, the author opines that courts must place an emphasis on the quality of its service deliverables to the citizenry, in which regard the measurement of the number of Judges per 100,000 population, an analysis of judicial salaries and certain annual court budgets as well as public perception are important. In addition to the measurements

outlined, Dakolias argues that the amount of time that a Judge spends on a particular judicial task can also be used as a proxy for judicial performance.

In examining trial court performance in Michigan State in the USA and proposing a series of best practice for trial courts as a whole, the State Court Administrative Office (2016) explores the importance of several important measurements and operating protocols, which are deemed central to court productivity. In particular, the authors draw on prescriptions from the National Centre for State Courts, pointing out that two of the most important metrics, which can be used to monitor, evaluate and manage court performance, are the clearance rate and the case age rate. In their discussion of the case clearance rate, the State Court Administrative Office drew on prescriptions from the National Centre for State Courts, pointing out that it should be computed as the ratio of income to outgoing cases in any specific period. In this respect, incoming cases constitute all new filings and reopened cases while outgoing cases encompass all disposed cases from new judgments entered and reopened cases concluded as well as cases placed on an inactive status. According to the authors, since the case clearance rate is type of productivity ratio, a court with a case clearance rate of 100% is keeping up with its backlog. In other words, such a court is disposing of as many cases as the number of new cases filed and is thus preventing an increase in the case backlog count. The authors further highlight that a court with a case clearance rate of greater than 100% is successfully reducing its backlog, since the number of cases disposed exceeds the number of new cases filed and a court with a case clearance rate under 100% is creating a backlog or adding to its pre-existing backlog inventory. The latter case may be a symptom of case management problems, according to the authors. In the main, the case clearance rate gives an indication of the extent to which a court

is keeping pace with the number of new cases filed and whether the court is creating or resolving a backlog, the authors opine.

According to the State Court Administrative Office, the case age rate which is also called the time to disposition refers to the proportion of cases disposed or otherwise resolved within the parameters or guidelines for all cases available to be finished. According to the authors, this is calculated as the ratio of disposed cases within prescribed timelines (for example a year) to the sum of cases disposed during the period/year and the pending cases aged within the prescribed timeline at the end of said period/year. In expounding on this measurement, the authors underscore that there are specific case events in certain case types, which cause the time, count to stop. Such, they argue, is typically the case when bench warrants are issued and the calculation of the case age pauses until, if, the bench warrant is executed and the matter returns to court.

Both the case clearance rates and the case age rates are affected by a range of factors, some of which are exogenous to the control of the courts. Among the important factors identified by the authors is the size and distribution of case types on a court list, in which regard the authors opine that some cases are simpler while others are disproportionately more difficult. Such complexity will, they argue, affect the duration of a case in the court system, which in turn lowers the case clearance rate. Another factor identified by the authors, which has an adverse impact on these metrics, is the adequacy of staffing. In this regard, they argue that an understaffed court will simply take a longer time to dispose of cases. Budgetary constraints, they opine, which affect staffing and provision of other resources will impair the ability to manage case flow and caseload thus adversely affecting court productivity. They however argue

that aside from budget constraints, the prevailing policies, practices and operational procedures in courts may be sources of delays. According to the authors, court infrastructure, namely court design, for example too few courtrooms may create a sizeable waiting list, which slows down case progression and creates undue delays, which are inimical to court productivity.

Consistent with the idea that what is measured gets attention that the success that is measured is a catalyst for the success achieved is the view of the authors that the relatively simple act of printing reports and discussing case age and case clearance with court staff may be a vehicle for change in the prevailing culture and attentiveness about court processes. In highlighting the success achieved in attaining a 3-year case clearance rate of between 98% and 103% leading up to 2014, the State Court Administrative Office proposes five interrelated measures for improving case clearance and case age rates. In this regard, they propose that courts conduct case flow management reviews, establish early control mechanisms, early involvement in judicial reviews as well as the provision of credible trial dates. The authors argue that a system of credible trial dates was found to be correlated with shorter disposition times in both civil and felony cases. They justify this correlation by underscoring that in the process of preparing for a trial, parties and their attorneys are afforded time to assess whether a matter can be amicably resolved through plea bargaining or other similar resolutions. With the correlation observed between trial date certainty rates and faster disposition of cases in some business lines, the authors also propose a set of procedures, which can be employed by courts to improve trial date certainty rates. The proposed procedures include - having a system to dispose of as many cases as possible before setting trial date, to schedule an appropriate number of trial dates for

a given day or period of time, to develop a clearly articulated policy for limiting the incidence of adjournments and continuances and to provide a working back-up list of Judges for any given period of time. On the matter of delays in case proceedings, the authors argue that an adjournment should only be granted for a good cause, namely 'to promote the cause of justice'. They propose that court administrators and judges to guide reasons that would be a good cause for continuation, whether it is for further negotiation or to delays in time, should develop a continuance policy. Such a policy, they argue, should define who would rule on requests for adjournments of cases and the procedures to be followed by parties in seeking possible exemptions to the rules governing the adjournment policy. In respect of effective trial date setting, the authors propose that courts hold trial management conferences, develop time expectations and control court proceedings in order to maintain the momentum required to marshal cases towards disposition.

The authors propose that regular review of court statistics should be carried out in order to engender effective case management practices. They opine that successful case flow management requires that courts continually measure its actual performance against the expectations and targets established for the timely disposition of cases. They suggest that the statistics used to inform such practices be focussed on information on the pending caseload by case type and age as well as the age of cases at the time of disposition. They argue that the latter be used to measure the performance of courts for all case types and case ages, in relation to the established time standards. Such lists, they opine, should include the names of parties, the start date of cases and list of actions and events on such cases, both past and pending, as well as the associated dates and the next date scheduled for court appearance and other

related actions. The authors also postulate that statistical reports on open cases should be provided which allows judges to assess the cases, which are potentially problematic, to evaluate whether particular attorneys are contributors to case flow problems and to examine the relative probability of various case types being disposed within specific time intervals. The State Court Administrative Office also outlines that a constant assessment of the case clearance rate as a whole and for the various case types in a court should prove vital in analysing whether courts are either building up or reducing their case backlog, thus acting as a proxy measurement of the effectiveness of case management practices and protocols. They further argue that tracking case clearance rates also allow courts to repurpose and redirect resources as necessary, in an effort to improve efficiency and productivity, ultimately redounding to the benefit of all court users. In providing statistical reports and measurements, the authors further underscore the importance of producing reports on the delays in criminal proceedings, namely the list of reasons why cases are adjourned or continued for a future date. This they opine is an essential facet of the effective case management in any court, geared towards informing the interventions which are necessary to expedite the disposition of cases and in so doing enhance the timely delivery of justice to citizens and bolster confidence in the judicial system. In summing up the effects of using statistics to monitor court performance, the authors point out that the regular review of statistics by court leaders creates the environment for case flow problem, both actual and potential, to be handled as effectively and efficiently as possible. Such practices, they opine, has a direct impact on the potency of the scheduling practices and procedures in courts, which in turn affects the age of cases. As a case in point, they opine that such practices have placed the Michigan Trial court among the best performing. For the

authors, continuous education and training of court staff is a vital cog in improving overall judicial productivity, promoting effective case management and improving confidence.

The use of statistics in informing the allocation of judicial resources needed to cater to the public's demands on the court system. Kleiman, Lee and Ostrom (2013) developed a set of basic mechanics for administering a judicial workload assessment in which they prescribe a series of steps which can be undertaken to objectively examine the quantum of Judges required cater to the courts' caseload as well as the supporting judicial resources which are needed. Using a weighted approach, Kleiman et al. (2013) proposed a four-step process for determining the required number of Judges and associated judicial staff. This method involves ascertaining the number of new cases filed, assigning case weights based on the relative complexity of different case types for which a product is found and then expressed as a ratio of the quantum of time the available to Judges for case related work. The result of this tells the required number of Judges to handle the court's caseload, from which the number of supporting staff can be determined, based on historical records and focus studies, the authors argue.

Other authors have proposed alternative methods of determining the required number of Judges to cater to the caseload demands of a court. Flango and Ostrom (1996) proposed a weighted caseload approach similar to that of Kleiman et al (2013), for which they argue that 'The best measure of demand for Judges and court support staff is the number of weighted filings, tempered by qualitative considerations.' They argue however, that such weighted approaches require a burdensome data collection undertaking and are hard to keep current due to constantly changing court dynamics. Additionally, they opine that such computations can be inimical to court productivity if they are inaccurate. To determine the required number

of Judges for a courts system, the authors simply propose taking a ratio of the quantum of time needed to hear all cases and amount of time the Judges have on hand to hear such cases. If the denominator is more than the numerator then more Judges are needed (Flango et al, 1996). The authors argue that the use of statistics to determine judicial need is an important facet in fostering judicial productivity, which they opine depends on the effectiveness of trial court support staff.

3. Methodology

In seeking to fulfil the objective of establishing a set of reliable, interrelated measures, which can be effectively applied in evaluating and assessing court needs and court performance, the study draws on measurement approaches from various studies reviewed. These are supplemented by a range of additional metrics derived from insights gleaned from three years of studying and working in the Jamaican court system. This study spanned the period August 2016 to July 2019 and involved extensive reviews of all business lines in the Jamaican court system at all jurisdictional levels as well as ongoing statistical reporting. The reviews were carried out using a combination of observation and unstructured interviews. The observations were administered periodically over the three years by scrutinizing the proceedings of various types of court hearings at several stages in the case progression continuum and by examining the processes involved in preparation of cases for court in several case types, both pre and post-court. Over 50 open court proceedings and 70 observations of pre and post court preparatory work across courts and jurisdictions in Jamaica were surveyed over three-year period. The unstructured interviews administered over the period were done with over 100

staff members at various levels and across different jurisdictions, including Judges, the IT professionals, Court Administrators, Deputy Registrars, Supervisors, Assistant and Deputy Clerks of Court and Data Entry Officers. The results of the observations and unstructured interviews were documented and sequenced over the period. The consequence of this extensive work has been the implementation of a data entry apparatus in most Jamaican courts, the development and deployment of electronic data systems throughout the courts and the creation of a reliable and consistent system of statistical reporting. The amalgam of this work has led to the harnessing and development of the 23 measurements, which are discussed later.

The 23 measures are subdivided into four primary categories, namely productivity/efficiency measurements, resources allocation measurements, time lag measurements and a broad category called miscellaneous measurements. A list of the 23 measures, subdivided by measurement category is outline below, the technical and operational details of which will be presented in the subsequent sections of the paper.

Table 1.0: List of court measurements by classification category

Productivity/efficiency metrics	Resource allocation metrics	Time Lag metrics	Miscellaneous metrics
1) Judicial carriage/pending caseload	1) The courtroom utilization rate	1) The on-time case processing rate	1) The case reissue rate and average reissue incidence
2)The case clearance rate	2) Required number of Judges and judicial support staff	2) The gross case backlog rate	2) Case non-enforcement rate
3)The case disposal rate	3) Judges per case file	3) The net case backlog rate	3) Requisitions response and clearance rates
4) The case congestion rate		4) The case turnover rate	4) Judges per population
5) The hearing date certainty rate		5) Estimated disposition time for unresolved cases	

6) The trial date certainty rate		6) The average time taken to dispose of cases	
7) The case file integrity rate		7) Case age rate	
		8) Pre-trial compliance rate	
		9) The judgment delivery and sentencing rates and average times.	

The productivity measurements are so called because either they are in a direct or an indirect way associated with the progression of cases through the court system. Such measurements therefore examine issues of the reliability of scheduled court dates and issues surrounding caseload management. They provide important insights into how well courts are doing in managing their caseload and case backlog and in resolving cases. The resource allocation measurements are termed as such because they address issues relating to the distribution and usage of vital court resources. Such allocations are at the centrepiece of an efficiently operated court system. The time lag measurements address the effectiveness of courts in resolving cases in a timely manner and in executing the events necessary to guarantee such outcomes. Importantly, these measures provide a good indication of the extent to which the actions of the court are contributing to backlog reduction. There are some measurements which do not fit neatly in any of the three categories outlined and are therefore classified in a miscellaneous metrics category.

The study will systematically explore and outline the concepts and applications surrounding each measurement as it seek to produce one of the most comprehensive, centralized lists of court metrics.

4. **Discussions**

This section of the paper will provide a description and discussion of the productivity, resource allocation, time lag and miscellaneous metrics identified in the methodology section. The interpretation and application of these measures will be explored within the context of the broad implied objective of courts and judicial systems to expeditiously deliver justice to its citizens. No single metric or subset of metrics should be examined in isolation to draw wholesale conclusions and generalize. Instead, each measure acts as small part of the overarching analytical tool, which should include several related measurements at any given time. Any analysis of court productivity must for example include the all productivity metrics some time lag metrics and possible some resource metrics – it all depends on the objectives of the assessment being carried out. Thus, to effectively apply the range of measurements in analysing courts requires a solid understanding of the various types of metrics and what they seek to accomplish. Any effort to assess the efficiency of court operations and how well a court is managing its caseload and case backlog must take into account the full range of productivity and time lag measures. Since this is a core objective of any judicial system, the simultaneous application and interpretation of the measures under these categories is therefore critical. Important insights on court efficiency and resource use can also however be derived from the two other resource categories which may be viewed as supplementary to the productivity and time lag measurements.

In this section, there will first be a discussion of the use, application and interpretation of the productivity metrics, followed by a related discussion of the time lag metrics and then the resource allocation and miscellaneous metrics. A number of the metrics presented are also

accompanied by an assessment of how specific measurements can be seamlessly used in tandem to offer quick, surgical guidance on the state of courts and thus inform the interventions, which are necessary to improve performance and output while assuring the efficient resolution of court cases. It must be pointed out that most of these measurements have broad application to all case types and business lines in the court system, though a few are specifically tailored for specific types of matters.

4.1 Productivity Metrics

4.11 The judicial carriage/pending caseload

Any serious effort to effectively mobilise and husband resources in a court, cannot take place void of comprehensive knowledge of the judicial carriage or pending case load which is carried by individual courts and the court system as a whole for various business lines in any jurisdiction. Consistent with the ideas expressed in the theoretical review by the State Court Administrative Office (2016), the pending caseload should be computed as the sum of all incoming cases, which includes both new filings and reopened cases. A clearer prescription could however be proposed where the pending caseload is expressed as the sum of all active cases brought forward, new case filings and reopened cases. Cases can be classified into one of four possible statuses – namely active cases which are cases that have a future date set for a court hearing or are awaiting the completion of a routine action for a date to be assigned, disposed cases which are cases resolved, inactive cases which do not have a future date of court appearance because they are awaiting some open-ended action and reactivated or

enforced cases which usually refers to civil cases on which applications have been made to enforce or vary a Judge's order. The stock of reopened cases which should be included in counting the pending caseload are those which were made inactive by the issuance of bench warrants or other event which requires that some action be undertaken outside of the court's direct influence to return the matter to court. A bench warrant, which is ordered by a Judge, requires for example, execution by the Police in order to be brought back to court. Thus, strictly speaking, the pending caseload speaks to cases for which hearing dates are set or being set or in other words the stock of active cases before the court. When a case becomes inactive therefore, it is not strictly speaking apart of the pending caseload, but neither is it, again, strictly speaking, disposed or resolved. With this in mind, inactive cases such as matters on which bench warrants are ordered but not executed and Nolle Proseque are not strictly a part of the pending caseload but neither are they disposed. If or when inactive matters are brought back before the courts they should be regarded as reopened cases because technically at the point of becoming inactive they may be administratively classified as closed, awaiting further action, which is not within the court's direct sphere of influence. As far as reactivated/enforced cases are concerned, these are a distinct category of cases, which were already disposed but are now involved in a new set of proceedings before the court to enforce or vary an existing order. Such matters may not be treated as a separate reporting category, affecting the new cases count nor the reopened case count since austerely speaking they would have already been factored into the stock of disposed cases. Reporting on such enforcements as a separate, post-disposal case activity is therefore prescribed to avoid any confusion or double counting. From the ensuing therefore, it is proposed that in computing the pending caseload of a court,

we include all active cases brought forward, new cases filed in the courts for the first time which are unrelated to enforcing or varying an existing court order on a disposed case as well as cases which were inactive and thus administratively classified as temporarily closed but are now being returned to court. The formula is stated below:

$$\boldsymbol{Pending\ caseload} = \boldsymbol{Active\ cases\ brought\ forward} + \boldsymbol{new\ case\ filings} + \boldsymbol{reopened\ cases}$$

This scenario can provide a simple illustration of this computation – 100 new cases are filed in a given year, 80 active cases were brought forward and 20 cases were returned to court because bench warrants were executed. If none of these cases were disposed at the end of the year, then the pending caseload would be 200 cases (100+80+20). If some of these cases were disposed during the year, then the pending caseload at the start of the next year would be 200 less the number of cases disposed during the year. The ideas proposed here are generally consistent with international best practices and prescriptions.

4.12 Case disposal and case clearance rates

The next set of productivity measurements to be discussed is the case disposal rate and the closely related case clearance rate. The case disposal rate speaks to the proportion of new cases filed in a given year which are disposed in that same year while the case clearance rate speaks to the ratio of incoming to outgoing cases within a specific period of time. Researchers such as Dakolias (1999) and the State Administrative Office (2016) agree that the case clearance rate is one of the most vital measurements of court productivity, providing a wide range of

insights into the efficiency of court operations and of potential problems in case management. The case disposal rate is important from the perspective that it provides an indication of the rate at which new cases filed are being resolved, which in turn has implications for the clearance rate. Improvements in the case disposal rate are generally expected to translate into higher clearance rates. Since the case clearance rate is a measurement of the ratio of incoming to outgoing cases, then a court with a backlog problem must consistently exceed a clearance rate of 100%, which would suggest that it is disposing of more cases than the number of incoming cases. If such a court sustains a backlog rate of under 100% long enough then its backlog stock and rate will invariably worsen. A court without a backlog problem to begin with will build u a backlog if it maintains a case clearance rate of consistently fewer than 100%. As highlighted in the International Framework for Court Excellence Report (2017), a court, which maintains a case clearance rate of fewer than 90%, but especially fewer than 80%, will build-up a severe backlog over time. As pointed out by the State Courts Administrative Office (2016), courts, which maintain a case clearance rate of 100%, are keeping up with their backlog since they would be disposing of as many cases as the number of new cases being filed. Consistently exceeding a 100% clearance rate is however necessary to reduce and ultimately eliminate the case backlog. Against this background, a court, which does not have an acute backlog stock, will be able to operate efficiently in managing its current caseload and in reducing its case backlog progressively if it is however between 90% and 115% clearance rate consistently. Sustaining such a band long enough and consistently will see a court largely operating as virtually backlog free.

The formulae for the case disposal and case clearance rates are as follows:

$$\textbf{Disposal rate} = \frac{\textbf{Number of cases disposed in period X (out of the stock of incoming cases)}}{\textbf{Number of incoming cases in period X}}$$

$$\textbf{Clearance rate} = \frac{\textbf{Number of cases disposed in period X (regardless of the date of case origin)}}{\textbf{Number of incoming case in period X}}$$

Since the case clearance rate takes into account all cases disposed in a particular period regardless of the date of origin, it is expected to be greater than or equal to the case disposal rate ***(i.e. Case clearance rate*** $\geq$ ***case disposal rate)***. The disposal rate only takes into account the stock of cases disposed from those incoming cases, which were filed in the same period. For example, in the Jamaican Parish Courts in 2018, there were 27,567 incoming cases filed. Of this number, 19,550 cases were classified as disposed, leading to a case disposal rate of 70.92% (Chief Justices Annual Statistics Report on Criminal Matters in the Parish Courts, 2018). At the same time, a gross figure of 25,999 cases were classified as disposed in the period, including aged cases which were brought forward at the beginning of the year. Thus, the case clearance rate was 94.31% for 2018 (Chief Justices Annual Statistics Report on Criminal Matters in the Parish Courts, 2018). Given that the Jamaican court system has a backlog of criminal cases, this rate of 94.31% though commendable falls below a minimum rate of 100% which would be required under the circumstances to reduce the criminal case backlog. The Chief Justice of Jamaica has set out a targeted case clearance rate 130% for the Jamaican court system over a six-year period leading up to 2025, a rate that is pivoted against the objective of making significant inroads in the pre-existing case backlog (Chief Justice's Annual Statistics Report on

Criminal Matters in the Parish Courts, 2018). The calculation of the clearance and disposals rates outlined above is shown below:

$$\textbf{Clearance rate} = \frac{25999}{27567} * 100 = 94.31\%$$

$$\textbf{Disposal rate} = \frac{19550}{27567} * 100 = 70.92\%$$

One matter to be clarified in the computation of the disposal and clearance rates is the inclusion of inactive cases in the denominator of the formulae, added to the stock of resolved cases. The rationale behind this approach is that such inactive cases are so rendered largely because of factors, which are outside of the court's direct control, such as awaiting the execution of a bench warrant by the Police. Such matters may therefore be administratively classified as 'temporarily closed' and thus included in the denominator of the computations, thereby giving a fairer measurement of case activity in the courts. This prescription is consistent with the practices in Michigan State and other parts of the United States, outlined in the earlier theoretical review of the work of the State Court Administrative Office.

4.13 The case congestion rate

Another crucial productivity metric is the case congestion rate. This metric seeks to measure the extent to which a court is keeping up with its caseload, based on its implied state of resources and rate of clearance. The case congestion rate is calculated as follows:

$$\textbf{Case congestion rate} = \frac{\textbf{Pending cases} + \textbf{incoming cases filed}}{\textbf{Disposed cases}}$$

Pending cases includes cases brought forward at the beginning of the applicable period, incoming cases includes new filings and reopened cases while disposed cases include all resolved cases and inactive cases awaiting some action to return to court at a future date.

A court with a case congestion rate of 100% is deemed to be keeping pace with its 'case traffic', that is, the number of cases disposed is keeping pace with the stock cases which are actively before the court. In particular, it suggests that the court's existing clearance rate is at optimal point and that the implied state of resources of the court is being optimally mobilized. If the case congestion rate falls below 100% then it suggests that the particular court has spare capacity, which creates an opportunity for resources to be repurposed to other areas of court operation. A rate exceeding 100% would mean that the court's caseload exceeds what its implied state of resources and rate of clearance would suggest. The case congestion rate provides vital insights into the ability of courts to keep up with their caseload obligations. In this regard, a case congestion rate of over 100% may imply that a court is simply ill-equipped with the resources needed to operate at its highest level of efficiency. Alternatively, and simultaneously it could mean that a court is not achieving its optimum potential as far as clearance and disposal rates are concerned. Thus, the case congestion rate should be interpreted alongside the clearance rate and other resource usage rates such as the courtroom utilization rate in order to garner the most meaningful interpretation and inform appropriate policy interventions. For example, a court, which has a high case congestion rate but low clearance and courtroom utilization rates, must take a very serious look at its case management and scheduling practices as well as its general administration to identify areas of weaknesses and undertake the appropriate interventions. At the start of 2018, the pending criminal

caseload (active cases), using cases originating since 2016, in the non-specialized parish court jurisdiction in Jamaica was 5,577 cases. There were 27,567 incoming cases filed while 21,749 cases were disposed and another 4,250 became inactive (Chief Justices Annual Statistics Report on Criminal Matters in the Parish Courts, 2018). Hence, the case congestion rate in these courts for 2018, applying the formula above would be:

$$\textbf{Case congestion rate} = \frac{5577+27567}{21749+4250} * 100 = \frac{33137}{25999} * 100 = 127.45\%$$

This result of 127.45% suggests that these courts are carrying 27.45% more cases than their current resource capacity and rate of clearance seem to suggest. Before drawing diagnostic conclusions however, it would be necessary to explore the case clearance as well as the courtroom utilization rate. The clearance rate of 94.31% computed earlier suggests that the courts are doing fairly well in moving cases out of the court system. If further analysis of the courtroom utilization rate were to reveal low rates of usage then it would mean that there is capacity for even higher case clearance rates and thus a clear opportunity to reduce case congestion through improved scheduling and case management practices. If on the other hand it were to be found that the courtroom utilization rate is high and meets the required standards then it would be a clear indication that a greater quantum of resources or more efficient resources should be contemplated, possibly more courtroom space. As outlined by Dakolias (1999) the case congestion rate is one of several measurements of the efficiency of court administration and demand on the court system. When complimented by an assessment of the clearance and disposal rates as well as resource measurements like the courtroom utilization rate, it becomes a potent measurement of court efficiency.

4.14 The hearing date certainty rate and the trial date certainty rate

Another set of important court productivity metrics are the hearing and trial date certainty rates. The hearing date certainty rate refers to the probability that dates set for various types of court hearings in a given period will proceed on schedule without delay. Such hearing dates vary depending on the particular case type or business line in the courts but will generally include mention dates, plea and case management dates, trial dates, bail application dates, dates set for the hearing of various applications for relief sought, part-heard, sentencing and judgment delivery dates. If for example a civil court sets 5 trial dates, 7 dates for delivering outstanding judgments and 23 dates for various applications to be heard in a given period and in turns out that 3 trial dates, 10 applications and 2 judgment dates started on schedule without been delayed to another dates, then the overall hearing date certainty rate for this civil court would be:$\frac{\mathbf{3+10+2}}{\mathbf{23+7+5}} * \mathbf{100} = \frac{\mathbf{15}}{\mathbf{35}} * \mathbf{100} = \mathbf{42.86}\%$. In other words, the hearing date certainty rate is computed using the formula:–

$\frac{\mathbf{Numberofhearingdatessetwhichstartedonscheduleinperiod X}}{\mathbf{TotalNumberofhearingdatessetinperiod X}}$. Alternatively, it may be computed as –$\frac{\mathbf{Numberofhearingdatessetinperiod X - thenumberofhearingdatesadjournedinperiod X}}{\mathbf{TotalNumberofhearingdatessetinperiod X}}$

A further alternative method of computing the trial date certainty rate is that prescribed by the International Framework for Court Excellence, which proposes that it may be computed as the ratio of the number of cases with no more than the prescribed or targeted sittings and the total number of closed trial cases. This should produce roughly the same outcomes as the formulae outlined.

The figure of roughly 43% computed above is an indication that in the applicable period there was a 43% chance that a hearing date set would commence on schedule without adjournment. An analysis of hearing date certainty by date type can be a very instructive tool in determining the areas of weaknesses in a court's scheduling and case management apparatus. A court for example which has a low hearing date certainty rate may simply be setting too many hearings for given period of time, given its resource and time limitations and the state of readiness of case files.

The trial date certainty rate, as implied, is a subset of the overall hearing date certainty rate. It speaks specifically to the probability that dates set for trials to start, actually proceed on schedule without being delayed to a future date. As with the overall hearing date certainty, the trial date certainty rate provides essential insights into the effectiveness of case management practices and the precision of the science that is applied in scheduling cases. It should be noted that simply reducing the number of trial dates set is not a fix for a low trial date certainty rate; rather setting a more realistic number of trials in a given period should be coupled with strong case management practices and procedures in order to attain the desired outcomes. A higher trial date certainty suggests that a court is using judicial time more productively, thus improving the probability that cases will be heard and disposed of in shorter times and inspiring public confidence in the court system. In Jamaica, the Chief Justice has set a target of an overall 95% trial date certainty rate across the court system, to be attained by 2025. This means that by 2025, 95 out of every 100 trial dates set should be starting on schedule without adjournment (Chief Justices Annual Statistics Report on the Supreme Court, 2018). This target hinges on the established correlation between higher trial date certainty and courts that are more productive,

which have higher clearance and disposal rates. The State Court Administrative Office (2016) highlights that strong case management procedures and practices have created the conditions, which have placed the Michigan State Trial Courts among the top performing in the State. The formula for computing trial date certainty rate is similar to that used for the overall hearing dare certainty rates, as expressed below:

$$\frac{\textbf{Number of trial dates set which started on schedule in period X}}{\textbf{Total Number of trial dates set in period X}}$$. Alternatively, it may be computed as –

$$\frac{\textbf{Number of trial dates set in period X} - \textbf{the number of trial dates adjourned in period X}}{\textbf{Total Number of trial dates set in period X}}$$

Low trial and hearing date certainty rates could be associated with low courtroom utilization and higher case congestion rates and is thus be viewed as a supplementary ratio in assessing court productivity. For example, a court with a low trial and hearing date certainty will have a low proportion of cases starting on the scheduled dates, thus possibly low courtroom utilization rates and a build-up of pending cases leading to higher case congestion rates and overall a less productive court.

4.15 The Case File Integrity Rate

The seventh and final court productivity metric is that of the file integrity rate. This provides a measurement of the probability that a case will not be adjourned because of any of the following factors – missing/lost files, incomplete files or untimely location of files. Case files, which are associated with cases scheduled for court, should be in a state of completeness, with all requisite documents properly filed and statements in place for the case to proceed. In the

absence of such readiness or a fairly high probability of readiness within the required time, scheduling cases associated with such case files invariably results in a wastage of judicial time. Case files scheduled for court should also be retrieved and made available for court in a timely manner and be properly listed for court. A low to zero incidence of case adjournments resulting from files missing/lost, incomplete or not located in a timely manner will contribute positively to the productive use of judicial time, potentially improving disposal and clearance rates and reducing the overall average time taken to dispose of cases. The case file integrity rate may be computed as follows:

$$\textbf{Case File Integrity Rate} = \frac{\textbf{Total number of cases scheduled} - \textbf{Number of cases adjourned due to missing late or incomplete files}}{\textbf{Tota l number of cases scheduled}} * 100$$

As an illustration, if in a given year, 1000 court hearing dates are set, requiring the use of the case files and 200 were not able to start or continue due to being missing, found late or incompleteness, then the case file integrity rate would be: $\frac{\mathbf{1000-200}}{\mathbf{1000}} * \mathbf{100} = \mathbf{80}\%$**.**This means that there is an 80% probability that a case will start or commence without delay or adjournment resulting from any of the named circumstances. A low case file integrity rate is a function of internal deficiencies in the administrative and case management processes in a court. The timely location, availability and completeness of a case file could be by way of manual or electronic facilities or both. In any case, the court's registry has an enormous responsibility to ensure that all actions, which are within its powers, are executed to ensure that the use of judicial time is optimized and that the mechanism used to schedule cases is a science and not just an art.

4.2 Resource allocation measures

As indicated earlier, the resource allocation measures specifically address the use of available resources and the required quantum of resources to optimize court performance. This subsection examines the three resource allocation measures, namely the courtroom utilization rate, the required number of judges and the number of judges per case file.

4.21 The courtroom utilization rate

The courtroom utilization rate is an important indicator of the efficiency with which the physical courtroom space in a court is being utilized. It is vital supplementary metric in analysing the case clearance and case congestion rates and thus court performance. The courtroom utilization rate is calculated as the proportion of time available for court to be sitting which is actually utilized. Thus, for example, if a courtroom has six available hours for courtroom sitting each day and four of those hours are utilized either for direct open court activity or in chamber discussions or consultations related to the case then the courtroom utilization rate would be calculated as:

$$\frac{\textbf{Proportion of available time for court sittings which are actually utlized}}{\textbf{Total time available for court sittings}} * \mathbf{100} = \frac{\mathbf{4}}{\mathbf{6}} * \mathbf{100} = \mathbf{67\%.}$$

It is important to point out that the number or the proportion of available court time which is actually utilized speaks to both open court usage and tangential out of court engagements which Judges carry out such as breaks to have brief discussions in chamber which are relevant to the continuation of the matter. A persistently low courtroom utilization rate may be as much a symptom of poor case management practices and weaknesses in the case scheduling

apparatus as it is of the unpredictable events that may happen on any court date. A low courtroom utilization rate is expected to be correlated with lower case disposal and case clearance rates and higher case congestion rates. A high courtroom utilization rate, which correlates with high case clearance and case disposal rates while case congestion rate remains high, may be an indication that additional courtroom space and supporting judicial resources are needed. Any serious assessment of court productivity must therefore take account of these productivity metrics as well as some time lag measures.

4.22 Required number of Judges

The number of Judges and support staff, which is required to effectively handle the caseload carried by a court system, is an essential facet of the planning of court operation and policy design. The number of Judges and supporting judicial staff hinges on the absolute number of cases before the court or which are expected to be before the court and the relative complexity of such cases. A court with inadequate judicial staff invariable fosters case congestion, which complicates case management and scheduling processes and in turn lowers hearing date certainty and case congestion rates. Conversely, having more judicial staff and Judges than required facilitates a waste of judicial resources and possible underutilization of courtroom space. The Weighted Caseload Model proposed by the Kleiman et al (2013) is one of the more popular techniques, which may be used to compute the required number of Judges and supporting judicial resources.

The Weighted Case Load Model computes the judicial needs of a court system, including Judges (directly) and support staff (indirectly) based on the aggregate judicial workload. There are

three principal facets to the weighted caseload formula. Firstly, the number of new cases filed in each business line and sub-types each year/period. For example the number of civil claims, sub-divided into the number of big claims and small claims. (***X)***. Secondly, each case is assigned weights based on the average quantum of judicial time required to handle each type of case from initiation to disposition***(Y).*** Thirdly, the Judge year is computed. This represents the volume of time that each Judge has at their disposition for all case-related work, both in court and chamber. ***(Z)***

To find the total judicial workload for any year or specific period, the total number of new cases filed for each case type **(*X)*** is multiplied by the case weights ***(Y)***, summed and divided by the value of the Judge year to determine the number of full time Judges required to handle the workload ***(Z)***. Based on the number of support staff required for each Judge, the total number of judicial staff required to can also be determined based on the total number of Judges needed. The limitation of this formula is that it only takes into account the quantum of total judicial resources required to handle the new cases filed in a given year. To expand this calculation to include the total quantum of judicial resources required to hear all cases, we simply adjust the first component of the formula ***(X)*** to reflect the sum of all pending cases brought forward at the beginning of a year or period plus the expected number of new cases to be filed. Once the required number of Judges and supporting judicial resources such as Clerks, Assistant Clerks etc. are determined, the figure can then be compared to the existing staff compliment to determine if changes to the size of the judiciary are justified. This computation can be done for the judiciary as a whole and for individual courts and business lines.

The foundation of the derivation of the different components of the formula (***i.e. parts X, Y and Z***) rests on two important pillars. The first is that the number of new case filings for the different case types in the courts as well the number of pending cases can be derived from the existing electronic and/or manual records. The case weights can be derived from one of or a combination of two approaches. The first approach is the workload assessment, which can be carried out using a brief time study, during which time all Judges track the entirety of their working time by case type and activities daily over for a period of six months. This time study would include recording the times spent working on cases on and off the bench as well as on work that is unrelated to cases such as administrative work, committee meetings and workshops. The length of time spent on the various case types would then be averaged across Judges to indicate the mean time needed by Judges (and support indirectly their support staff) to handle the total case load and then weighted using statistical software. A basic excel platform could assist in guiding this tracking exercise. Alternatively or concomitantly, electronic data on the average time that it takes to dispose of various types of cases. Once these times are derived, a designated expert review committee could vet and make adjustments to reflect the ideal standards. These average times may then be weighted using appropriate mathematical techniques to assign relative weights to the various case types and subtypes as necessary.

The second important pillar relates to the value of the Judge year ***(variable Z)*** which speaks to the quantum of time that Judges have available for case related work. This can be gleaned from the time study mentioned in point number 2 above. Case related time for Judges include all time devoted to activities such as, pre-trial activities, court trial activities, and post-trial activities. This time study approach would be most precise but as a proxy, the Judge year for

case related activity be easily computed by subtracting the total number of vacation and non-case related time from the total number of days available in the year. That is, ***total case related days available = 365 less weekends, holidays, training, workshops and other administrative activities.*** These approaches take direct account of the fact that Judges at different levels may have different Judge values as measured by the total case related days available and is thus a robust estimation in aiding to determine total judicial resources.

The Formula $\sum \frac{X_i Y_i}{Z}$therefore provides a powerful means of determining the number of Judges and supporting judicial staff needed to effectively handle and dispose of the court's caseload. Because it encompasses the case weights, it also provides a vibrant basis for allocating cases to Judges based on complexity and other factors. To demonstrate this measurement we use a simplified scenario with a court having only criminal cases and only two subtypes, namely indictments, summary matters. Let us assume that summary matters in this court are determined to have a case weight of three, which means that the average time taken to hear and dispose of each such case is3 hours, while indictments are assumed to have a weight of five, which implies an average of 5 hours to dispose of each case. Let us further assume that 500 summary matters are filed and 1000 indictments, representing the full judicial case load in that court. Hence, we are assuming that there are no pending cases brought forward at the start of that year. Additionally, the Judges year is assumed to work out to 180 days when the number of weekends, holidays, training, workshops and other administrative activities are subtracted from 365. Thus, the number of Judges required in this jurisdiction would be:

Required number of Judges $= \frac{(500*3)+(1000*5)}{180} = \frac{6500}{180} = \mathbf{36 Judges.}$

Court systems are of course far more complex than this simplified model suggests but it provides a useful guide in application. Court administrators would also need to determine the average number of different types of court administrators and judicial supports staff, which are needed per Judge, which can then be multiplied by 36 to determine the total required staff compliment to cater to the court's judicial needs. Having the optimal level of Judges and judicial support staff is vital to engendering healthy courtroom utilization rates, higher clearance and disposal rates, higher hearing and trial date certainty rates, more manageable caseload and efficient case congestion rates.

4.23 Judges per case file

The number of Judges per case file is an alternative to the weighted caseload model in determining the number required number of Judges. If based on historical records, the optimal number of cases to be allocated to/handled by a single Judge is known, the by dividing the existing caseload in a court by the number of Judges, it can be determined whether the court needs additional Judges or the total number of Judges required to handle the court's caseload. For example, if it is known based on historical trends or studies carried out that the a single Judge is needed for every 200 cases in a court, then the number of Judges per case file would need to be approximately 200. If we assume that the pending caseload of this court is currently 4000 cases and there are 10 Judges currently employed, each Judge would be carrying 400 cases ($\boldsymbol{Judges\ per\ case\ file} = \frac{\boldsymbol{Number\ of\ pending\ cases}}{\boldsymbol{Number\ of\ Judges}}$), which is twice the optimal amount. Such a court would need to double its number of Judges in order to achieve the desired average

of 200, thus 20 Judges are required. The disadvantage of the use of the number of Judges per case files to determine the optimal number of Judges and hence the supporting judicial support and administrative staff is that it is an absolute measurement, which does not take account of the relative weight and complexity of cases. It essentially assumes an equal weight for all cases, which is impractical. The number of Judges per case file nonetheless provides essential insights into the judicial load carried by Judges in a court and can be a useful tool in guiding the allocation of resources to support the judicial work of the Judges.

4.3 The time lag metrics

The time lag metrics are useful tools in analysing the actual and expected length of time that cases stay in the court system before been disposed or resolved as well as factors that may contribute to cases being delayed in the court system. The time lag metrics are especially useful in supplementing the court productivity measures when analysing court performance for policy intervention purposes.

4.31 The on-time case processing rate

The on-time case processing rate is a metric which is used to quantify the proportion of cases which are disposed within the prescribe time standards. The prescribed time standards for the disposition of cases vary depending on the case type or case, subtype but most court systems will have a general timeline within which cases, regardless of type and complexity will be disposed. This timeline tends to range from 2-5 years depending on jurisdiction and the guiding principles and applications in law, however there may be specific case types, which are

expected to be disposed well within the overarching maximum prescribed time to disposition and are thus measured by such standards. The overarching on time case processing rate for a court is computed as follows:

On time case processing rate =

$$\frac{\boldsymbol{Number\ of\ cases\ disposed\ within\ the\ prescribed\ time\ standards\ in\ period\ X}}{\boldsymbol{Total\ number of\ cases\ disposed\ in\ period\ X}} * \mathbf{100}$$

Alternatively, the on time case-processing rate may be computed as: $\mathbf{1} - [\boldsymbol{case\ backlog\ rate}]$

For example, if the total of 1000 cases are disposed in a given year, and 400 of those cases were disposed within a maximum prescribed time for disposal of cases of 2 years, then the on time case processing rate would be $\frac{\mathbf{400}}{\mathbf{1000}} * \mathbf{100} = \mathbf{40}\%$**.** Alternatively, since 600 or 60% of the cases took more than the prescribed 2 years to be disposed, the case backlog rate would be 60%, hence the on time case processing rate would be$1 - 0.60 = 0.40\ or\ 40\%$. The on time case-processing rate provides a reliable and simple tool for tracking how well a court is doing in meeting time disposal targets as well as to monitor operational interventions aimed at improving such outcomes. The on time case-processing rate is directly affected by the case clearance rate such that higher case clearance rate will generally be associated with lower times to disposition and hence higher on time case disposition rates.

4.32 Gross and net case backlog counts

In discussing the computation of the pending caseload, the distinction between active, inactive and disposed cases was forwarded. The **gross backlog** may be used to describe the sum of all active and inactive cases, which have been unresolved in the court system for more than the prescribed maximum length of time for all case types to be disposed, for example two years. The **net backlog** on the other hand excludes inactive cases from this computation, including only active pending cases before the courts. As a whole, the backlog rate is therefore the proportion of all cases disposed in a given period (typically a year) which were resolved outside of the prescribed maximum time standard for disposal of cases. The gross backlog gives a more complete picture of the quantity of unresolved cases before the courts but it also unfairly classifies and counts a quantum of cases as backlog, which is awaiting actions, which are not directly within the court's control. For example when a bench warrant is issued, it has to be executed by the law enforcement authorities in order for the matter to come back before the courts. The formulas for both backlog counts and the overall backlog rate are enumerated below:

$$\boldsymbol{Gross\ case\ backlog}$$

$$= \boldsymbol{Active\ cases\ at\ the\ end\ of} + \boldsymbol{Inactive\ cases\ at\ the\ end\ of\ period\ X}$$

$$\boldsymbol{Net\ case\ backlog} = \boldsymbol{Active\ cases\ at\ the\ end\ of\ period\ X}$$

$$\boldsymbol{Backlog\ rate}$$

$$= \frac{\boldsymbol{Number\ of\ cases\ disposed\ outside\ the\ prescribed\ time\ period\ in\ period\ X}}{\boldsymbol{Total\ number\ of\ cases\ disposed}}$$

In the Michigan State, when cases become inactive they are excluded from the list of pending cases and from the court's backlog. In fact, their case age also stops counting, until the matter returns to court (State Court Administrative Office, 2017).

The case backlog counts, particularly in net and the backlog rate are important in assessing the extent to which courts are delivering justice in a timely and efficient manner. The old adage that justice delayed is justice denied is extremely pertinent to the courts' establishment of a robust and reliable mechanism to track its backlog by case type and thus to pursue the interventions that are necessary to remove roadblock and to move a case towards disposition. The case backlog counts and the backlog rate must be assessed in tandem with productivity measures such as the case clearance rate and case congestion rates as well as the courtroom utilization rates. In general, a higher clearance rate will reduce the case backlog count and the backlog rate, however low clearance rate will generally correlate with high case congestion rates and high case backlog. A direct association is therefore to be expected between case congestion rates and case backlog rates. Courts with heavy caseload, yet generally low courtroom utilization rates would be expected to have high backlog and case congestion rates. As pointed out by Dakolias (2012), case backlog rate of 10% or more for any court should be considered as problematic, requiring special policy interventions and urgent remedies. As an illustration, let us assume that cases, which are unresolved for over 2 years, are considered to be in a state of backlog in a particular jurisdiction. If the pending caseload (encompassing both active and inactive cases) in the courts of this jurisdiction at the end of period (year) X is 1000 cases and 600 of those cases are over two years old, then the gross backlog rate would be the 600 cases. Now if 400 of those 600 cases over two years old were inactive cases, then the net

case backlog would be $600 - 400 = 200$ cases. Let us further assume that of the actual total number of cases disposed during this year were 400 cases and of this number, 300 were over two years old at the point of disposition, then the case backlog rate would be $\frac{\mathbf{300}}{\mathbf{400}} * \mathbf{100} = \mathbf{75}\%$**.** This result would suggest that based on the latest statistics, the probability of a case falling into a backlog classification would be 75%.

One important challenge that faces all courts is the determination of the number of cases, which need to be disposed in order to reduce the net case backlog to zero over a period. This can be accomplished with the use of techniques in calculus. To apply this technique we create a simple mathematical model, which expresses net backlog rate as a function of the quantum of cases disposed. The equation can be developed using time series data of the net case backlog rate and the number of cases disposed. This data can be inputted into any mathematical programming software such as Matlab to generate the requisite function that describes the functional association between the two variables. The function can then be differentiated and equated to zero to find the optimal number of cases to be disposed in order to determine the required number of disposed cases to attain a case backlog rate of zero. For example, if the mathematical function that describes the relationship between the net case backlog rate and the number of disposed cases in a particular court is given by the polynomial function:

$y = 5x^2 + 1200x - 1000$, where y is the backlog rate and x is the quantum of cases to be disposed, then the first derivative would be $\frac{dy}{dx} = 10x - 1200$ which. When this is set equal to zero produces a result of $10x - 1200 = 0, so\ 10x = 1200, so\ x = 120$. Thus, in order to attain a case backlog rate of zero, this court would need to dispose a quantum of 120 cases. Anything

below this number will keep the court in a state of backlog and the greater the distance below it, the more severe the case backlog. This approach creates a robust way for courts to monitor the progress been made in eliminating its backlog and to inform ongoing operational and judicial interventions.

4.33 Average time taken to dispose of cases

Courts must have a good understanding of the average length of time taken to dispose of its various cases and case subtypes. This information is important in first making a determination of whether the times are reasonable based on the relative complexity of the cases and to inform the policies and resource allocation needed to prevent simpler matters from queuing with cases that are more complex. The average time to disposition for any case type or court as a whole is computed as the sum of all the times taken for the relevant population of cases to be disposed, divided by the number of cases disposed. This is expressed mathematically as follows:

$$\textbf{Average time to disposition} = \frac{\sum \mathbf{T_i}}{\mathbf{N_i}},$$

Where $\boldsymbol{T_i}$ is the individual times taken to dispose of all cases in a case population in particular period and$\boldsymbol{N_i}$is the number of cases disposed in that period. As a simple example, if there were five cases disposed of a particular case type in period *i*, with times to disposition 10, 13, 15, 19 and 25 months respectively then the average time to disposition for this case type would be the simple arithmetic average of these scores which would be roughly 16 months.

The probability that particular case types or subtypes will be disposed within any particular average time may also be determined using the principles of the **Central Limits Theorem.** The

Central Limits Theorem states that if we have a population with the parameters mean (μ) and variance σ^2, and we take a large enough random sample from this population (i.e. a sample size of 30 or more) without replacement, then the distribution of the values in the sample will be roughly normally distributed (LaMorte, 2016)[1]. The Central Limits Theorem will hold true even if the population from which the sample is drawn is skewed and will be true for sample sizes less than 30 as long as the population of source is normal (LaMorte, 2016). To apply the Central Limits Theorem, we standardize the data using the formula $Z = \frac{\bar{X}-\mu}{\frac{\sigma}{\sqrt{n}}}$, where $\bar{X}$the sample is is mean, μ is the population mean, σ is the standard deviation and n is the sample size.

A court may for example wish to compute the probability that a set of cases of a certain type will be disposed in 3, 6, 8 or 12 months or any period of interest. The Central Limits Theorem can be effectively and easily applied once the sample size for the estimate is greater than or equal to 30 days, the overall population average time taken to dispose of cases is known and the variance of the population of times taken to dispose the cases are also known. For example, let us say that it is known that the standard deviation of the time taken to dispose criminal cases in a particular court is 12 months and the average time taken to dispose a criminal case is 36 months. Using a sample of say 64 criminal cases, we can compute the probability that a sample of criminal cases will take an average time of say, more than 40 months to be disposed. We would standardize this data and compute the required probability as follows:

---

[1] Lamorte W.W. (2016). *The Role of Probability: Central Limits Theorem.* Boston: Boston University School of Public Health. http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Probability/BS704_Probability12.html

$$P(\bar{X} > 40) = P\left(Z < \frac{40-36}{\frac{12}{\sqrt{64}}}\right) = P\left(Z > \frac{4}{1.5}\right) = P(Z > 2.67) = 1 - \Phi 2.67 = 1 - 0.99621$$

$$= 0.004 \; or \; 0.4\%.$$

The above result suggests that there is a 0.4% chance that a criminal case selected at random will take more than 40 months to be disposed. In other words, four in every 1000 cases disposed will take a period of more than 40 months. Application of the Central Limits Theorem in computing the proportion of cases, which are expected to be in the court system for a specific time period is an extremely important tool in planning and court administration.

4.34 The case turnover rates and the estimated disposition time for unresolved cases

The case turnover rate provides a measurement of the number of cases resolved (disposed), for every unresolved case. For example, if in a given period, the number of cases resolved is 500 but there were 700 unresolved cases at the end of the period (usually a year), then the case turnover rate would be $\frac{\boldsymbol{Number\ of\ resolved\ cases}}{\boldsymbol{Number\ of\ unresolved\ cases}} = \frac{\mathbf{500}}{\mathbf{700}} = \mathbf{0.71}$.This result implies that 71 resolved cases, for every 100 unresolved cases or 7 cases resolved for every 10 cases unresolved at the end of the reporting period. A case turnover rate of under 1, means that there are more unresolved than resolved cases, a figure of 1 implies that the number of resolved cases equate with the number of unresolved cases while a rate of over 1 implies that there are more resolved than unresolved cases in the period. A sustained case turnover rate of less than one implies that there is a build-up in the court's case backlog. A declining case turnover rate implies that cases are on average taking longer to be disposed and the reverse is

true when the case turnover rate is increasing. Hence, the case turnover rate can be used to estimate the length of time that it will, on average take for unresolved cases to be disposed. Thus, using a year as a standard reporting period, the estimated case disposition time for unresolved cases can be computed as:

Estimated case disposition time for unresolved cases =$\frac{\boldsymbol{365\ days}}{\boldsymbol{Case\ turnover\ rate}}$. Using the above scenario, this would work out to$\frac{365}{0.71} = 514\ days$. This result implies that the remaining unresolved cases are expected to take an average of 514 days or 1.4 years to be disposed. Although this estimate does not always have practical significance because it ignores the potential effect of special interventions on expediting the disposition of cases, these two measures provide meaningful insights into how well a court is doing in managing its caseload, informs planning and are useful compliments to the productivity measures, which were discussed earlier.

4.35 The case age rate

The case age rate is an important measurement for assessing the effectiveness of courts in attaining the disposition of cases or categories of cases within targeted timelines. As suggested by the State Courts Administrative Office (2016), it is computed as follows:

$$\mathbf{Case\ age\ rate} = \frac{\mathbf{All\ cases\ disposed\ within\ a\ specified\ time\ guideline}}{\mathbf{Sum\ of\ all\ cases\ disposed} + \mathbf{cases\ pending\ within\ the\ specified\ time\ guidelines}} * \mathbf{100}$$

For example, if a timeline is established for all Estate cases in a particular court to be disposed within 12 months and in that period 50 of the 100 cases disposed took less than 12 months

while there are another 25 pending cases which are under 12 months old, then the case age rate would be computed as: $\frac{50}{100+25} * 100 = 40\%$. This case age rate of 40% here suggests that this proportion of the stock of cases at the end of the period, which could have possibly been disposed within the time guidelines, were actually disposed in that time. This metric is extremely useful in monitoring the effectiveness of courts in achieving prescribed timelines for the resolution of specific case types and subtypes. As suggested by the State Court Administrative Office (2016), along with productivity measurements such as the case clearance rate, the case age rate provides an important instrument in case management and target driven planning and scheduling.

4.36 Pre-trial incidence compliance rate

Pre-trial assessments are an important facet of informing the interventions necessary to remove roadblocks to the timely and expeditious disposition of cases as well setting effective hearing dates, which are necessary to guarantee consistently high hearing and trial date certainty rates. A lower incidence of pre-trial hearings such as mention court hearings should be targeted by courts as it saves on judicial time ensures more effective trial dates and ultimately bolsters the productivity of the court. An assessment of the pre-trial incidence compliance rate is an important supplementary measurement when examining potential inhibitors to court productivity output conferred by measures such as the case clearance rate, the case congestion rate and hearing date certainty. The pre-trial incidence compliance rate may be computed as the number of cases with no more than the prescribed or targeted number of pre-trial hearings divided by the total number of cases heard in the period of

interest. For example if a court targets no more than 5 pre-trial hearings per case, and in a given period there were 10 cases with more than that prescribed/targeted number of pre-trial hearings and 15 others with 5 or less such hearings, then the pre-trial compliance rate would be computed as:

$$\frac{\textbf{Number of cases with no more than the prescribed pre-trial hearings in period X}}{\textbf{Number of cases heard in period}} * 100 = \frac{15}{25} * 100 = 60\%.$$

This result suggests that 60% of all cases have incidence of pre-trial hearings within the prescribed standard. The prescribed standard may vary by case type and jurisdiction. In many jurisdictions, a maximum of five pre-trial hearings is recommended.

4.37 Judgment delivery and sentencing rates and average times

Towards the end of a criminal case, a date is typically set for a sentence to be handed down and in a civil case; a judgment may be reserved for delivery at a future date. The timely delivery of justice requires that the average time taken between the last day of pre-sentencing hearing and the actual date if sentencing and between the reservation and delivery of a judgment be kept at a minimum. Similarly, the proportion of judgments being delivered within a prescribed time standard and the proportion of sentencing being handed down within a recommended time standard provides courts with an important tool to track the delay times at these crucial ends in a case. Setting standards in these areas and tracking them via these metrics are important judicial management tools, which can be used to great effect by the head of the judiciary in enhancing court efficiency and increasing accountability. The judgment/sentencing delivery rate is calculated as:

$$\frac{\textbf{Number of judgments/sentences delivered (handed down) within the prescribed timeline}}{\textbf{Number of judgments/setences delivered}} * \mathbf{100}$$

As a simple example, if a standard is set for judgments to be delivered in a particular court within 3 months after being reserved and 50 out of 100 judgments meet this standard in a given period, then the judgment delivery rate would be 50%. These measures provide useful supplementary analysis when examining the productivity measures discussed earlier. They for example have a direct effect on clearance and congestion rates as cases with judgments reserved or outstanding sentencing are not finally disposed until these critical tasks are executed.

4.4 Miscellaneous metrics

Having examined a range of productivity, resource and time lag measures in court systems, the study now turns to an examination of the four miscellaneous measurements which are so called because they may be viewed as hybrid measures, not fitting neatly in any of the other 3 classifications. The miscellaneous measures proposed here are the case reissue rate, the case non-enforcement rate, the requisitions clearance rare and the Judges per 100 thousand populations.

4.41 The case reissue rate and average incidence

In civil cases, summonses are served to notify defendant of a claim made against them and the associated court date. A standard time is typically set in a jurisdiction between the service of such summonses and the court day, for example eight clear days. In situations where the

defendant is not served or is short-served, the case is often reissued for a future court date and for service/proper service of summonses. The number of cases reissued and the average number of reissues per case are important metrics to track civil cases because the process consumes judicial time, both directly in open court and indirectly by way of administrative support processes. The case reissue rate may be computed as the number of new cases filed which are reissued one or more times, divided by the total number of cases filed in given period

$$- \boldsymbol{Case\ reissue\ rate} = \frac{\textbf{Number of new cases reissued one or more time in period X}}{\textbf{Number of new cases filed in period X}} * \mathbf{100}$$

Any serious analysis of the case reissue rate should be supplemented by an examination of the average number of reissues per case as this provides useful information on frequency. For example, if 100 new cases are filed in a given period and 20 of those cases are reissued one or more times, then the reissue rate is 20%. Further analysis of the average number of reissues per case could however show a high figure like five, which is indication that the 20% of cases filed which were reissued one or more times may have been issued abnormally high number times, as conferred by the apparently high overall average incidence. High reissue rates adversely affects the productivity measures such as the case clearance and case congestion rates as well as hearing date certainty and also impacts negatively on some of the key time lag measurements such as the average length of time taken to dispose a case.

4.42 Case non-enforcement rate

The purpose of the case non-enforcement rate is to measure the extent to which orders made by the court in resolving a case (typically civil cases), do not have a subsequent application for enforcement or variation of such orders. The rate at which such court orders are complied with

could reduce the demand for court time and space and in turn create an opportunity for a more timely hearing and disposition of newer cases entering the court system. Cases enforced by way of Judgment summonses may for example take inordinately long times to be finally resolved, occupying extensive judicial and administrative support resources and time. The case non-enforcement rate is therefore a useful tool for court planning and scheduling, providing vital insights into the possible optimal allocation of time and resources between new cases entering the court system and cases being enforced or for which applications are made for orders to be varied. A court with a low case non-enforcement rates (in other words a high enforcement rate); with generally heavy traffic of cases will see a squeeze on its resources to cater to the efficient handling of new cases filed. The case non-enforcement rate is computed as follows:

$$\mathbf{1} - \frac{\boldsymbol{Sum\ of\ cases\ entering\ enforcement\ and\ vary\ order\ hearings\ in\ period\ X}}{\boldsymbol{Number\ of\ cases\ disposed\ in\ period\ X}}$$

As an example, if within a given period, say three years, 1000 cases were disposed and of that number, 400 enter enforcement or vary order proceedings, then the case non-enforcement rate would be compute as:

$$\mathbf{1} - \frac{\mathbf{400}}{\mathbf{1000}} = \mathbf{1} - \mathbf{0.4} = \mathbf{0.60}\ \boldsymbol{or}\ \mathbf{60}\%$$

This result suggests that there is a 60% chance that a case will not enter enforcement or vary order proceedings after disposal. For this measure to be most meaningful, the time period over which the figures are gathered must be sufficiently large to capture the typical full cycle of a case, from initiation to enforcement or vary order proceedings (where applicable). Such times vary by court and possibly, by case type and must be carefully measured and studied before the

case non-enforcement rate is reliably computed. The case non-enforcement rate is best used in tandem with caseload and resource allocation metrics, discussed earlier in the study.

4.43 Requisition response and clearance rates

In many civil courts where the filing of multiple case documents is necessary for a case to be processed at different stages along the case continuum, requisitions are issued to have corrections made by the claimants or applicants. Due to a multitude of factors, mostly external to the court, the corrections to documents filed which should result from such requisitions may take a long time and in some cases may be filed incorrectly multiple times. Invariably, these occurrences lower the probability that the affected case types will be disposed in a timely manner. It is therefore necessary to measure both the requisition response rate and the clearance rates for requisitions, in order to get a good measure of the extent to which non-responses, slow responses or inaccurate responses may be contributing to delays in the progression of cases. The requisition response rate and the requisition clearance rate may be calculated as follows:

$$\textbf{Requisition response rate} = \frac{\textbf{Number of requisition responses filed in period X (of those issued in period X)}}{\textbf{Number of requisitions issued by the court in period X}}$$

$$\textbf{Requisition clearance rate} = \frac{\textbf{Number of requisition responses filed in period X (regardless of date of issue)}}{\textbf{Number of requisitions issued by the court in period X}}$$

As an example, of an Estate Registry in a Court issues 1000 requisitions in period X and of those requisitions there were 700 responses however there were 1100 responses as a whole received

in that period, including many with issue dates which pre-date the period, then the requisition response and clearance rates respectively would be computed as :

$$\mathbf{Requisition\ response\ rate} = \frac{\mathbf{700}}{\mathbf{1000}} * \mathbf{100} = \mathbf{70}\%$$

$$\mathbf{Requisition\ clearance\ rate} = \frac{\mathbf{1100}}{\mathbf{1000}} * \mathbf{100} = \mathbf{110}\%$$

In simple terms, the 70% requisition response rate implies that there is a 7/10 chance that a requisition issued will receive a response in the same time period while the requisition clearance rate suggests that for every 100 requisitions issued in the period, there were 110 responses. These measures are important analytical tools when examining potential cases of delay in the movement of cases and are thus supplementary to the time lag and productivity measures. The rate of accuracy of responses to requisitions is an important factor to be considered however this is somewhat addressed by both the overall requisition response rate and the requisition clearance rate. For example, a high and increasing requisition response rate will generally translate into higher rates of both compliance and accuracy of responses over time.

4.44 Judges per population

The final miscellaneous measurement examined in this paper is the Judges per population, more popularly Judges per 100,000 population. It seeks to measure the number of Judges available per 100,000 (for example) persons living in a country or region. It is popularly used as an indicator of how equipped the judiciary of a country is to attend to the demand for judicial services of various forms. The Judges per population is calculated by multiplying first dividing

the number of employed Judges by the total population size and then multiplying by the number of unit if comparison, for example 100,000. This is expressed below:

$$\textbf{Judges per 100,000 population} = \frac{\textbf{Number of employed Judges}}{\textbf{Population size}} * \mathbf{100,000}$$

For example, a country with a population size of 3 million, which has 200 sitting Judges would have $\frac{\mathbf{200}}{\mathbf{3000000}} * \mathbf{100000} \backsimeq \mathbf{7\ Judges}$. This result means that for every 100,000 citizens, there are seven Judges employed. Generally, the lower the number of Judges per 100,000 citizens, the less equipped is the judiciary to cater to the judicial needs of the population, though such considerations must be tempered by the litigious nature of the populace and the incidence of criminal activity. The Judges per population is an important supplementary measurement to the resource allocation metrics, discussed earlier in the study.

5. Conclusion

This paper examined a wide range of measurements, which may be effectively used in tracking and quantifying court performance and the general state of affairs in courts. It clearly establishes a range of measurement categories and their applications and how various measurements may be deployed in tandem to produce comprehensive court profiles and assessments. In so doing, this work creates a unique foundation for courts across the world to develop performance standards and to improve on the efficient delivery of justice to its citizens. The paper clearly outlines that any serous analysis of the state of affairs in a court or court performance must be done by utilizing an appropriate mix of productivity, resource allocation, time lag and miscellaneous measurements. The mix chosen will depend of the objective being pursued however, the metrics proposed are both far reaching and easily applied to any court system, with an important proviso being the availability of reliable and comprehensive data and data systems.

References

Clements, T. (2006). *Trial Court Performance Standards. An Assessment of the Second Judicial District Court, Washoe County, Reno, Nevada*. Nevada: Institute for Court Executive Development Program, Phase III Project.

Dakolias, M. (1999). *Court Performance Around the World: A comparative Perspective.* Washington, DC: World Bank.

Flango V.E., Ostrom B.J. (1996). *Assessing the need for Judges and Court Support Staff.* Williamsburg, VA: NCSC.

International Framework for Court Excellence (2017). *Global measures of Court Performance.* Williamsburg, VA: NCSC.

Keilitz, I. (2002). *Why do we need court performance standards? Manager's Briefcase*. Williamsburg, VA: NCSC.

Kleiman M., Cynthia G., Ostrom, B.J. (2013). *Workload Assessment: A Data-driven Management Tool for the Judicial Branch.* Williamsburg: NCSC.

Lamorte W.W. (2016). (November 02, 2016). The Role of Probability: Central Limits Theorem. Retrieved from http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Probability/BS704_Probability12.html

Lepore, L., Metallo C., Agrijoglio, R. (2012). Evaluating Court Performance: Findings from two Italian Courts. *International Journal of Court Administration 4(2)* 1-12.

Ostrom, B.J., Hanson B.A. (2010). *Achieving High Performance: A framework for Courts.* Williamsburg: NCSC.

State Court Administrative Office (2016). *Trial Court Services Best Practices: Case Age and Clearance Rate.* Michigan: State Court Administrative Office.

The Economist (2017). *The World in 2017.* London: The Economist Newspaper Limited.

The Court Statistics Unit (2018). (January 31, 2019). The Chief Justices Annual Statistics Report on Criminal Matters in the Parish Courts. Retrieved from https://supremecourt.gov.jm/sites/default/files/THE%20CHIEF%20JUSTICE%27S%20ANNUAL%20STATISTICS%20REPORT%20ONCRIMINAL%20MATTERS_PARISH%20COURTS_t.pdf

Appendix

Computational Formulae for the Productivity Metrics

1) $Pending\ caseload = Active\ cases\ brought\ forward + new\ case\ filings + reopened\ cases$

2) $$Disposal\ rate = \frac{Number\ of\ cases\ disposed\ in\ period\ X\ (out\ of\ the\ stock\ of\ incoming\ cases)}{Number\ of\ incoming\ cases\ in\ period\ X}$$

3) $$Clearance\ rate = \frac{Number\ of\ cases\ disposed\ in\ period\ X\ (regardless\ of\ the\ date\ of\ case\ origin)}{Number\ of\ incoming\ case\ in\ period\ X}$$

4) $$Case\ congestion\ rate = \frac{Pending\ cases + incoming\ cases\ filed}{Disposed\ cases}$$

5) $Hearing\ date\ certainty\ rate$

$$= \frac{\text{Number of hearing dates set which started on schedule in periodX}}{\text{Total Number of hearing dates set in periodX}}$$

Or

$Hearing\ date\ certainty\ rate$

$$= \frac{\text{Number of hearing dates set in period X } - \text{the number of hearing dates adjourned in period X}}{\text{Total Number of hearing dates set in period X}}$$

6) $$Trial\ date\ certainty\ rate = \frac{Number\ of\ trial\ dates\ set\ which\ started\ on\ schedule\ in\ period\ X}{Total\ Number\ of\ trial\ dates\ set\ in\ period\ X}.$$

Or

$$Trial\ date\ certainty$$

$$= \frac{Number\ of\ trial\ dates\ set\ in\ period\ X\ -the\ number\ of\ trial\ dates\ adjourned\ in\ period\ X}{Total\ Number\ of\ trial\ dates\ set\ in\ period\ X}$$

7) Case File Integrity Rate

$$= \frac{\text{Total number of cases scheduled} - \text{Number of cases adjourned due to missing late or incomplete files}}{\text{Total number of cases scheduled}}$$

Computational Formulae for the Resource Allocation Metrics

1) Courtroom utlization rate $=$

$$\frac{Proportion\ of\ available\ time\ for\ court\ sittings\ which\ are\ actually\ utlized}{Total\ time\ available\ for\ court\ sittings} * 100 = \frac{4}{6} * 100 = 67\%.$$

2) Required number of Judges $= \sum \frac{X_i Y_i}{Z}$

Where:

i) The number of new cases filed in each business line (***X)***
ii) Case weight ***(Y)***
iii) The Judge year ***(Z)***

3) Judges per case file $= \frac{\text{Number of pending cases}}{\text{Number of Judges}}$

Computational Formulae for the Time lag Metrics

1) On time case processing rate =

$$\frac{Number\ of\ cases\ disposed\ with\ in\ the\ prescribed\ time\ standards\ in\ period\ X}{Total\ numberof cases\ disposed\ in\ period\ X} * 100$$

Or

On time case processing rate =

$$\text{On time case processing rate} = 1 - [\text{case backlog rate}]$$

2) $Gross\ case\ backlog = Active\ cases + Inactive\ cases\ at\ the\ end\ of\ period\ X$

3) $Net\ case\ backlog = Active\ cases\ at\ the\ end\ of\ period\ X$

4) $Backlog\ rate = \frac{Number\ of\ cases\ disposed\ outside\ the\ prescribed\ time\ period\ in\ period\ X}{Number\ of\ cases\ disposed}$

5) Average time to disposition $= \frac{\sum T_i}{N_i}$,

Where $\boldsymbol{T_i}$ is the individual times taken to dispose of all cases in a case population in particular period and$\boldsymbol{N_i}$is the number of cases disposed in that period.

Determining the likelihood of average disposition times using the Central Limits Theorem: $Z = \frac{\bar{X}-\mu}{\frac{\sigma}{\sqrt{n}}}$, where $\bar{X}$ is the sample is mean, μ is the population mean, σ is the standard deviation and n is the sample size.

6) Case turnover rate $= \dfrac{\boldsymbol{Number\ of\ resolved\ cases}}{\boldsymbol{Number\ of\ unresolved\ cases}}$

7) Estimated case disposition time for unresolved cases $= \frac{365\ days}{Case\ turnover\ rate}$

8) Case age rate $=$

$$\frac{\text{All cases disposed within a specified time guideline}}{\text{Sum of all cases disposed} + \text{cases pending within the specified time guidelines}} * 100$$

9) $\text{Pre} - \text{trial incidence compliance rate} =$

$$\frac{\text{Number of cases with no more than the prescribed pre}-\text{trial hearings in period X}}{\text{Number of cases heard in period}}$$

10) Judgment delivery /sentencing rate =

$$\frac{\text{Number of judgments/sentences delivered (handed down) within the prescribed timeline}}{\text{Number of judgments/setences delivered}} * 100$$

Computational Formulae for the Miscellaneous Metrics

1) Case reissue rate $= \frac{\text{Number of new cases reissued one or more time in period X}}{\text{Number of new cases filed in period X}}$

2) Case non $-$ enforcement rate $= 1 -$

$$\frac{\text{Sum of cases entering enforcement and vary order hearings in period X}}{\text{Number of cases disposed in period X}} * 100$$

3) Requisition response rate $=$

$$\frac{\text{Number of requisition responses filed in period X (of those issued in period X)}}{\text{Number of requisitions issued by the court in period X}}$$

4) Requisition clearance rate $=$

$$\frac{\text{Number of requisition responses filed in period X (regardless of date of issue)}}{\text{Number of requisitions issued by the court in period X}}$$

5) Judges per 100,000 population = $\frac{Number\ of\ employed\ Judges}{Population\ size} * 100{,}000$