Interim Report

Interconnected E-Court System

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Declaration

Module: FC6P01   **Deadline: Tuesday 13ᵗʰ July 2021 at 23.58 pm**
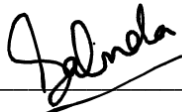
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Dedication

For my Parents…

Acknowledgements

This work would not have been possible without the support of all the lecturers and staff at E-Soft Metro Campus, Kandy. I am especially indebted to Mr. Dimuthu Thammitage, who has been supportive throughout the project. Most importantly, I wish to thank my parents and sibling for guidance and care. Last but not least, to my friends for unending inspiration.

Abstract

A civilized society encourages its citizens to solve any conflict arises among them through the court system. However, with the increase in the number of conflicts referred to courts to be solved through judicial adjudication. The time taken to reach an end gradually increased, to a point where citizens looked upon the judicial adjudicatory system as an archaic form of adjudication. So as the time -consuming process, the traditional court system consists of several defects that are inherent to it; including, but not limited to less opportunities for the marginalized groups to access, high costs, use of pressure; inducement, and threat in investigations by the law enforcement authorities. Though, methods of alternative disputes resolution were introduced to reduce the huge backlog of cases. Alternative dispute resolution methods are only an alternative, not a substitute for the traditional judiciary system. On the other hand, all other drawbacks except reducing delays, were unsolved by alternative resolution methods for decades. Due to the fact that alternative dispute resolution methods are not a substitute for the traditional method, the most favorable solutions for the mentioned issues lie with mechanisms that increase the efficiency of the judicial system.

The massive development in the information technology field paved the way for new innovative measures that all of the mentioned issues were capable of satisfactorily answered. Even though, the developed states were swift to adopt new technology to courts. The developing counties like Sri Lanka are far behind in introducing technology to the judiciary system. In Sri Lanka, the current backlog of cases is massive and the system is costly; due to those, access to justice has been limited. The author has elaborated in detail with substantial evidence the reasons for those issues in the report.

As a remedy for current issues prevailing in the court system; the author proposes an interconnected e-court system. The proposed system allows most of the government authorities involved from an institution of a case to the end; to deliver all its tasks through this system. As a result, time taken is reduced, costs are reduced, and as the speed of flow of information between authorities increases the possibility of government authorities acting in a manner that is detrimental to citizens is also eliminated.

This interim report contains all the diagrams and descriptions develop during the requirement gathering and the designing phrases. Based on the requirements gathered and the design, the Agile development scrum approach is followed to develop the system, and CSS, HTML, JAVA SCRIPT languages are used to develop the front end, while C# is used to develop the back end. The MVC architecture is the architecture of the proposed system. The final system is delivered within 154 days from the project start date of March 28th 2021. This interim report is presented in the course of the development to communicate the current details about the development of the system.

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Abbreviations

ADR	Alternative Dispute Resolution Methods
ATM	Asynchronous Transfer Mode
ATOMS	Automated Traffic Offence Management System
BENI	Broadband Enterprise Network Infrastructure
CEIS	Civil Electronic Information System
ICMS	Integrated Case Management System
IT	Information Technology
ICT	Information and communication technology
JUSTIN	Justice Information System
NJDG	National Judicial Data Grid
PKI	Public Key Infrastructure
WAN	Wide Area Network
WebCATS	Web- based Court of Appeal Tracking System

1. Introduction

Information Technology (hereinafter referred to as "IT") now plays a wider role than what it was initially expected to play in the society. The ability to use IT to make our day-to-day lives more comfortable and easy is evident to any human being. Though, the private sector and businesses are very sensitive to maximize its profits and enhance the ease of doing business, by utilizing technology. The state sector in any country is far behind satisfactorily utilizing technology; when compared with the private sector. The project proposed is directly connected with the e-governance initiatives and focus on enhancing the efficiency of the court system.

Through this report, details will be provided as to the work in progress regarding the E-Court system. To get a full idea regarding the project it would be prudent to read this Interim report with the project proposal submitted. The Chapter 02 furnishes details regarding the e-court systems that have been implemented in the world and its success or failures. Also, details pertaining to those systems will be compared with the functions of the proposed systems and a comparative analysis will be drawn. In other words a detail analysis will be conducted on the e-court systems of South Korean, India, Singapore and Canada. The prevailing e-filing system pertaining to filling fundamental petitions will also be discussed. There is rich legal literature shaped by E-justice scholars that focuses on the philosophical aspects of adapting technology to law. The author will extract and elaborate on it, where it is necessary to understand the functions of the proposed system. Further, this Interim project report is prepared to communicate up to date details-what has been achieved and what are the milestones couldn't achieve, with reasons, specifically in Chapters 03, 04 or 05. Any revisions regarding the project plan will be dealt in Chapter 05, and a detail analysis will be provided on the effect of such changes.

1.1 Aim and Objectives

As a means of increasing efficiency of the Sri Lankan court system an interconnected E-Court System was proposed by the author of this Interim report through the project proposal. The system that the writer wishes to develop can be viewed as a more simple and limited system that can be used to develop a more complex system. Due to the limitation of resources at the disposal of the author a complex system that can be immediately adapted in the real court system is not feasible.

The Proposed "E-Court system" will increase: the transparency; access to justice; efficiency; document security. And decrease the costs involved; eliminate discrimination, enhance equal protection of law etc.

The main aims of this Project can be listed as:

- A research will be conducted and the data collected from the research will be analyzed to identify the root causes of the delays and other problems that associated with the court system;

- Based on the findings of the above, critically evaluate how delays can be remedied. Rather than focusing on other procedural remedies priority will be given to reach a remedy that can be achieved through the use of Information Technology;
- Conduct a feasibility study pertaining to the proposed system;
- A requirement analysis will be conducted;
- The interconnected e-court system will be designed;
- Coding and Implementation of the court system;
- Testing the system;
- Evaluating the usability and success of the proposed system;
- Based on the above, changing the proposed system as required; and
- Preparing final documents analyzing every aspect of the problem domain and proposed solution.

1.2 Motivation

The issue selected to be inquired is, more sensitive and of paramount importance as not only a single person or entity will be benefitted through remedying this issue, but whole society will be immensely benefitted. The use of technology in Sri Lankan court system is inadequate, but the positive changes that can be achieved through adopting technology are immense.

As the writer elsewhere mentioned in this report, the access to justice is fundamental for every society. Any disputes arise in a civilized society is expected to be solved through judicial adjudication. With high number of disputes resorted for adjudication through judiciary. Delays in the court system exist as unprecedented. As solutions for delays - alternative dispute resolution methods (hereinafter referred to as "ADR") and digitalization of the court system are proposed and utilize in every country. Nonetheless, the uses of ADR methods are limited as it can only be used as a supplementary method, not as a substitute for judicial adjudication. On the other hand, almost in every country of the world access to justice is available as a right and ADR methods cannot be utilize in a manner that curtails, the right of access to justice. On such a backdrop the digitalization of the court system and its process is the more democratically favored solution to increase efficiency of the court system.

The digitalization of the court doesn't mean that whole process pertaining to litigation; from instituting a case to pronouncing a judgment will be conducted through a digital platform and it is against the essence of justice to implement such a system, because some steps pertaining to litigation such as leading evidence, cross examination shall only be done in an open court. Through, digitalization only few tasks like document filing, issuing court orders, and checking court journals will be implemented in a digital forum.

1.3 Problem

The problems to which the author of this report endeavors to find answers can be discussed under few sub-topics. While, there are innumerable problems associated with the main problem, the discussion will be only limited to discuss the most crucial ones.

Police Brutality (Torture in Custody)

Police torture is a common occurrence in Sri Lanka. Torture is used as the most common method of criminal investigation. Under the Convention Against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment Act No 22 of 1994. Torture is an offence that is punishable with imprisonment of either description for a term not less than seven years and not exceeding ten years. Be that as it may, following figure shows the complaints received by the Human Rights Commission to the Committee against Torture pertaining to the torture relation to the police custody.

Office	2010	2011	2012	2013	2014	2015	2016**
Head Office	369	358	389	380	329	315	160
Ampara	15	17	07	15	06	02	02
Anuradhapura	59	58	40	69	53	40	14
Badulla	04	12	01	19	11	-	01
Batticaloa	-	03	03	04	-	07	05
Kalmunai	02	04	07	07	09	03	03
Jaffna	02	03	04	-	02	-	02
Kandy	29	35	28	28	28	18	04
Matara	75	81	59	63	28	23	10
Trincomalee	05	07	02	10	02	02	03
Vavuniya	06	01	02	05	21	10	04
Total	**566**	**579**	**542**	**600**	**489**	**420**	**208**

**From 01.01.2016 to 31.08.2016

Diagram 01: Torture in Custody
(Report of the Human Rights Commission to the Committee against Torture, 2021)

However, above details is just a fraction of total number of torture incidents as most of the incidents are unreported. Not only torture is widely used, most police officers publically acknowledge and recognize torture as a method of police interrogation. The inability or the secretive environment the torture takes place is a factor that acts as a hindrance when exposing and remedying torture. The following figure is an excerpt from a research conducted in Sri Lanka that provides a complete picture of the incidents related to torture.
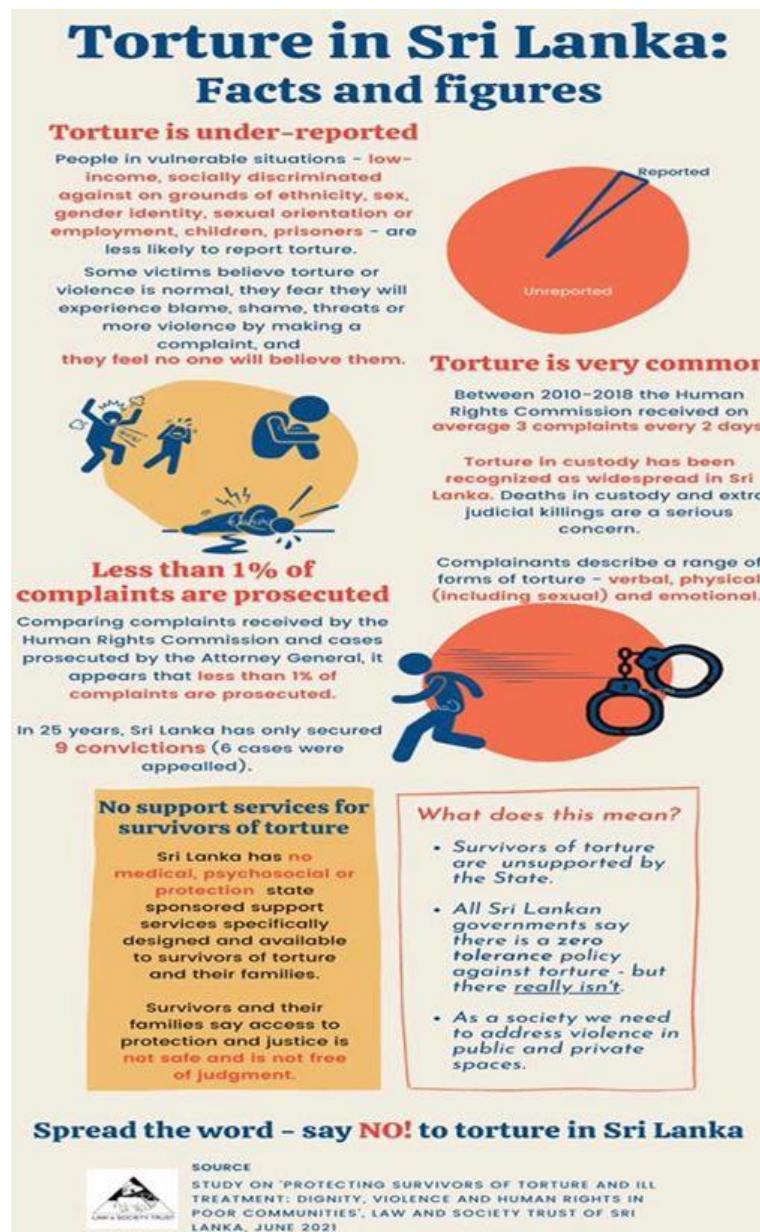
Diagram 02: Torture in Sri Lanka
(Protecting Survivors of Torture and ill treatment: dignity, violence and human rights in Poor communities, 2021)

The proposed E-Court system hopes to remedy torture by establishing a requirement of contacting a close relative, friend or a lawyer of the suspect at the time of arresting and making it mandatory to include data about the arrested person to the proposed system. Thereby, uncertainty remains from the time of arrest and producing before the magistrate is eliminated. Also, the right of a suspect to access to justice, which is already a right recognize under the law can be successfully implemented - the Inspector General of Police made rules under the Police Ordinance cited as Police (Appearances of Attorneys-at-Law at Police Stations) Rules 2012 recognizing the right of a lawyer to represent his/her client at a police station and requiring the officer in charge of the police station to facilitate such representation.

Access to Justice

Accessibility to justice covers a wide area from educating people on their rights to eliminating discrimination. Similarly, the access to justice not only covers the rights of suspects or victims, but also lawyers.

In Sri Lanka most of the harassments and minor offences are unreported and unheard. Due to people are unaware about their rights and inability to access information. A system that educates people at the correct instant will work proactively in remedying aforementioned defects.

Right to appear in court is a part and parcel of right to access justice. All parties involved must be fully aware about the date on which the case is called and the current status of the case. If the relevant parties are unaware about the date on which the case is heard and absent on a mandatory , then in a civil case the case might proceed only hearing one party as an ex-parte case.

High legal fees and costs involved negatively affect access to justice. If the involved costs are reduced that will also increase access to justice.

Also, the geographical barrier impacts negatively on access to justice. As an example: under the current system even to check the court journals lawyers should reach the court house and with the new corona pandemic as less people can be in a small room. It is required to get an appointment. A system that will allow lawyer to check the journals from their offices will positively impact.

As citizens get the opportunity to access some of the services provided by the courts 24/7, which are currently only accessible by reaching the court, more people will get the opportunity receive services provided by the courts.

Delays

The one main issue to which the writer of this report endeavors to find solution is the reduction of delays in the justice system, which is increasing day by day throughout the whole court system. From a philosophical point of view it is well acquainted fact that as stated in the famous Latin maxim (*Iustitia dilata est iustitia negate*) "justice delayed is justice denied."

In Sri Lanka currently there are 54 judicial districts, and more than 200 courts established. A complete system that interconnects all these courts with other law enforcement agencies, relevant government agencies will immensely reduce the time taken for communication between these agencies.

It was reported that there was a backlog of 750,000 pending cases (Thilakawardene, 2021) before the covid19 pandemic and it doesn't take a genius to understand the fact that post- pandemic backlog is much more worse. Further, the Sectoral Oversight committee on Legal Affairs

(anti-corruption) & Media, issuing recommendations pertaining to the Expeditious and Efficient Administration of Criminal Justice stated that the average length of time from the date of occurrence of commission of a serious criminal offence that should be prosecuted at the High Court, till the date of the conclusion of prosecution at the High Court is 10.2 years (Sectoral Oversight Committee on Legal Affairs (Anti-Corruption) and Media, 2017). However, the public perception and the experience of the writer of this proposal is that more complex court proceedings with appeals take up to 20+ years to fully reach the end.

An e-court system will increase the number of cases a judge can within a one day, which will directly increase the efficiency and productivity of judges, thereby reduce the backlog of cases.

Costs

Through digitalization the current paper based system will be turned to paperless system. The costs involved with storing large storage areas to keep files and then maintaining staff to guard those files in every court house throughout the country can be reduced. The number of staff members involved can be drastically reduced.

The number of cases a judge can take up per day will be increase as information is accessible through an online system. Also, the productivity of the other judicial staff members will be increased. The increased productivity and efficiency at the end of the day will result in more work is done by a reduced staff.

The prison department transports hundreds of prisoners from prisons to the respective courts where cases are being heard and this process wastes millions of tax payers' money. An interconnected system that allows prison officers to present prisoners electronically will save the transport costs.

As a result not only the time taken, but also associated costs government spends on the justice system will be drastically reduced.

Transparency and Accountability

Right to information is enshrined as a fundamental right in Article 14A of the Constitution. The general public has the right to know information hold by public authorities. Through the proposed system, public will be able to access some of the court journals which will result in implementing the right to information. Also, 24/7 access to the proposed system will implement equal protection of the law which is guaranteed under Article 12. (1) of the Constitution. Also, a transparent court process clearly in line with the dictum "Justice must not only be done, but must also be seen to be done".

As the public participation in the court process increases and process become more open through the proposed online system, that will eliminate the countless forms of corruption and malpractices, which will result in judicial officers becoming more accountable and transparent. On the other hand, a streamlined, cost effective and transparent process will increase public trust in the judicial adjudication process and enhance direct involvement of the general public in the court process.

02. Background

02.01 Literature Survey

In this part of the report the author will discuss the academic work available that deals with the same question author intends to answer. Although, the research conducted by other scholars cannot be directly adapted to Sri Lankan context or to this project, there is no doubt that when implementing and designing the project any such knowledge will be invaluable. Hereafter, author will discuss scholarly articles on, the reasons for the digitalization, its impact on the traditional methods of justice and facts that must be considered to get the maximum benefits from digitalization.

What is digitalization?
The word **"digitalization"** is vague, and takes the meaning depending on the context which it has been used. In simple terms, in the context of the judiciary digitalization mean the transfer of information or processes to digital form (Bradautanu et al., 2020a).

Why digitalize the justice system?
Professor Richard Susskind, IT adviser to the UK lord chief justice, provides four reasons why judiciary should be digitalize, "The system is costly for users; it's usually too time consuming; it's largely unintelligible; and it also seems out of step in the internet society" (Online justice: why courts should explore emerging digital possibilities, 2021a). Most of the literature available reaches the same points stated by Professor Richard Susskind, as reasons for the judicial digitalization. The main objective of digitalization is enhancing the access to justice. While speeding up proceedings and reducing reliance on paper-based cases are other desirable outcomes, the establishment of online courts or systems should not be viewed as a means of prioritizing efficiency over justice (Bradautanu et al., 2020b). As the author mentioned number of instances throughout this report, the dominant reason for digitalization of court processors is the backlog of cases. However, apart from that common reason there are other reasons that can be highlighted. As an international conventional obligation, including Sri Lanka, 193 countries of the world are duty bound to realize Sustainable Development goals (United Nations, n.d.). From the seventeen sustainable goals, 16th goal is to promote just, peaceful and inclusive societies. In order to achieve this goal rule of law must be enforced. To enforce the rule of law access to justice is a necessity. In order to ease the access to justice- as mentioned in this report digitalization of justice system is a well-reputed solution.

Philosophical Background
The most crucial fact that has been dealt by most of the legal literature is the relationship between law and technology. Some of the institutions that the author proposed to digitalize are the oldest institution of human history. Any changes introduced must be preserved the respect and

importance of its historic values. Law, as a subject entangled with traditions and formalities inclines to be a subject that not entirely in line with the ends technology pursue to achieve. While law's main objective is the legitimacy of actions (legal/illegal), technology's logic is based on functioning (works/does not work). As a result, an e-justice service may be functional and efficient from a technological point of view, but not legally valid (Lupo and Bailey, 2014a). The author will not delved into philosophical conflict between digitalizing courts of law, as the proposed solutions will not proposed any Artificial Intelligent agents to the present court process, and any technology that try to substitute human touch needs to be thoroughly debated before implementing.

Desirable Features of an E-Justice System

In the article Designing and Implementing e-Justice Systems: Some Lessons Learned from EU and Canadian Examples. The authors have stated that when developing a system the prime focus should be on accessibility and simplicity, adaptability and modularization. As simple system will attract people, it is necessary any system to be simplistic. However, a system must not be over simplistic. Right balance between a system's maximum level of feasible simplicity and its maximum level of manageable complexity must be achieved. As systems that are simplified to a point that undermines the functionalities, value, usefulness, and legal validity of a procedure are highly unlikely to attract users (Lupo and Bailey, 2014b). The new system must be able to adapt to changing user requirements, unless the system is adaptable the system will not be able to establish as a trustworthy system in the long run. Modularization will reduce inter dependencies and costs involved in system maintenance.

Technology and Marginal Communities

It must also be noted that using technology to enhance access to justice might be futile or further distance people from the justice system. As per the data available on the World Bank website in Sri Lanka, as a percentage of the population, only 34.11% (2017), (data.worldbank.org, n.d.) had access to Internet. Fully digitalizing and offering services in digital mediums will further distance the marginal groups of the society. Disadvantaged or marginalized groups based on factors such as ethnicity, and accessibility challenges faced by persons with disabilities must be taken in to consideration and shall not be left out when designing and implementing e-justice systems. Therefore, it is prudent only to introduce the new system to coexist with the traditional system.

Things to Consider When Implementing the System

Thomson Reuters' in its research paper published on the topic; lessons learned in courts digitization, provides that their experience demonstrates the significant value of standardizing processes before implementing digitization, particularly when moving from a paper-based system to online system (Reuters, 2015a). Justifying its findings, the research paper presents abandonment of State of California state-wide case management system after having incurred over $300m, and delays in the State of Victoria's state-wide Integrated

Courts Management System as the effects of non-standardization. Further, following factors are recognized as lessons learned; spreading key deliverables out over a phased implementation schedule reduces the risk associated with a 'big bang' roll-out: Change management and product development need to happen in tandem, based on a prioritized road map that delivers the largest efficiencies soonest: detailed internal planning of all relevant levels: practice proper cost control: involving with the chosen vendor in identifying system requirements, rather than relying solely on external management consultancy(Reuters, 2015b).

Merely, implementing new systems will not achieve the desired results. More time must be devoted to cultural and organization readiness (gov.bc.ca, 2019). All legislative changes required must be passed in the parliament and enacted as a law before the implementing the system. Assured budgets for the court digital transformation strategy are needed.

Judicial Digitalization in Other Countries

The legal systems of countries are heterogeneous, and digitalization is being done differently. Australian federal court was the first to introduced electronic court files and now steps are being taken to embed electronic files in other courts. In Netherlands, an automated system has been introduced to provide legal guidance for matrimonial disputes and matters of custody and maintenance. (Online justice: why courts should explore emerging digital possibilities, 2021). Likewise, countries have started the digitalization process from different points, based on the suitability to ground realities. Furthermore, in most countries different systems have been implemented to manage different areas of the judicial process. As an example: South Korean system comprised of Electronic Case Filling system, Judge Support system and Case management system. Therefore, rather than a single system there is a cluster of systems that work together.

Singapore

In general, Singapore is considered as the first country to design and implement an information system for the justice system (Rosa, Teixeira and Sousa Pinto, 2021a). Singapore's digitalization was systematic and initially only certain services related to traffic offences were done on a digital forum. With time more technology was introduced.

In 1991, Singapore's justice system faced the backlog of cases and as a solution digitalization was started. Initially, some of the services were digitally restructured by implementing a new information system. The centralized system, where all multimedia kiosks are linked to ATOMS (Automated Traffic Offence Management System) database, which manages the offender's information enabled citizens to pay their fines, or consulting cases in other locations, without addressing to the court (Rosa, Teixeira and Sousa Pinto, 2013b).
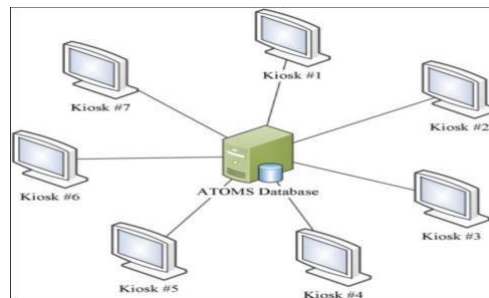
ATOMS architecture
Diagram 3: (Rosa, Teixeira and Sousa Pinto, 2021c)

In 1999 web-based applications were replaced by desktop applications. This second generation of information systems uses a typical 3-tier layer using Oracle databases, FileNet workflow systems and Powerbuilder or Oracle client software (Rosa, Teixeira and Sousa Pinto, 2013d).
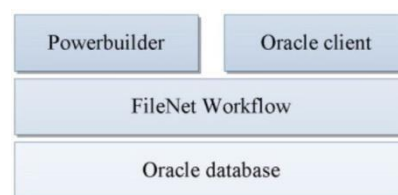
Three Tier Architecture
Diagram 4: (Rosa, Teixeira and Sousa Pinto, 2021e)

In the latter part of 1999, EFS (Electronic Filing System) was developed. This information system was developed for civil matters, allowing lawyers to file electronic documents and providing real-time information to all involved entities. In 2002 ICJS (Integrated Criminal Justice System) was launched. Also, network infrastructure, creating the BENI (Broadband Enterprise Network Infrastructure) based on ATM (Asynchronous Transfer Mode) technology was developed, which supported data transfer speed of 622 Mbps, scalable up to 2.1 Gbps, supported by WAN (Wide Area Network) segments of 45 Mbps each, connecting the different locations where justice entities operated. To improve the security in these information systems, authorities implemented a PKI (Public Key Infrastructure). As a result now signed court documents can be issued electronically
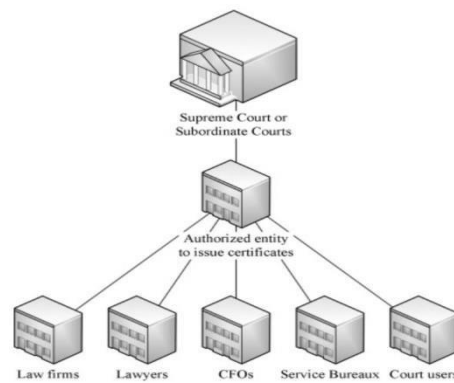
Diagram 5: PKI Infrastructure
(Rosa, Teixeira and Sousa Pinto, 2021f)

The Singapore digitalization project spans well-over 2 decades and still there are proposals for further development. This manifests that digitalization is a process, not an end.

E-court system of Republic of Korean

The Republic of Korea started digitalization in 1980's and continued to develop its systems ever since. The support of the central government is immense, for example in 2012, of the $1.8 billion budget for the Korean judiciary; $180 million went to information and communication technology development pertaining to the e-court system. Korean e-court system encompasses features dedicated to help judges (case management system and judge support system), facilitate the filing of cases for litigants (e-filing) and inform the public (publication of cases), (World Bank, n.d.).

Diagram 6: Features of South Korea
(World Bank, n.d.a)

Experiences with e-courts in Korea show that: (a). the system must be user friendly and adapt in response to comments from users; a thorough needs analysis is required. (b). the information technology budget should take into account costs of data preservation and system maintenance. (c).Users should receive adequate training. (d).Cases covering various subject matters should be integrated. (e). Systems in other economies can offer useful guidance (World Bank, n.d.b).

Canadian (British Columbia) e-court system

British Columbian authorities started computerizing court systems in 2001, with the (Minister of Justice and Attorney General, 2012) Justice Information System (JUSTIN). JUSTIN is an integrated criminal case management system used in BC's provincial and superior courts.

The Civil Electronic Information System (CEIS) was introduced in 2003, and in 2004 Web-based Court of Appeal Tracking System (WebCATS) was implemented. CEIS is a customized case management system facilitating information management for civil, family, and estates cases in the superior and provincial courts of BC. The Web-based Court of Appeal Tracking System (WebCATS) allows for tracking and management of cases in the BC Court of Appeal.

The British Columbia courts now capable of hearing fully online cases. The BC Supreme Court held its first fully electronic proceeding in 2011, while the BC Court of Appeal conducted its first entirely electronic appeal in 2012.

Indian e-court system

In 2005, National Policy and Action Plan for Implementation of information and communication technology (ICT) presented its standing on the e-court project. The main objective of the e-Courts project was to bring more transparency in judicial matters and to bring the judiciary closer to the common litigant of India, (Verma, 2018). Rather than implementing comprehensive information systems or databases like in other countries the main focus of attention has been establishing technical infrastructure.

Many new features were introduced for the existing system. The court houses have been upgraded with LCD screens and multimedia projectors that allow Lawyers to conduct cases online. Among other innovative measure most laudable feature is the ability to serve summons through SMS. This clearly eliminates the delays delivering summons in traditional method. The National Judicial Data Grid (NJDG) came into existence in November, 2015. This grid provides real-time information to around 25 million Indian courts on various levels. The NJDG program holds details on pending proceedings, discarded proceedings and complete cases under various headings (Sehgal, 2020). The Judgment Information System, provide all the judgments that have been delivered by the Supreme Court and various High Courts.

Sri Lankan e-filing system

The existing efiling system which can be accessed through: http://efiling.supremecourt.lk/, only allows filing fundamental rights cases, and check the status of pending Fundamental rights cases. To use the site an attorney or law firm can create an account. The User interfaces are very basic. The grave concern of the writer about this site is that the connection to the site is not secured. Any sensitive information transacted through this site is at the risk. When compared with e-court systems of other countries the existing filing system is far behind in every aspect.
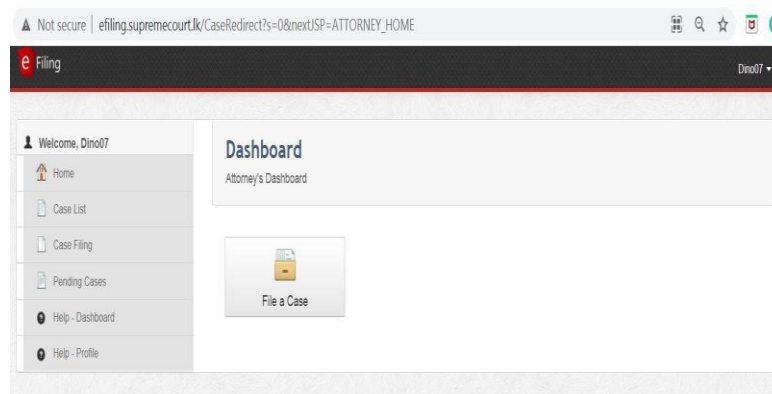
Diagram 07: Home Screen of the e-filing system

02.02 Similar System

In the first few following paragraphs the writer will endeavor to ascertain the details pertaining to Integrated Case Management System (ICMS) of Singapore and South Korea.

ICMS of Singapore

This system can be accessed via the URL: https://www.statecourts.gov.sg/cws/CriminalCase/Pages/The-ICMS-portal.aspx. This internet-based system came into existence only in 2013. This system links different agencies related to the administration of criminal cases, and is being used from the start of prosecution process to the issuance of verdict.

There are three types of users to this system: Law Firm User: Accused person and other authorized users.

ICMS is mainly used for three purposes. They are Case Filling Management, Case Management and Document Management.

Case Filing Management

- File case and court documents electronically.
- Users can request and extract records electronically.

Case Management

- Governs all the activities pertaining to a case. From case institution to tracking to post-judgment activities.
- Workflows are defined and the case is automatically routed to the respective court.

Document Management

- Electronic Service of Documents and share documents to other agencies / lawyers.

ECFS of South Korea

Electronic Case Filing System (ECFS) is accessible through the URL: https://ecfs.scourt.go.kr/ecf/ecf800/ECF830.jsp?&url=https%3A%2F%2Fecfs.scourt.go.kr%2Fecf%2Findex.jsp . Through this system lawyers can file cases and relevant documents. All case management is done electronically. This new system converted the already existing paper based system to a paperless system.

Currently, only litigants or their attorneys can access this system.
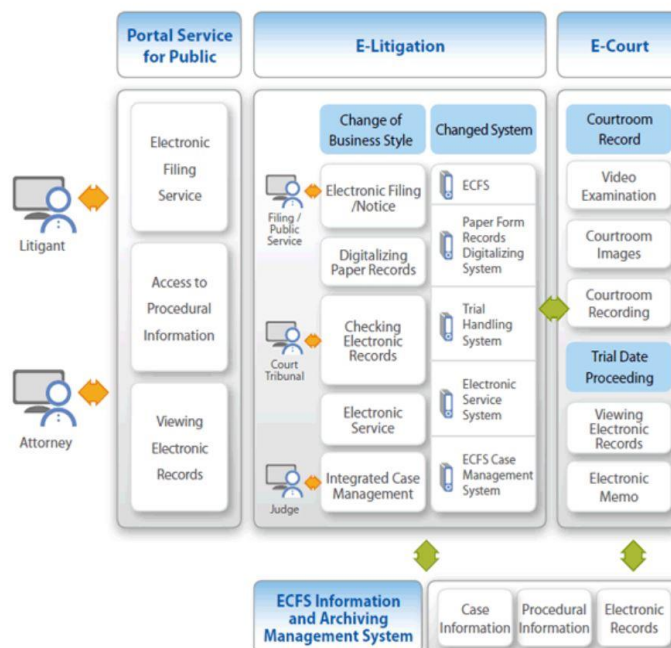
Diagram 08: ECFS of South Korea
(World Bank, n.d.)

02.03 Proposed System

Mainly, there will be 6 actors that can use this web application. Namely, Police; Accused Person; Attorney-at-law; Administrator; Judicial Officer and General Public.

The Actors will be able to perform the following functions through the system. Except for downloading judgments it will be required to login to the system to perform the following functions:

a). Police
- Officers shall be able to add details about the persons arrested and based on the offence committed application will request further information. Set of predetermined information will be shared with relevant magistrate court. Automatically, a number for the arrest will be generated. Depending on the offence alleged to be committed – an automated message will be sent to a relative/friend/attorney-at-law that contains the relevant court to which the suspect will be produced and the further steps that they can take.
- Police shall be able to file cases. At the time of filing the case an automatic number is generated by the system.
- Police shall be able file documents through this system.
- Police shall be able view arrest details and case details.

b). Attorney-at-law
- Attorneys shall be able view arrest details and case details, upon furnishing relevant numbers.
- Request documents through the judicial officers.

c). Accused Person
- Accused Person will be able view arrest details and case details, registered under his NIC number.
- Request documents through the judicial officers on cases under his NIC number.

d). Judicial Officers
- Judicial Officers shall be able to add the current status of the pending cases, arrest details.
- Check arrest and Case details.
- Upload documents requested by the system.
- Upload judgments to the system.

e). General public
- General public will be able to download the judgments without login to the system the system.

f). Administrator
- All system maintenance.

All these parties will use the application using a Graphical User Interface. And the details entered will be stored in the database. There will be an intermediate layer which handles requests from users, processes the entered data, and renders a response back to the users. This system will be

designed as a web-based application that can be accessed using normal browsers. Also, when implementing the process maximum security will be taken in to consideration.

Use Case Diagram
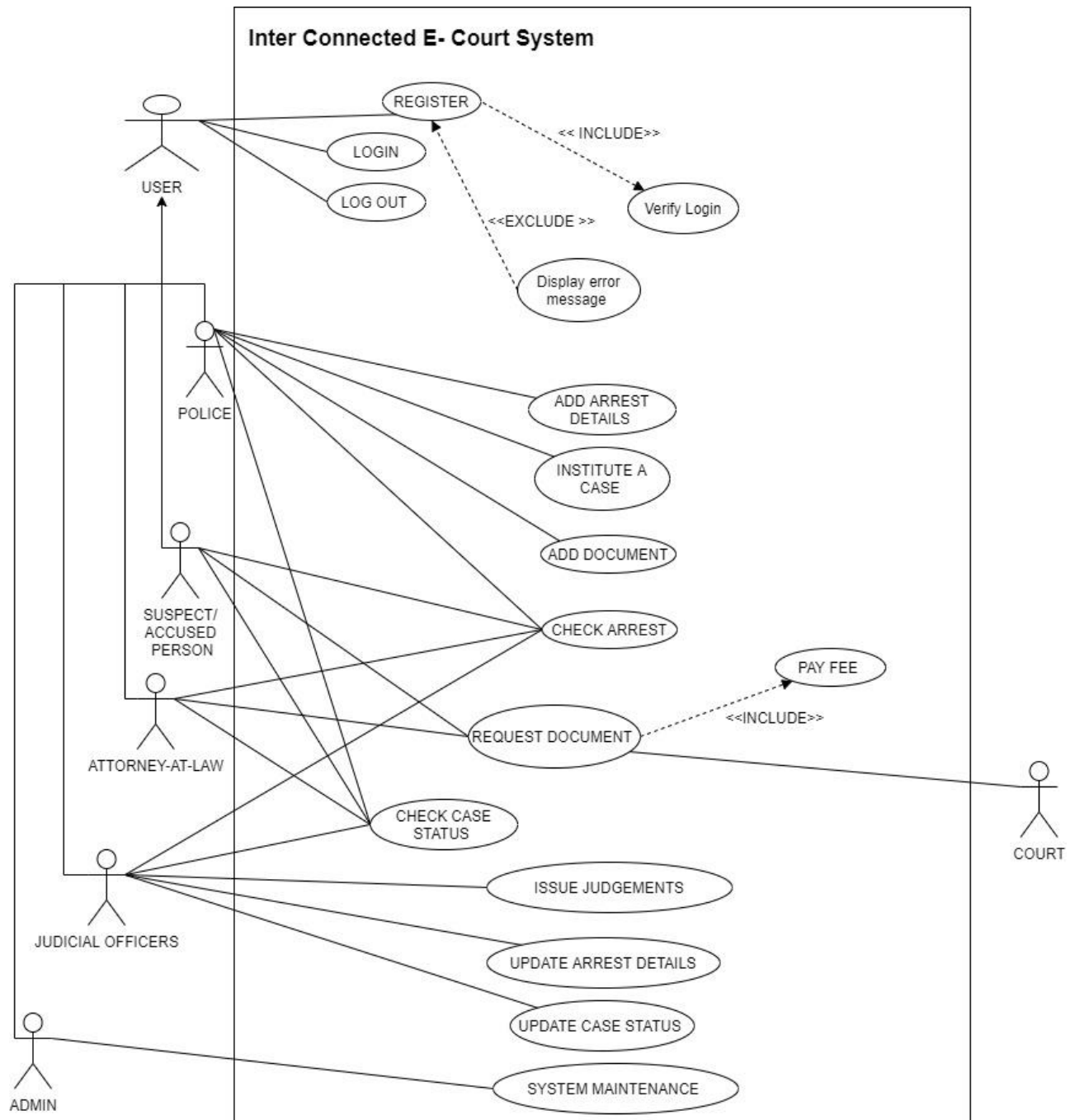
Diagram 09: User Case Diagram

Actor: Police Officer

01. As a first time user I want to download the app from the app store/ apple store and register in the application.
02. As a first time user I need to create a profile.
03. As a user I need to login to the application and use the services provided.
04. As a user I need to add details pertaining to arrests, so that magistrate receives details.
05. As a user I need to file new cases, so that magistrate receives them.
06. As a user I need to check arrest details, so I can become aware of the status of an arrest.
07. As a user I need to check case details, so I can become aware of the status of a case.
08. As a user I want to add documents requested by the court.

Actor: Suspect/Accused Person

01. As a first time user I want to download the app from the app store/ apple store and register in the application.
02. As a first time user I need to create a profile.
03. As a user I need to login to the application and use the services provided.
04. As a user I need to check arrest details, so I can become aware of the status of an arrest pertaining to me.
05. As a user I need to check request document rom the court in a case pertaining to me, so that I can receive soft or hard copies.
06. As a user I need to check case details, so I can become aware of the status of a case pertaining to me.

Actor: Attorney-at-Law

01. As a first time user I want to download the app from the app store/ apple store and register in the application.
02. As a first time user I need to create a profile.
03. As a user I need to login to the application and use the services provided.
04. As a user I need to check arrest details, so I can become aware of the status of an arrest.
05. As a user I need to check request document from the court, so that I can receive soft or hard copies.
06. As a user I need to check case details, so I can become aware of the status of a case.

Actor: Judicial Officer

01. As a first time user I want to download the app from the app store/ apple store and register in the application.
02. As a first time user I need to create a profile.
03. As a user I need to login to the application and use the services provided.
04. As a user I need to check arrest details, so I can become aware of the status of an arrest.
05. As a user I need to issue judgments, so that other users can download.
06. As a user I need to check case details, so I can become aware of the status of a case.
07. As a user I need to edit arrest details, so I can update b the status of an arrest.
08. As a user I need to edit case details, so I can update the status of a case.

Actor: Admin

01. As a user I need to do basic system maintenance, so I can maintain the system.

Use Case Description

Use case: Register

Description	The relevant actors must register to access the system.
Actors	Police, Accused Person, Judicial Officers (Admin) and Attorney-at-law
Pre-Condition	Accused person must have a charge sheet filed relevant to a crime. Attorney-at-Law must be a registered as an attorney.
Post-Condition	A username and a password are Generated.

Main Success Path	The Actor upon filling relevant details a username and the password are generated.

Actor Actions	System Responses
1. Add NIC number and Phone Number (Accused Person). Add Attorney Number and Phone Number (Attorney at law). Add police person number, and Phone Number (Police Officer). Add number issued by Judiciary and Phone Number (Judicial Officers).	1.1 System verifies NIC number and Attorney Number. 1.2 Sends an OTP to the phone number.
2. Enter the OTP and Create an Account Button.	2.1 System Verifies the OTP. 2.2 Generate a new username and Password. 2.3 Send details (username and password) to the phone number. 2.4 Display the please login to continue message.

Exception Path 01   The Actor upon filling relevant details if any of the provided details are incorrect.

Actor Actions	System Responses
1. Add NIC number and Phone Number (Accused Person). Add Attorney Number and Phone Number (Attorney at law). Add police person number, and Phone Number (Police Officer). Add number issued by Judiciary and Phone Number.	1.1 System verifies details. 1.2 Display the error message.

Exception Path 02   The Actor upon filling wrong OTP code.

Actor Actions	System Responses
1. Add NIC number and Phone Number (Accused Person). Add Attorney Number and Phone Number (Attorney at law). Add police person number, and Phone Number (Police Officer). Add number issued by Judiciary and Phone Number.	1.1 System verifies NIC/Attorney number/police person number and Judicial officers' number. 1.2 Sends an OTP to the phone number.
2. Enter the OTP.	2.1 System Verifies the OTP. 2.2 Display an error message with Resend code button.

Use case: Login

Description	The relevant actors must login to the system by proving the given Username and the Password.
Actors	Police, Accused Person, Judicial Officers, Admin and Attorney-at-law
Pre-Condition	The Actor is already registered as a user
Post-Condition	The Actor directs to the Dashboard

Main Success Path   The Actor upon filling username and the password directs to the main Dashboard

Actor Actions	System Responses
1. Add Username and Password	1.1 System verifies details 1.2 Directs to the Main Dashboard

Exception Path   The Actor upon filling wrong username and/or the password. Access to the system is denied

Actor Actions	System Responses
1. Add Username and Password	1.1 System verifies details 1.2 Display the error message

Use case: Log Out

Description	The registered users shall log-out from the system
Actors	Police, Accused Person, Judicial Officers, Admin and Attorney-at-law
Pre-Condition	The Actor is login to the system.
Post-Condition	The Actor directs to the login screen

Main Success Path   Press the log-out button

Actor Actions	System Responses
1. Press the log out button	1.1 Directs to the Login Screen

Use case: Add Arrest Details

Description	The Police can add details pertaining to an arrest.
Actors	Police.
Pre-Condition	The Actor must be registered with the system.
Post-Condition	New arrest details file is created.

Main Success Path   The Actor adds all relevant details.

Actor Actions	System Responses
1. Add **all required details** of the arrest of the person arrested and the details of the officers involved.	1.1 System saves details to the database. 1.2 A number is generated. 1.3 Display successful message with the number.

Exception Path   The Actor **doesn't** add all relevant details.

Actor Actions	System Responses
1. Add **only some details** of the arrest of the person arrested and the details of the officers involved.	1.1 Display the error message.

Use case: Institute a Case

Description	The Police can file a case.
Actors	Police
Pre-Condition	The Actor must be registered with the system.
Post-Condition	New case file is created.

Main Success Path   The Actor adds all relevant details. Once added the system will share the added details with a judicial officer. Once the judicial officer accepts the case. A message will be sent to the inbox of the police inbox and registered users will be able to see the progress under the check case details tab.

Actor Actions	System Responses
1. Add **all required details** of the case.	1.1 System saves details to the database.

1.2 A number is generated.

1.3 Display successful message with the number.

Exception Path	The Actor **doesn't** add all relevant details. The system will display a message stating relevant information to be added. Also, if a judicial offer rejects the case based on a reason that reason with details will be sent to the police inbox and request to re-file.

Actor Actions	System Responses
1. Add **only some details** of the case.	1.1 Display the error message.

Use case: Add Document

Description	The relevant actors can use this feature file any additional documents as requested by the court.
Actors	Police.
Pre-Condition	The Actor must be registered with the system.
Post-Condition	New Document uploaded.

Main Success Path	The Actor adds documents.

Actor Actions	System Responses
1. Upload document.	1.1 System saves details to the database.
	1.2 Display successful message with a number.

Use case: Check Case status

Description	The relevant actors can use this feature check the status of an ongoing case.
Actors	Police, Accused Person and Attorney-at-Law.
Pre-Condition	The Actor must be registered with the system.
Post-Condition	Case status is shown.

Main Success Path	The Actor can check the status of an ongoing case. The Actor must be registered to check the status.

Actor Actions	System Responses
1. Enter the case number.	1.1 System retrieves data from the database.
	1.2 Display the relevant file.

Use case: Request Document

Description	The relevant actors can use this feature to request documents, upon paying relevant fees. The court will then check the possibility of issuing document and may issue the document.
Actors	Accused Person and Attorney-at-Law.
Pre-Condition	The Actor must be registered with the system.

| **Post-Condition** | Request will be sent to the Judicial officers. |

Main Success Path   The Actor request documents, upon paying relevant fees.

Actor Actions	System Responses
1. Actor requests Documents of a particular case.	1.1 System sends the details to the judicial officers.
	1.2 Navigate to the payment portal.
2. Enter payment details	2.1 Complete the transaction.
	2.2 Return to the dash board.

Use case: Check Arrest

Description	The relevant actors can use this feature check the status of an arrest.
Actors	Police, Accused Person and Attorney-at-Law.
Pre-Condition	The Actor must be registered with the system.
Post-Condition	Arrest status is shown.

Main Success Path   The relevant actors can use this feature check the status of an arrest.

Actor Actions	System Responses
1. Enter the Accused NIC number.	1.1 System retrieves data from the database.
	1.2 Display the relevant file.

Use case: Update Case Status

Description	The relevant actors can use this feature to update the progress of a case.
Actors	Judicial Officers
Pre-Condition	Must login.
Post-Condition	Case status is updated.

Main Success Path   The relevant actors can use this feature to update the progress of a case.

Actor Actions	System Responses
1. Enter the case number.	1.1 System retrieves data from the database.
	1.2 Display the relevant file.
2. Click on add tab to update the details and save.	2.1 Updated information saved to the database.

Use case: Issue Judgment

Description	The relevant actors can use this feature to issue judgments.
Actors	Judicial officer

| | Pre-Condition | Logged in to the system |
| Post-Condition | Judgment will appear on the judgment list |

Main Success Path   The Actor request documents, upon paying relevant fees.

Actor Actions	System Responses
1. Submit the relevant judgment.	1.1 System saves the file.
	1.2 Successful message appear.

Use case: System Maintenance

Description	The relevant actors can use this feature to add, delete or edit any information, file or any other thing in the system.
Actors	Administrator.
Pre-Condition	Logged in to the system.
Post-Condition	Intended changes will take place.

Main Success Path   System admin can use this feature to make changes in the system.

Actor Actions	System Responses
1. Do changes.	1.1 System saves the file/information.
	1.2 Successful message appears.

Use case: Update Arrest Status

Description	The relevant actors can use this feature to update the progress after Arresting a person.
Actors	Judicial Officer.
Pre-Condition	Must login.
Post-Condition	Arrest status is updated.

Main Success Path   The relevant actors can use this feature to update the progress after Arresting a person.

Actor Actions	System Responses
3. Enter the Arrest number.	1.1 System retrieves data from the database.
	1.2 Display the relevant file.
4. Click on add tab to update the details and save.	2.1 Updated information saved to the database.

03. Work Completed

03.01 Project Management

Managing an IT project involves managing nine knowledge areas of project management. Under this part in detail discussion will be provided on the core knowledge areas of project management. Namely: scope management, time management, cost management and quality management. Though, project integration management and other facilitating knowledge areas of project are also relevant, due to the fact that this project is being done as an individual project not much attention is given.

Scope Management

Scope management involves initiation, scope planning, scope definition, scope verification and scope change control.
The final objective of this project is to build an interconnected E-Court System. An E-Court system that interconnects most of the actors of a court system will increase the ease of access and reduce the time taken pertaining to judicial activities. However, the prominence will be given to delivering justice and project will not include anything that will hinder the delivery of justice.

There shall be four main parties that will be able to access the proposed system: **(a).** Law enforcement officers will be able to add details about the persons arrested and based on the offence committed application will request further information. Set of predetermined information will be shared with relevant magistrate court. **(b)**. Attorneys will be able to file litigations and pay stamp fee. **(c).**Judicial Officers will be able to add the current status of the pending cases. **(d).** Members of the general public, who is a plaintiff, accused, suspect or defendant will be able to check the status of the relevant cases and download the judgment.

The main aims of this Project can be listed as:
a. A research will be conducted and the data collected from the research will be analyzed to identify the root causes of the delays in the court system;
b. Based on the findings of (a) above, critically evaluate how delays can be remedied. Rather than focusing on other procedural remedies priority will be given to reach a remedy that can be achieved through the use of Information Technology;
c. Developing an interconnected system that will reduce delays and increase ease of access to justice;
d. Evaluating the usability and success of the proposed system;
e. Based on the (d) above, changing the proposed system as required; and
f. Preparing final documents analyzing every aspect of the problem domain and proposed solution.

The Final system is achieved through the following the below work breakdown structure.

Diagram 10

E-COURT SYSTEM

1.1 Project management

- 1.1.1 Scope
- 1.1.2 Cost
- 1.1.3 Time
- 1.1.4 Quality

1.2 Requirement Analysis

- 1.2.1 Req. Gathering
- 1.2.2. Req. Analysis
- 1.2.3. Documenting req.

1.3 Design

- 1.3.1 High-level diagram
- 1.3.2 Design check-in
- 1.3.3 Designing
- 1.3.4 Final Design

1.4 Implementation

- 1.4.1 Sprint 01
  - 1.4.1.1 Planning
  - 1.4.1.2 Sprint Period
  - 1.4.1.3 Testing
- 1.4.2 Sprint 02
  - 1.4.2.1 Planning
  - 1.4.2.2 Sprint Period
  - 1.4.2.3 Testing
- 1.4.3 Sprint 03
  - 1.4.3.1 Planning
  - 1.4.3.2 Sprint Period
  - 1.4.3.3 Testing
- 1.4.4 Sprint 04
  - 1.4.4.1 Planning
  - 1.4.4.2 Sprint Period
  - 1.4.4.3 Planning

1.5 Deployment

- 1.5 Deployment

03.02 Time Management

Gantt chart
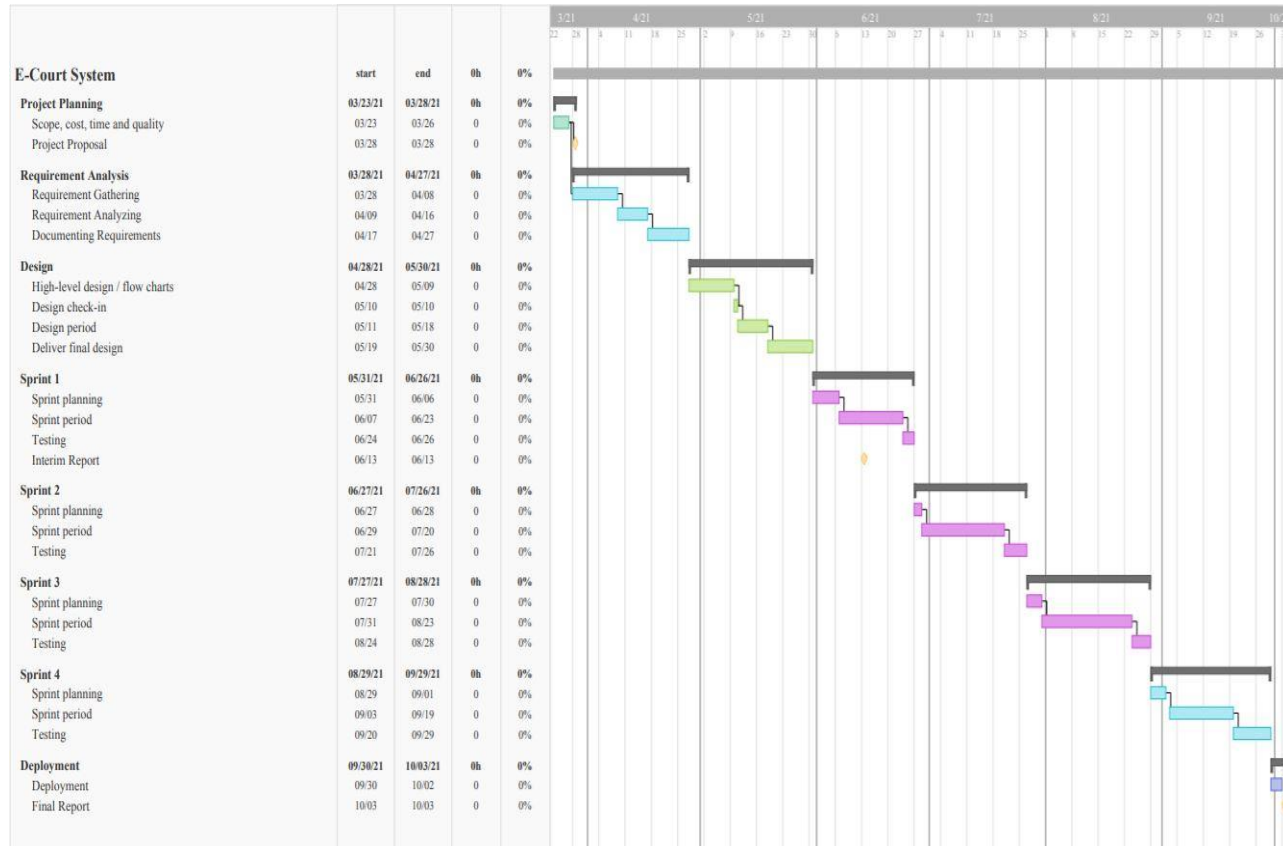
Diagram 11: Project Gantt chart

The Gantt chart above provides the steps that will be undertaken to deliver the project and how the **time management** is done. The project planning was initiated with the announcement of the project details and the initial project planning is expected to be completed within 15 days. From the Initial project proposal submission date of 28/03/2021, the final project deliverables will be delivered within 154 days as shown in the Gantt chart. The implementation is divided into 4 sprints. As shown, the majority of the project time period will be sacrificed for implementation (Four sprints). Requirement Analysis and design procedure have been allocated with consecutively 30 days and 33 days.

Please note that these time periods and dates may be subjected to changes due to unavoidable reasons and if required, the changed Gantt chart will be provided in the Final Project Report.

Cost Management

Work Brake Down Structure

WBS	DURATION	BUDGET
Project Planning	**4 day**	**Rs. 10,000**
- Scope	1 day	Rs. 2500
- Time	1 day	Rs.2500
- Cost	1 day	Rs.2500
- Quality	1 day	Rs.2500
	30 days	
Requirement Analysis	11 days	**Rs. 30,000**
- Requirement Gathering	8 days	Rs. 11,000
- Requirement Analysing	11 days	Rs. 8,000
- Documenting Requirements		Rs. 11,000
Design	**33 days**	**Rs. 33,000**
- High level design	12 days	Rs. 12,000
- Design check-in	1 days	Rs. 1000
- Design Period	8 days	Rs. 8000
- Deliver Final Design	12 days	Rs. 12,000
Implementation	**89 days**	**Rs. 89,000**
- Sprint 01	20 days	Rs. 20,000
- Sprint 02	21 days	Rs. 21,000
- Sprint 03	25 days	Rs. 25,000
- Sprint 04	23 days	Rs. 23,000
Deployment	**2 days**	**Rs. 2,000**
- Deployment		
		Total : Rs. 164,000

Costs are estimated based on the work brake down structure, using the bottom-up technique. This technique involves estimating the cost of individual activity and then adding the individual techniques to get a project total. This technique is selected because the project of this nature in the Sri Lankan context is completely novel and no historical data is available.

Quality Management

Software quality management involves three components: quality planning, quality assurance and quality control. A test plan is developed that focuses on all the functional and non-functional areas of the system to make sure the final product clearly in line with the objectives of the project.

Quality Plan

Throughout, the implementation procedure an eye is kept open for quality. The ISO/IEC 15504 (SPICE) standard is followed regarding the software process to make sure an effective software process is followed.

The software quality components (Operation quality, revision quality and transition quality) developed by James A. McCall are followed regarding the specific product qualities.

Operation Quality

FACTORS	COMMENT
Correctness	White box testing and black box testing will be used to test the correctness.
Reliability	Feature testing, regression testing and load testing will be done to check the system and system runs within a minimum down time.
Efficiency	The system is implemented using the most technological advanced and reputed hardware.
Integrity	The website will be hosted through https: Relevant ISO standards will be followed. This factor deals with security. Different users will only be able to access different level of information. As an example: general public will be only given the read permit not the write permit. But, court staff will be provided with the opportunity to both read and write.
Usability	A user manual will be provided. Staff will be trained and for system maintenance (if necessary) a training program will be conducted.

Revision Quality

FACTORS	COMMENT
Maintainability	Through iterative development and regular review maintainability will be ensured. The coding will be done in a maintainability oriented manner.
Flexibility	Due to the practices like encapsulation and de-composition the program will be flexible.
Testability	As the agile scrum method is followed to development at the end of the every sprint a testing will be done. Also, a live test will be done at the end.

Transition Quality

FACTORS	COMMENT
Portability	As the system is developed to run on a web browser, the capable of running in any operating system.
Reusability	Codes will be developed based on modularity, high-cohesion, loose- coupling and test class.
Interoperability	System will be developed using the same language or common standards. And compatibility tests will be conducted to make sure the interoperability.

Quality Control

The software process will be checked against the ISO/IEC 15504 (SPICE) standard to make sure an effective software process is followed.

In each and every sprint the quality is tested. This is mainly comprised of, functional testing and regression testing. **a).** Functional testing will ensure that all functional/system requirements of the system documented in requirement specification documents are accurately and fully implemented. **b).** Regression testing will ensure that the modifications are not having any impact to existing functionalities.

And live testing is done, once the software is live.

Quality Assurance

A quality audit is done to make sure relevant quality standards are followed. Under quality assurance, requirement standards are audited and result from quality control measurements are considered to ensure relevant quality standards are followed. This will facilitate the improvement of the quality processes.

03.03 Feasibility Study

Costs

The most of the costs will be associated with the implementation process and to establish the infrastructure required (in reality the costs involved to implement a system that covers whole court system will amount to USD Millions as it is required to establish infrastructure at police stations, court houses and other relevant government departments). The client and the server applications will be hosted through as web application and it is required to bear the associated hosting costs. When the operation is operational monthly charges are required to be paid for Internet Service Providers. The bandwidth required is high and conventional copper cables are not satisfactory. The use of fibre optical connection is recommended. Also, a substantial amount will be allocated for maintenance and testing.

However, the benefits accrued after the adaptation will able to be calculated in multi-millions. The number of human working hours that will save through the system is immense. Most importantly the backlog of cases will be reduced drastically.

Economic Feasibility

The infrastructure needed is already established as there are computers and the ability to access internet in most of the court houses and other authorities. The fiber optical access is available in most part of the country. When compared other than the costs required for developing the web application the costs for infrastructure development will be minimum (**development costs and set up costs**). In the operation phrase when implementing a system, it will be required to train the staff or appointing new staff members, which will increase the costs drastically (**operational cost**). However, the monthly salaries and the costs involved in maintaining staff will be as same as the staff required in a non-digitalize court system.

The final product will continue to produce results for ages. As elsewhere mentioned in this report this system will reduced the staff requirements. The government will be able to save millions spend on salaries. As the number of papers used by the court system reduces that will directly reduce the costs and as less papers will be used (**direct benefits**).

The impact on the environment is also positive as fewer resources will be wasted. As the government uses less resources on the system the relevant government fee and stamp charges can be reduced. (As per the present law every proxy and other documents must be stamped based on the value of the case) (**Assessable indirect benefits**).

The author of this report is of the view that the **intangible benefits** of implementing this project will surpass the tangible benefits. Under the international conventions it is required to increase use of

technology in our day-to-day lives. By digitalizing our court system the image boost received by the country will create new opportunities and position Sri Lanka as a favourable country to do international trade and business. The country's ease of doing business rank will be reduced as any issue is being capable of solved within a very short period of time. The image boost country accumulates is harder to estimate or measure.

As the proposed system reduce the backlog of cases that will increase the efficiency of the court system. Less Judges and police officers are required to maintain the court system. Overall, the efficacy of human working hours will be considerably increased.

The most valuable advantage of all the advantages will be cultural effect on the society. As cases are solved within a short period of time more and more people will resort to solving cases through judiciary, which will result in a paradigm change on how people react in problematic situations (access to justice will increase).

Technical Feasibility

This application as a web application is associated with following technologies and techniques. All this technologies are freely available and can access without any subscription plans or costs, as open sources. The application will be developed using HTML, CSS and C#. The data bases are developed using MySQL.

3.4.1 Software Development Process

As the Software Development life model Scrum method is adapted. Scrum is an agile software development method that was conceived by Jeff Sutherland and his development team in the early 1990s. Scrum principles are consistent with the agile manifesto and are used to guide development activities within a process that incorporates the following framework activities: requirements, analysis, design, evolution, and delivery. Work tasks occur within a process pattern called a sprint. At the end of each sprint a demo with certain functionalities is developed. The Scrum process is selected because it can be used for a software development with a tight timelines with changing requirements and business criticality. This project is very time sensitive as it is required to deliver the final delivery within 154 days.
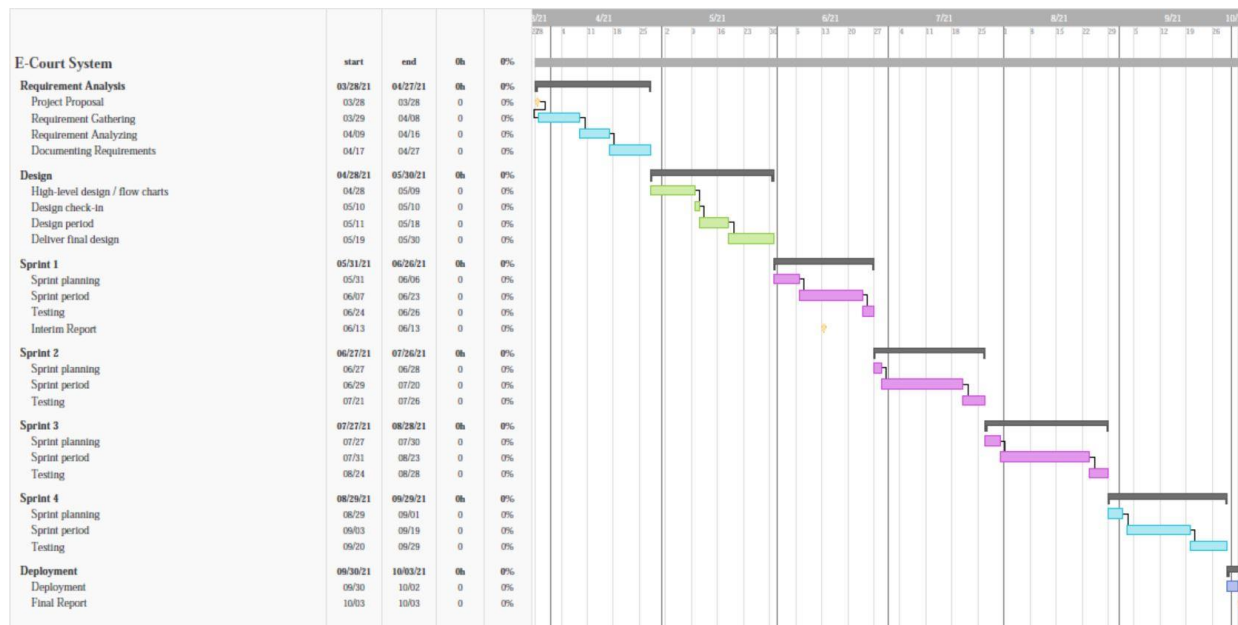
Diagram 12: Software Development Life Cycle

The development process consists of 4 sprints. 20 days allocated for sprint 01. 21 days allocated for sprint 02. 25 days allocated for sprint 03 and 23 days allocated for sprint 04. Unlike in the waterfall model of software development, Scrum enables an iterative and incremental development process, which allows to deliver a usable product to the customer. This is advantages because any gaps between customer requirements and the final delivery can be eliminated.

3.4.2 Architectural Pattern

As any web-application the architecture design of the proposed application is client server architecture. Nevertheless, as Pressman and Maxim states in their book Software engineering: a practitioner's approach. A three-layer design architecture that decouples interface from navigation and from application behavior by keeping interface, application, and navigation separate simplifies implementation and enhances reuse (Pressman, 2021). Therefore, the Model – View – Controller architecture is selected for the proposed system.
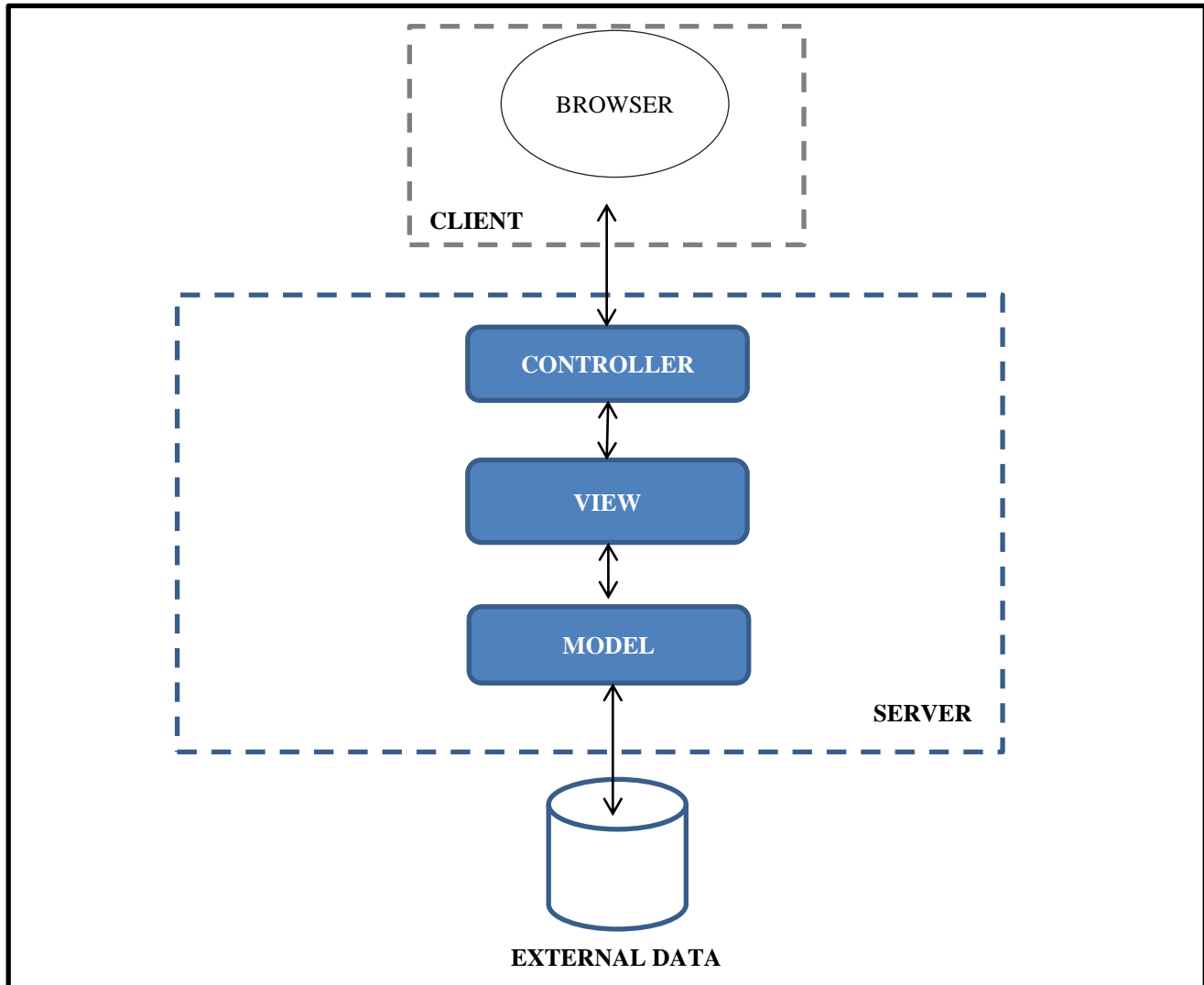
Diagram 13: Software Architecture

Model is the core component of the architecture, and contains all the data and logic. The View element comprised of the Graphical user interfaces, and only capable of accessing data in the model through the controller. The main reason for using this architecture is the security as the user can only access the view. This pattern is more suitable for an application pertaining to the judiciary. Also, asynchronous

technique makes it possible to work with PDF files, site-specific browsers, and also with desktop widgets. Also, due to the ability to load the application fast that will save the time. Saving time is the most prominent aim of this project. Also, though not relevant to this project, in a project more than one developer is involved using this pattern will allow developers to develop the view, control and model simultaneously.

3.4.3 Class Diagram

USER

- UserName: string
- Password: string
- ContactDetails :string
- NICNumber:string

- Register ()
- VerifyLogin()
+ CheckCaseStatus ()
+ CheckArrest ()

POLICE

-PoliceNumber: String

- FileCase ()
- AddArrest ()
- AddDoc ()
+CheckArrest ()
+CheckCaseStatus ()

ADMIN

- AdminEmployeeNumber: string

- EditArrest ()
- EditCaseStatus ()
- EditUser ()
- EditJudgement ()
+ CheckCaseStatus ()
+ CheckArrest ()

JUDICIAL OFFICER

- EmployeeNumber: string

+ CheckCaseStatus ()
+ CheckArrest ()
- AddJudgement ()
- ViewRequest ()
- ReleaseDocuent ()
- EditCaseDetails ()
- EditArrestDetails ()

SUSPECT/ACCUSED PERSON

- ArrestedPersonNumber: string

+ CheckArrest ()
+ CheckCaseStatus ()
- RequestDocA ()

ATTORNEY-AT-LAW

- AttorneyNumber: string

+ CheckCaseStatus ()
+ CheckArrest ()
- RequestDocument ()

JUDGEMENT

- DateIssued: date
- PartyName: String
- JudgementNumber: string

- AddJudgement ()

DOCUMENT REQUESTS

- RequestNumber: String
- RequestName ;string
- CaseNumber ; string
- Date : date
- Address: string
- email: string

- SendRequest ()

PAYMENT

- PaymentNumber: string
- RequestNumber : string
- AccDetails : string

- pay():

DOCUMENT ADDING

- DocAddNumber: String
- Sender : string
- Date : date

- DocAdditionSave ()

ARREST

- ArrestDate: date
- ArrestPlace: string
- Offence : string
- ArrestedPerson : string
- ArrestedPersonAge: Integer
- ArrestedNIC:string
- ArrestedFriend: string
- ContactDetail: string
- PolicePerson: String
- Policestation: string
- ArrestedPersonNumber
- ArrestNumber

- SaveArrestDetails ()

CASES

- CaseNumber: string
- ArrestNumber: string
- FileDate: date
- PoliceOIC: string
- MagistrateCourt: string
- Charges: string
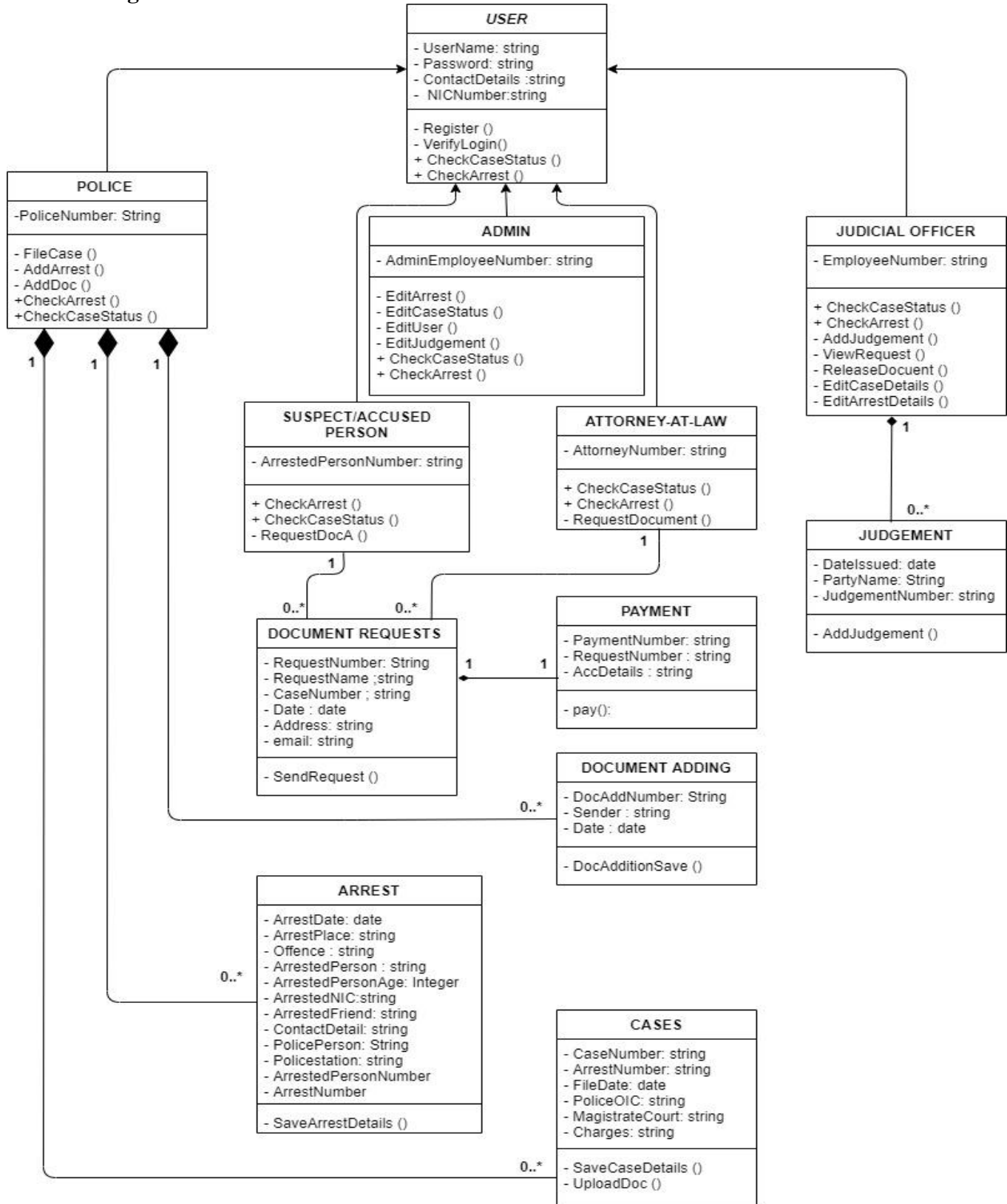
- SaveCaseDetails ()
- UploadDoc ()

Diagram 14

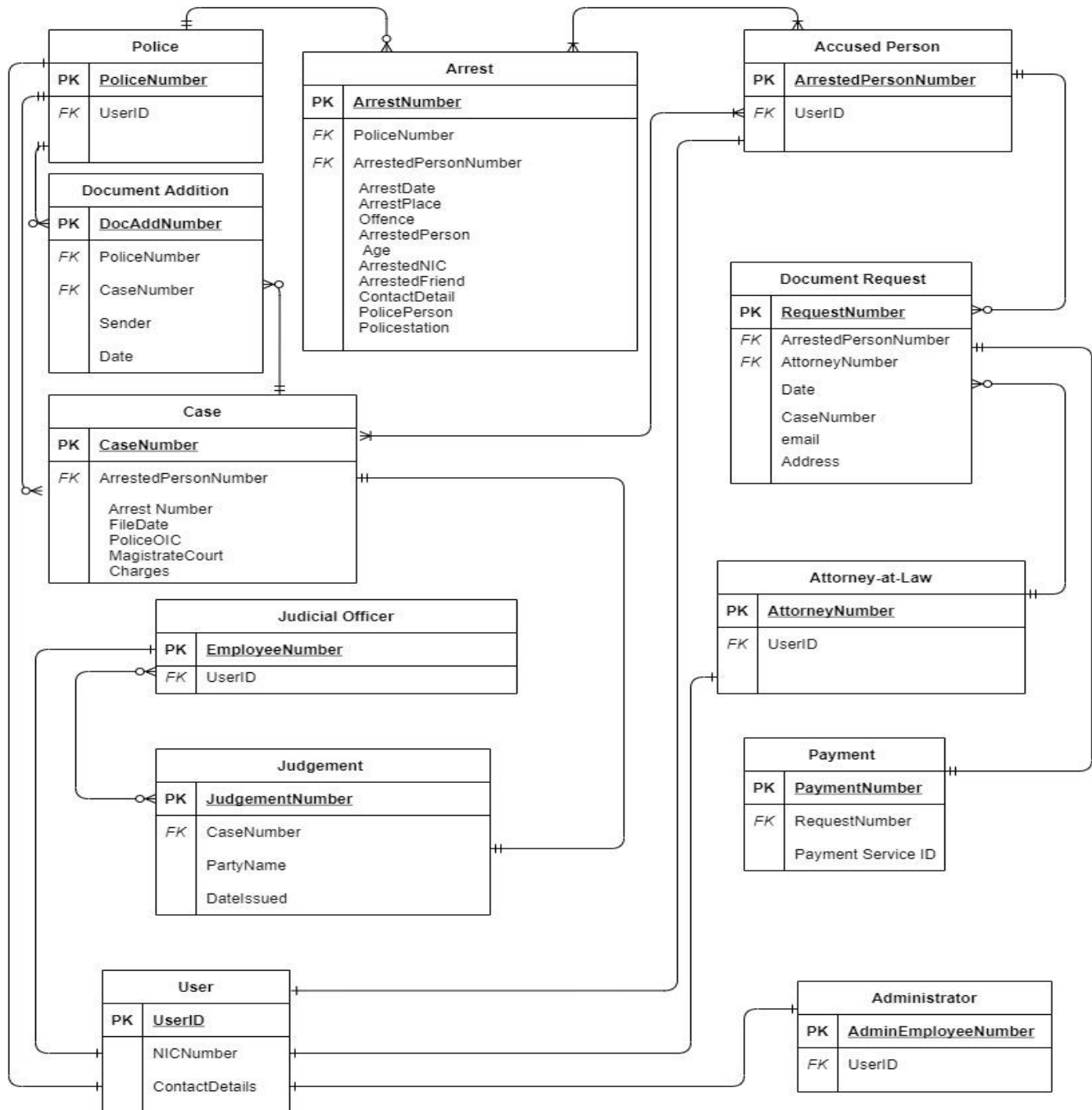## 3.4.4 Entity Relationship Diagram

Diagram 15

3.5 Implementation

Sprint 01

- **User Stories**

Actor: Police, Accused Person, Judicial Officers (including Admin) and Attorney-at-law. (As all Actors should follow this process word "User" has been used to denote all Actors mentioned herein).

01. Scenario:

Signup / register
As a first time user I should be able to download the app and register in the application.

Success:
1. As a user I should be able to open the app by clicking the app icon.
2. As a user i should be navigated to the welcome screen.
3. As a user I should be able to click signup now icon
4. As a user I should be navigated to sign up page.
5. As a user I should be able to go back to the previous screen by clicking the back icon.
6. As a first time user I should be able to enter my NIC Number, Police Number, Employee Number or the Attorney number on the registration page with other details (First Name, Last Name and Address).
8. As a first time user I should be able to click the next button.
9. As a first time user I should be navigated to the next screen (OTP code page).
10. As a first time user I should be able to add my mobile phone number and get a four digit OTP code to the given mobile number.
11. As a first time user I should be able to enter the four digit OTP code
12. As a first time user I should be able to click the Resend button.
13. As a first time user I should be able to see a countdown from 10 seconds to 0 when the user clicks the resend button.
14. As a first time user I should get a notification when clicks the resend button "OTP code has been send to your phone number".
15. As a first time user I should be able to get another OTP code to my phone number
16. As a first time user I should be able to go back to the previous screen by clicking the back icon
17. As a first time user I should be able to click the verify OTP button.
18. As a first time user when I click the verify button, I should get a system generated username and password to the mobile phone number provided. Also, I should get message ""Registration is successful" message.
19. As a first time user I should be navigated to a first time screen.

Failure:
1. As a user system should display an error message if i don't enter any phone number and other requested details and clicks the next button - "Please enter your mobile number".
2. As a user system should highlight and notify me the areas that I have left blank - "Please fill xxx field".
3. As a user application should pop ups an error if I enter a wrong phone number - "Please enter a valid phone number".

4. As a user I should be get an error message if I entered an incorrect OTP code - "Invalid OTP code, Please try again".

02. Scenario:

Login
As a registered user I should be able log in to the application.

Actor: Police, Accused Person, Judicial Officers (including Admin) and Attorney-at-law.

Success:
1. As a registered user I should be able to open the app by clicking the app icon.
2. As a registered user I should be navigated to the welcome screen.
3. As a registered user I should be able to select the type of the Account (Police, Accused Person, Judicial Officers (including Admin) and Attorney-at-law).
4. As a registered user I should be able to click Log In page.
5. As a registered user I should be able to add username and password and click the login button.
6. As a registered user I should be able to go back to the previous screen by clicking the back icon.
7. As a registered user I should be navigated to the relevant dashboard based on the role.

Failure:
1. As a registered user system should display an error message, if I don't enter the correct Username or password or select wrong type of Account.

- **Test Cases**

No	Test Case Name	Steps	Expected Result	Status
1	Verify the User Registration for the Police	1. User launch the app by clicking on the app icon 2. click on the 'Sign-up' Link in the welcome Screen 3. Below fields should be displayed in the 'Sign-up' page as Mandatory • First Name • Last Name • Address • User Type • Police No • Mobile No: • Username	Application should be launched User should be able to click on the Sign-up link and should be re-directed to 'Sign-Up' page Fields should be displayed as below, • First Name – Should be a text field with the length of 50 characters • Last Name- – Should be a text field with the length of 50 characters • Address – Should be a	

	• Password	text field with the length of 200 characters
User fill up all the fields		• User Type – Should be a dropdown field with values: Police, Attorney, Accused and Judicial Officer
		• Police No: - Should be displayed only if the user Type is 'Police' as a text field with the length of 50 characters
		• Mobile No: Should be a text field with the length of 50 characters
		• Username- – Should be a text field with the length of 100 characters
		• Password-should be a text field with 10 characters
		Once these are filled out 'Next' button should be enabled
4. User should be able to click the Next button		User should be able to click on the 'Next Button'
		User should receive a verification code to his Mobile after clicking the 'Next' button
5. User should be able to enter the verification code in this page		should be redirected to 'Verify Mobile No' Page
		User should be able to enter the verification code and that should be validated
		'Registration Successful' confirmation message should

2	Verify the User Registration for an Accused Person	1. User launch the app by clicking on the app icon 2. click on the 'Sign-up' Link in the welcome Screen 3. Below fields should be displayed in the 'Sign-up' page as Mandatory • First Name • Last Name • Address • User Type • National ID No • Mobile No: • Username • Password User fill up all the fields	Application should be launched User should be able to click on the Sign-up link and should be re-directed to 'Sign-Up' page Fields should be displayed as below, • First Name – Should be a text field with the length of 50 characters • Last Name- – Should be a text field with the length of 50 characters • Address – Should be a text field with the length of 200 characters • User Type – Should be a dropdown field with values: Police, Attorney, Accused and Judicial Officer • National ID No: - Should be displayed only if the user type is 'Accused' as a text field with the length of 50 characters • Mobile No: Should be a text field with the length of 50 characters • Username- – Should be a text field with the length of 100 characters • Password-should be a text field with 10 characters

		Once these are filled out 'Next' button should be enabled
	4. User should be able to click the Next button	User should be able to click on the 'Next Button' User should receive a verification code to his Mobile after clicking the 'Next' button should be redirected to 'Verify Mobile No' Page
	5. User should be able to enter the verification code in this page	User should be able to enter the verification code and that should be validated 'Registration Successful' confirmation message should be displayed
3	Verify the User Registration for an Attorney-at law	1. User launch the app by clicking on the app icon 2. click on the 'Sign-up' Link in the welcome Screen	Application should be launched User should be able to click on the Sign-up link and should be re-directed to 'Sign-Up' page
		3. Below fields should be displayed in the 'Sign-up' page as Mandatory • First Name • Last Name • Address • User Type • Bar association Registration No • Mobile No: • Username • Password User fill up all the fields	Fields should be displayed as below, • First Name – Should be a text field with the length of 100 characters • Last Name- – Should be a text field with the length of 100 characters • Address – Should be a text field with the length of 200 characters • User Type – Should be a dropdown field with values: Police, Attorney, Accused

- Bar association Registration No: - Should be displayed only if the user type is 'Attorney-at-law' as a text field with the length of 50 characters
- Mobile No: Should be a text field with the length of 50 characters
- Username- – Should be a text field with the length of 100 characters
- Password-should be a text field with 10 characters

		Once these are filled out 'Next' button should be enabled
	4. User should be able to click the Next button	User should be able to click on the 'Next Button'
		User should receive a verification code to his Mobile after clicking the 'Next' button
	5. User should be able to enter the verification code in this page	should be redirected to 'Verify Mobile No' Page User should be able to enter the verification code and that should be validated
		'Registration Successful' confirmation message should be displayed
4	Verify the User Registration for a Judicial Officer	1. User launch the app by clicking on the app icon 2. click on the 'Sign-up' Link in the welcome Screen	Application should be launched User should be able to click on the Sign-up link and

3. Below fields should be displayed in the 'Sign-up' page as Mandatory

- First Name
- Last Name
- Address
- User Type
- Employee No
- Mobile No:
- Username
- Password

User fill up all the fields

should be re-directed to 'Sign-Up' page

Fields should be displayed as below,

- First Name – Should be a text field with the length of 100 characters
- Last Name- – Should be a text field with the length of 100 characters
- Address – Should be a text field with the length of 200 characters
- User Type – Should be a dropdown field with values: Police, Attorney, Accused and Judicial Officer
- Employee No: - Should be displayed only if the user type is 'Judicial Officer' as a text field with the length of 50 characters
- Mobile No: Should be a text field with the length of 50 characters
- Username- – Should be a text field with the length of 100 characters
- Password-should be a text field with 10 characters

Once these are filled out 'Next' button should be enabled

4. User should be able to

User should be able to click

		click the Next button	on the 'Next Button'
			User should receive a verification code to his Mobile after clicking the 'Next' button
			should be redirected to 'Verify Mobile No' Page
		5. User should be able to enter the verification code in this page	User should be able to enter the verification code and that should be validated
			'Registration Successful' confirmation message should be displayed
5	Verify Login as a Police Officer	1. User launch the app by clicking on the app icon 2. click on the 'Sign-In' Link in the welcome Screen	Application should be launched User should be able to click on the Sign-In link and should be re-directed to 'Login' page
		3. Below fields should be displayed in the Login page as mandatory Username: Password: - Login Button User should enter the username and password	Fields should be displayed as below, • Username- – Should be a text field with the length of 10 characters • Password-should be a text field with 10 characters
		4. User clicks on the login button	System should authenticate the User If username and Password is correct user should be re-directed to the Dashboard.
6	**Verify Login as an accused Person**	1. User launch the app by clicking on the app icon 2. click on the 'Sign-In' Link in the welcome Screen	Application should be launched User should be able to click on the Sign-In link and should be re-directed to 'Login' page.

		3. Below fields should be displayed in the Login page as mandatory Username: Password: - Login Button User should enter the username and password	Fields should be displayed as below, • Username- – Should be a text field with the length of 10 characters • Password-should be a text field with 10 characters
		4. User clicks on the login button	System should authenticate the User If username and Password is correct user should be re-directed to the Dashboard
7	Verify Login as an Attorney-at-law	1. User launch the app by clicking on the app icon 2. click on the 'Sign-In' Link in the welcome Screen	Application should be launched User should be able to click on the Sign-In link and should be re-directed to 'Login' page
		3. Below fields should be displayed in the Login page as mandatory Username: Password: - Login Button User should enter the username and password	Fields should be displayed as below, • Username- – Should be a text field with the length of 10 characters • Password-should be a text field with 10 characters
		4. User clicks on the login button	System should authenticate the User If username and Password is correct user should be re-directed to the Dashboard
8	Verify login as a Judicial Officer	1. User launch the app by clicking on the app icon 2. click on the 'Sign-In' Link in the welcome Screen	Application should be launched User should be able to click on the Sign-In link and should be re-directed to 'Login' page

3. Below fields should be
displayed in the Login page
as mandatory
Username:
Password: -
Login Button

User should enter the
username and password

Fields should be displayed as
below,
- Username- – Should
  be a text field with the
  length of 10
  characters
- Password-should be a
  text field with 10
  characters

| 9 | Verify login as a System Administrator | 1. User launch the app by clicking on the app icon | Application should be launched |

4. User clicks on the login
button

System should authenticate
the User

If username and Password is
correct user should be re-
directed to the Dashboard

9	Verify login as a System Administrator	1. User launch the app by clicking on the app icon 2. click on the 'Sign-In' Link in the welcome Screen	Application should be launched User should be able to click on the Sign-In link and should be re-directed to 'Login' page
		3. Below fields should be displayed in the Login page as mandatory Username: Password: - Login Button User should enter the username and password	Fields should be displayed as below, • Username- – Should be a text field with the length of 10 characters • Password-should be a text field with 10 characters
		4. User clicks on the login button	System should authenticate the User If username and Password is correct user should be re-directed to the Dashboard.

3.6 Testing and Verification

The software being developed must comply with the relevant quality attributes. The Test phrase ensures that all the bugs are remedied before the software is delivered to the client. Throughout this project IEEE 829 standard for software testing is followed. As prescribed in the standard the following deliverables are necessary: test plan, test design specification, test case specification, test procedure specification, test item transmittal report, test log, test incident report, test summary report. However, due to the space and tie constraints not all documents will be created. The test cases will be created per every sprint and will be provided under the implementation phrase.

Type of Testing

Unit testing, Integration testing, system testing and acceptance testing will be conducted during each print, as agile development scrum practice is followed. All frontend and backend coding will be manually tested.

Test Environments

This application will be tested on following software and hardware configuration.

Software: Windows 8.1 OS with a Chrome browser of the Version 91.0.4472.114 (Official Build) (64-bit).
Hardware: Intel 64 bit- 2.40 GHz processor with 8 GB Ram.

Features to be tested during the course of all sprints

Following functionalities will be tested when logged-in as Police.

1. Registration
2. Login
3. Dashboard
      3.1. Adding arrest details.
      3.2. Adding new case details.
      3.3. Viewing arrest details.
      3.4. Viewing case details.
      3.5. Adding documents.
4. Logout

Following functionalities will be tested when logged-in as a Suspect/Accused.

1. Registration
2. Login
3. Dashboard
      3.1 Viewing arrest details.
      3.2 Viewing case details.
      3.3 Requesting documents.
4. Logout

Following functionalities will be tested when logged-in as Attorney.

1. Registration
2. Login
3. Dashboard
      3.1 Viewing arrest details.
      3.2 Viewing case details.
      3.3 Requesting documents.
4. Logout

Following functionalities will be tested when logged-in as Judicial Officer.

1. Registration
2. Login
3. Dashboard
      3.1 Viewing arrest details.
      3.2 Viewing case details.
      3.3 Issue documents.
      3.4 Update arrest details.
      3.2 Update case details.

4. Logout

Features not to be tested during the course of all sprints

1. It will not be tested whether this application's features runs on different operating systems. Only whether this application is capable of running Windows 8 OS with 64 bit processor is tested.

04. Evaluation and Conclusion

The project was started soon after the submission of the final project proposal. As shown in the diagram below; it is planned to complete the project on or before 03rd of October 2021. By the time this interim report is submitted (Yellow horizontal line on the following Gantt chart [Diagram 15]) the initial evaluation was to complete half of the sprint 02. However, it was only managed to complete the sprint planning phrase of the Sprint 01 (check Diagram 16), which means only 29% of the sprint 01 has been completed. As a percentage, only 39% from the total project work has been completed.
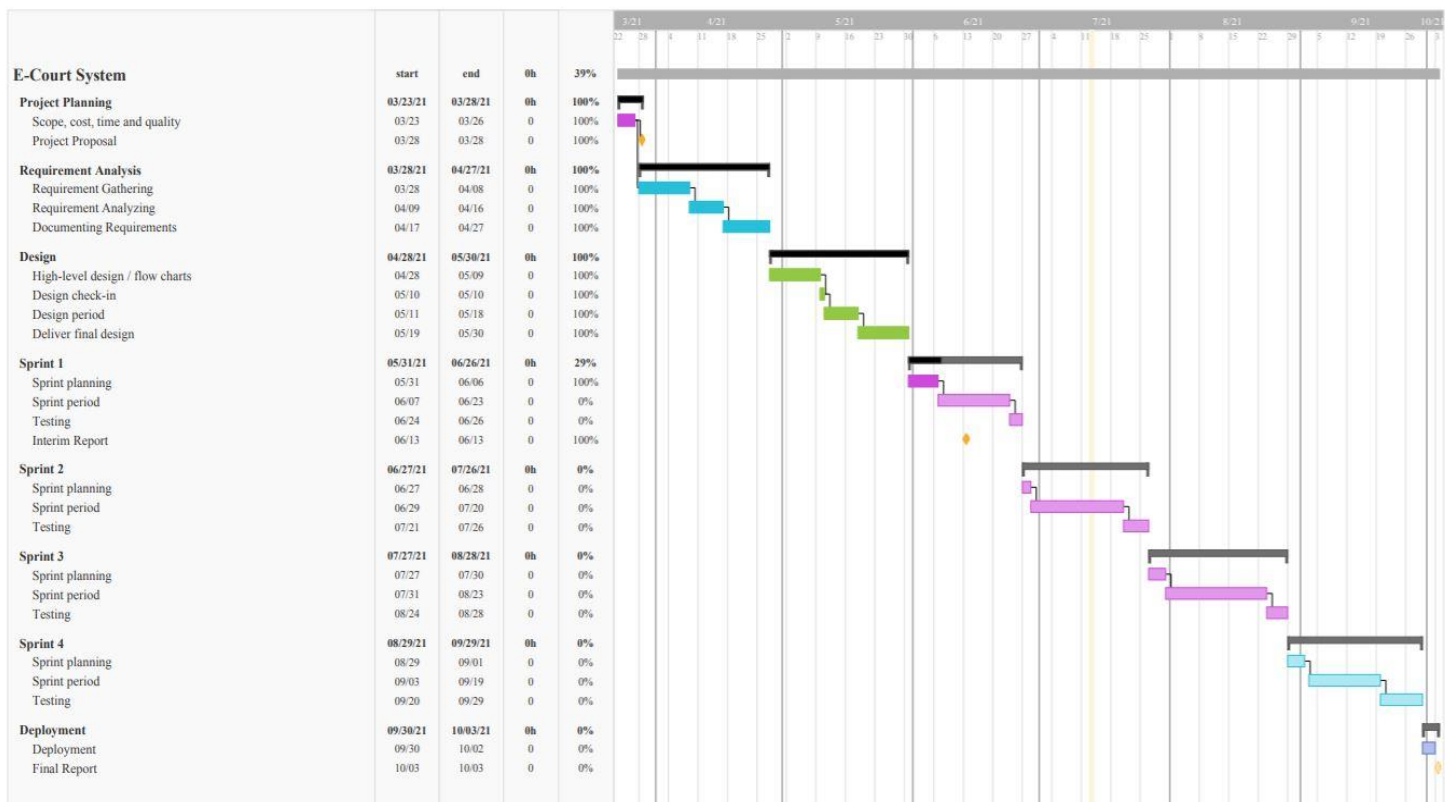

Diagram 16: Project Gantt chart

As a percentage, 61% of the total project work has to be completed before 03rd of October. Mainly this includes remaining three sprints and the remaining half of the sprint 01.All the remaining work is pertaining to the implementation phrase of the project.

E-Court System	start	end	0h	39%
Project Planning	**03/23/21**	**03/28/21**	**0h**	**100%**
Scope, cost, time and quality	03/23	03/26	0	100%
Project Proposal	03/28	03/28	0	100%
Requirement Analysis	**03/28/21**	**04/27/21**	**0h**	**100%**
Requirement Gathering	03/28	04/08	0	100%
Requirement Analyzing	04/09	04/16	0	100%
Documenting Requirements	04/17	04/27	0	100%
Design	**04/28/21**	**05/30/21**	**0h**	**100%**
High-level design / flow charts	04/28	05/09	0	100%
Design check-in	05/10	05/10	0	100%
Design period	05/11	05/18	0	100%
Deliver final design	05/19	05/30	0	100%
Sprint 1	**05/31/21**	**06/26/21**	**0h**	**29%**
Sprint planning	05/31	06/06	0	100%
Sprint period	06/07	06/23	0	0%
Testing	06/24	06/26	0	0%
Interim Report	06/13	06/13	0	100%
Sprint 2	**06/27/21**	**07/26/21**	**0h**	**0%**
Sprint planning	06/27	06/28	0	0%
Sprint period	06/29	07/20	0	0%
Testing	07/21	07/26	0	0%
Sprint 3	**07/27/21**	**08/28/21**	**0h**	**0%**
Sprint planning	07/27	07/30	0	0%
Sprint period	07/31	08/23	0	0%
Testing	08/24	08/28	0	0%
Sprint 4	**08/29/21**	**09/29/21**	**0h**	**0%**
Sprint planning	08/29	09/01	0	0%
Sprint period	09/03	09/19	0	0%
Testing	09/20	09/29	0	0%
Deployment	**09/30/21**	**10/03/21**	**0h**	**0%**
Deployment	09/30	10/02	0	0%
Final Report	10/03	10/03	0	0%

Diagram 17: Project Status

The main reason for not being able to achieve the expected target was the wrong calculation pertaining to the time taken for the designing process and requirement analysis. The time had allocated for the designing and requirement gathering was in adequate as during the designing process number of diagrams had to be drawn. Also, from the start of the project, it had been forgotten to decide on the number of hours that needed to sacrifice for this project on a daily basis or weekly basis. Ultimately that resulted in a massive backlog of work.

Nevertheless, author of this report is still optimistic that the project will be able to complete within the relevant time period. To eliminate the backlog of work, more time will be sacrificed in a daily basis, until the project is back on time.

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