

**EXPERT SYSTEM FOR THE LEGAL REGIME GOVERNING WOMEN IN ETHIOPIA:
THE CASE OF THE REVISED FAMILY CODE AND LABOR LAW**

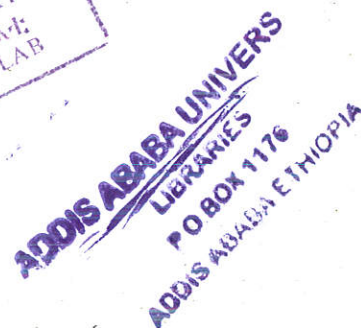
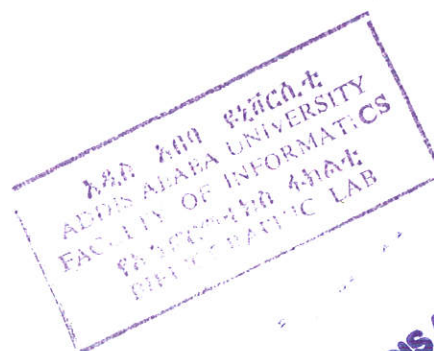
**BY
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**PRESENTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA
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SCHOOL OF GRADUATE STUDIES
Faculty of Informatics
Department of Information Science

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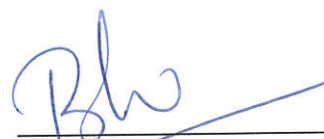
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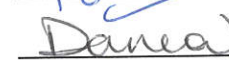
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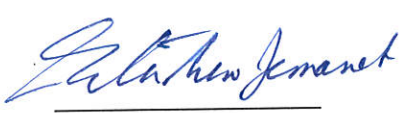
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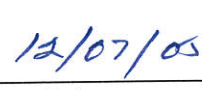


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Dedication

This thesis is dedicated to ***MOM*** and ***DAD***

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EXPERT SYSTEM FOR THE LEGAL REGIME GOVERNING WOMEN IN ETHIOPIA: THE CASE OF THE REVISED FAMILY CODE AND LABOR LAW

TADELE TEDLA

Abstract

Expert systems play a significant role in disseminating facts by simulating the knowledge of the expert. Works in the area of expert system focuses on issues like alleviating the scarcity and preserving of expert knowledge. One of the areas which expert system plays a significant role is law. In this research we investigated the potentials of expert system by developing an expert advisory for the legal regime governing the rights of women in Ethiopia. The study will primarily used for assisting legal experts.

Currently there are different governmental and non-governmental bodies that work on the provision of consultancy service to issues related to women. The Ethiopian Women Lawyers Association (EWLA), a private organization founded by group of Ethiopian women lawyers in 1995, is one such organization that provides legal advisory service to women in Ethiopia. However; there exists shortage of experts in the association to disseminate the legal aid service throughout the whole country with desired capacity. In an attempt to address this problem Women Legal Advisory (WoLA) is developed in this study.

The knowledge of WoLa is acquired using hierarchical modeling method. The important parameters are identified to produce the rules out of the Revised Family Code and the Labor Law of Ethiopia. Then the acquired rules are represented in an expert system development shell known as Knowledge Pro Gold for windows.

WoLA provide advise on the bases of rules that are specified in the codes specially, the Revised Family Code and Labor Law. Advisory providers at Ethiopian Women Lawyers Association test WOLA and fairly encouraging result is obtained.

Chapter One

1. Introduction

1.1. Background

Machine learning and expert systems are sub-fields, which contributed a lot for the development of Artificial Intelligence (AI) (Bibel and Petkoff, 1985). Though the goal of AI according to (Margaret, 1990), is making machines intelligent, the way of achieving this objective might vary slightly among the sub-fields. In machine learning the goal is to train the machine so that it can acquaint itself with the problem to be solved on the bases of experience gained either from a supervisor or context (Michell, 1997). Where as, in case of expert systems, capturing and representing the knowledge of the expert is the way to the expert systems.

Expert systems are used to assist experts, or others who seek the knowledge of the expert, and in areas where getting domain experts become a challenge. According to (Cawsey, 1998) and (Rauch-Hindin, 1988) expert systems can be used in two different ways:

1. Decision supporting: Reminding information or options to an experienced decision maker.
2. Decision-making: Allowing an unqualified person to make a decision beyond his or her level of training or expertise.

Health and law are two major disciplines where application of expert system can be discerned. MYCIN, which diagnose and recommend treatment for certain blood infection, is one of the classical examples of the application of expert system in health. There are a numbers of knowledge-based applications to legal practices too. System for Asbestos Litigation (SAL), which advises on the settlement of asbestosis claims against insulators, and Legal Decisionmaking System (LDS) which advises on likely settlement figures for product liability cases (Greenleaf, 1989). Reference, available in the department of Information Science bibliographic lab can also be pointed as an instance of the application of expert system in law within the local context (Ethiopia, 2000).

To govern people by law, it is necessary to develop rules and regulations. These rules and regulations ensure the rights and obligation of the citizens. Having the knowledge of these Laws and Regulations is like arming oneself to defend other individuals' rights as well as his own rights. However; there are only few individuals, who comprehend their rights in line with the existing law. Especially, Ethiopian women where so many cultural influences constrained them from being aware of their legal rights (Rakeb, 1996) and (EFDRE, 1998). Considering such fact, the current study is triggered to raise Ethiopian women's awareness towards their rights by building a knowledge-based system on the bases of the existing country's law.

1.2. Statement of the Problem and Justification of the Study

According to the report of (Rakeb, 1996), wife beating and rape are pervasive social problems in Ethiopia. The abuses, according to the national report on women in Ethiopia, submitted to the committee in Convention on the Elimination of all forms of Discrimination Against Women (CEDAW) in 1996 are facilitated by societal norms and limited infrastructures (Emzat, 2001). Despite the occurrence of such problems, only few of them are addressed to the courts or to various concerned bodies (Rakeb, 1997). Thus, the participation of women themselves to improve their own lives rather than expecting solutions from other parties is very important.

Even though the numbers are limited, some governmental and non-governmental bodies are doing activities related to problems associated with women. The activities are done to raise women's awareness on various issues. Activities like preparing magazines and ratifying conventions specific to women is a good example to mention. Magazines like 'በርፕ', which is similar to "be strong" in English, by EWLA and 'ሴቶች ለሴቶች', its direct translation to English gives "Women to Women", by British council, are some exemplary works done to enhance women awareness on various domestic issues. The convention on "Elimination of all Forms of Discrimination against Women" formulated by

UN and composed of 30 articles, is another work that is done to further reveal the rights of women.

In addition to these, the Ethiopian Government is also playing a role to improve the lives of women through the formulation of policies. The release of Ethiopian embassy paper entitled "Women in Ethiopia": National Policy on Ethiopian Women (EFDRE, 1998) stated that, facilitating the necessary education, where by rural women can have access to basic social services to ways and means of lightening their work load as an objective of the policy. Furthermore, the Embassy pointed the following legal and regulatory issues.

- The use of patriarchal customary laws constrained women's access to resources.
- The legal framework prohibited poor women from entering informal labor markets.
- Prevailing traditional gender biases exist against women in the allocation of land.
- Women's access to resources is limited due to biases resulting from the family arbitration system.
- Women have no access to legal aid and are severely constrained in seeking remedies from civil courts.
- Lack of women's grassroots organizations prevents their participation in development activities.

To alleviate the above pointed problems, The Ethiopian Embassy in the same release forwarded the following key recommendation:

- Public policy should be made consistent by amending discriminatory provisions in the civil court which promote traditional gender biases.
- Mitigating of the impact of inequitable customary laws
 - By examining the applicability of customary laws.
 - By making women aware of their legal rights.
 - By strengthening awareness of women's roles and rights by building consensus against customary practices.

One way of raising the awareness of women to understand their legal rights is providing consistent consultancy service for the problems they are facing. To endow with such services, the main obstacle is the lack of sufficient professionals. In other words, lack of grass root organizations hamper the provision of necessary information at that levels. The women at the lower level need information to be aware of their legal rights. However; there are no adequate experts providing the services. So, there should be a way to communicate or share the expert's knowledge at the grass root levels. In such situation as it has been recommended by (Rauch-Hindin, 1988), expert system can be of great importance. Moreover, the legal rules, which govern women, are not compiled together. Thus access will not be easy for those who are in charge of providing the advisory services. That is Articles stating the legal rights of women are found dispersed: in penal code, family code, labor law and other conventions, proclamations and regulations. Thus as stated above accessing the required information will be challenging. This calls for the need of organizing the articles together. Organizing women's focused articles together facilitates the rendering of the required services, on the bases of a given case, without delay. Organizing documents helps to easily assign which advise or advises should be given for which case or cases. In addition to organizing the articles together, developing an expert system will ease the burden of finding legal advisory expert whenever needed. So, this study is conducted to alleviate such problems by building a knowledge base system on the legal rights of women.

1.3. Objectives of the study

1.3.1. General objective

The general objective of the study is to develop an expert advisory system for the legal regime governing the rights of women in Ethiopia that will be used to assist experts who are in charge of rendering consultancy services.

1.3.2. Specific objectives

Specific objectives include:

1. to study existing legal women advisory system
2. to gather women focused articles found in the legal codes
3. to review various literatures on expert system development
4. to review applicability of knowledge base system in legal advisory areas
5. to explore possible applications of expert system in solving problems associated with women legal rights
6. to develop and test system prototype
7. drawing conclusions and making recommendations

1.4. Methods

1.4.1 Literature Review

Various literatures are reviewed and analyzed to have a good understanding of problems specific to women in Ethiopia in general and their legal practices in particular. In addition, literatures are reviewed to get an insight on the development of expert systems.

1.4.2 Data collection and Knowledge representation

Besides what is stated on the Revised Family code and the Labor Law, discussions and interview is made with domain experts. Articles specific to women are collected. The result of the interview and discussions with domain experts help to make the research more comprehensive. Finally the collected articles are represented in the knowledge base of the expert system to make the realization of the desired expert system.

1.4.3 Tools to be used

The kind of tool used for the development of the expert system is knowledge pro Gold version 3. Knowledge pro is a commercial expert system shell which is available in the department. Knowledge pro is preferred due to its flexibility and the various features it provides for the development of the desired system.

1.4.4 Testing Mechanism

The validity of expert system is tested to check its efficiency. To test the validity of the system, similar problems are given to two groups of legal experts, one group with expert system and the other without the expert system. Then the contribution of the expert system in helping to find acceptable advice is examined.

1.4.5 Organization of the thesis

The thesis is organized in to seven chapters. The first chapter gives some background information about the thesis including objectives of the study. Chapter two extensively discusses the review of related literatures. Highlights about women and the Legal Domain in Ethiopia are dealt in chapter three. Knowledge acquisition is discussed on chapter Four. Chapter Five deals with knowledge representation that is knowledge acquired from the legal codes is organized and represented in to the knowledge base of the expert system using knowledge pro. Discussion about the development of prototype is the core of chapter six. Finally conclusions and recommendations are given in chapter seven.

1.5. Scope and Limitations of the study

This study is limited to articles focused on women and Ethiopian Law. The research mainly concentrates on articles from the Revised Family Code and Labor Law. This is due to the fact that most Ethiopian women problems are domestic (in house) in nature and labor related (Emzat, 2001), thus it can easily and mostly be addressed through the Family Code and Labor Law. In addition, with the given time for the research

undertaking, dealing with these two areas seems reasonable. This study is intended only to raise the awareness of women towards their legal rights by building an advisory expert system for those who provide the advisory service. The paper does not deal for example, with how to establish women's legal case to courts. The expert system, in this paper, is intended to be a knowledge base of legal articles specific to women that can be used to assist those professional who are in the provision of consultancy services based on information provided by advice seekers.

1.6. Application of results

In addition to the fulfillment of the requirements of the M.Sc in Information Science where the researcher enrolled in, the study might have the following applications:

1. to help those professional who are at the forefront of women legal rights advisory service provisions
2. to facilitate access to information regarding of law in general and access to law that concern women cases in particular
3. to help lawyers to have quick reference for their case by providing access for women specific article.
4. to facilitate the activity of empowering women by providing a compiled information about their own (women) legal rights
5. to aid the instructional process in law by finding legal articles specific to women in Ethiopia easily
6. to be used as a spring board for researchers who would like to further study along the same line

Chapter Two

2. Review of Literature

2.1. Introduction

Background, statement of the problem, objectives and the approaches to be followed in this research is discussed in the previous chapter. In this chapter a review of various related literatures is covered in depth. More specifically, thorough theoretical discussion about expert systems, components of expert systems, inferring mechanisms, and applications of expert systems in legal situations is discussed.

2.2. Expert Systems

1970 is the year that AI researchers shift their focus from developing generally intelligent machines to solving real world problems (Forsyth, 1986). As the result, expert system turned out to be one of the first emerged fields of applied AI. The basic idea behind expert system is conserving the knowledge of the expert. According to (Moynihan, 2000) expert systems are defined as a computer system which imitates the knowledge and reasoning of an expert in a particular domain area.

Expert systems are computer systems, which performs the same way or even better than a human expert. One may argue, "How expert systems could outperform human expert?" The quality that enables expert systems to perform better than human expert lies in the ability of the expert systems to provide consistent outputs. Consistency of expert systems is realized through the provisions of the same results for similar cases at different times, which is noticed to deviate slightly from time to time in human experts due to so many social influences.

2.3. Characteristics of expert systems

Though the field of expert system is dynamic to forward stable defining characteristics for the field, there are certain features shared among most of the existing expert systems.

These features as explained in (Moynihan, 2000) are:

- An expert system is limited to a relatively narrow domain of expertise.

Readers of this sentence may ask, "How 'relatively narrow' domain is narrow?" Establishing a physical framework for the term "narrow" directly may be difficult. However; since the goal of expert system is to represent the knowledge of experts, and experts are specialized in certain domain knowledge, concentrating only on that specific field of specialization yields a good expert system. Hence, the term narrow at the same time can be addressed in terms of the domain knowledge, which experts specialized on.

- It should be able to reason with uncertain data (and unreliable rules).

Ideally it is presumed that the knowledge base of the expert system should have complete and all of the required information to make a decision; however, this is not usually true in most of the developed expert systems. This is due to the fact that it is difficult to acquire complete knowledge either from the expert or user of the system. One of the features of a typical expert system to over come such problems is the ability to decide or reason with incomplete, missing and uncertain knowledge.

- It must be able to explain its train of reasoning in a comprehensible way.

This is associated with explanation facility. Expert system should have explanation facility if a user is curious to know why he/she is being asked to provide certain information or how a certain conclusion is arrived at.

In addition to what has mentioned above (Rauch- Hindin, 1998) forwarded the following as the characteristics of expert systems.

- Expert system must have the capacity to update their knowledge easily.

Learning capacity is necessary to correct the mistakes that the expert system makes. In addition to this, learning facility helps to incorporate the new knowledge that the expert learns, or new items that are required to be added.

- Expert systems must have flexible problem solving strategies.

This feature is necessary since the problem to be solved as well as the information available to solve it, may be slightly different. In such situations, expert systems should be able to provide a solution based on the available data.

- Expert system needs to exhibit high performance in terms of their ability to solve their assigned problems correctly.

Since a human who face difficulties in solving the tasks that he/she is assigned to will not be called expert, expert system that face a problem in dealing with the tasks that it is assigned to solve would not be called expert system.

2.4. Architecture of Expert System

More or less expert systems have similar architecture. The following figure shows the general expert system architecture adapted from (Cawsey, 1998)

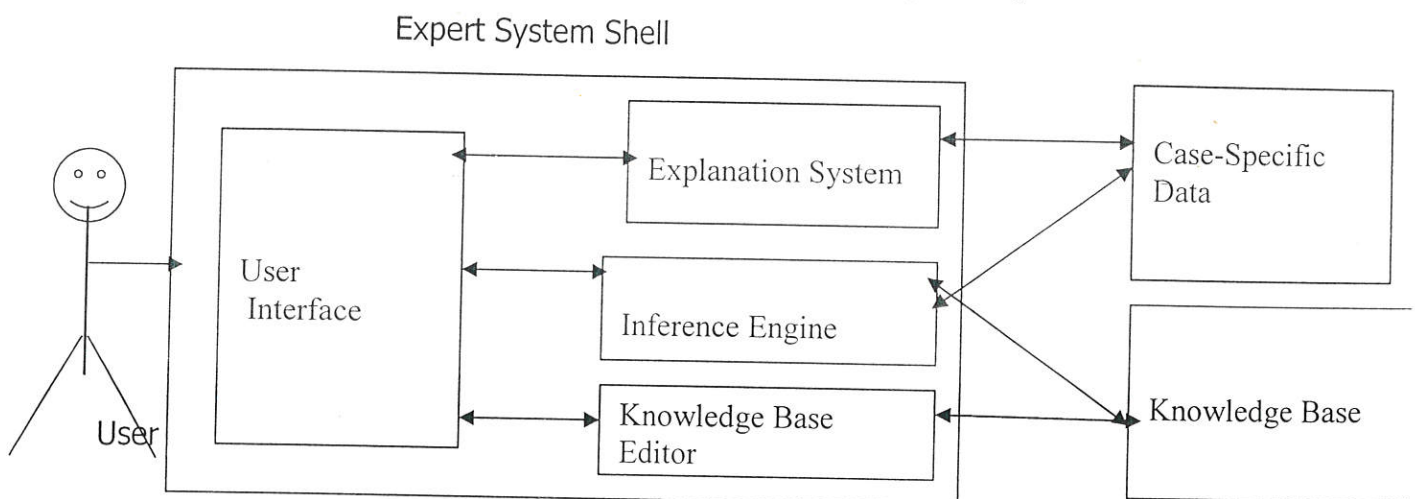


Fig 1. Expert System Architecture

2.4.1. The user

User interacts with the expert system through the user interface. The user could be a layperson interacting with the system looking for some kind of information or an expert seeking to confirm his or her idea.

2.4.2. The expert system shell

Expert system shell is composed of user interface, explanation system, inference engine and knowledge base editor. A user interface is providing the "best" possible interaction point to users. It should be designed in a way that can be capable of encompassing the requirements of the diversified intended users. The inference engine as the name implies infers knowledge from both the knowledge base and case specific data. Case-specific data includes specific data provided by users. The explanation facility is used to explain its reasoning to users and the knowledge base editor will provide the facility to easily update and go through the knowledge base for knowledge engineers.

2.4.3. Inference Mechanism

Having good knowledge base and knowledge representation skill is not enough to have a good expert system. In addition to this fact, it is impossible to represent each and every fact explicitly in knowledge base of the expert system. So, there should be a way to infer those implied knowledge from the knowledge base. This task is handled by inference engine. With regard to inference engine (Rauch-Hindin, 1988) confirms this with the view stating expert system produce advice and recommendations based on the outputs produced by inference mechanism.

Inference strategies can be of backward chaining, forward chaining or a combination of both. Examining each one by one is important so as to identify the underlining difference and the situation in which one is preferable than the other.

2.4.3.1. Backward chaining

This inference mechanism starts with a goal to prove. That is; it starts with a known goal and use the expert system program to get to the known goal. In addition backward chaining uses the rule to arrive at an identified goal. The backward chaining method tries to solve a problem by generating a goal. What happens if that is not the goal? If the goal cannot be proved with the supplied rules, then it postulates a different cause,

which is a new goal and keeps this until a solution is found or the goals to be examined are exhausted. That is why (Rauch-Hindin, 1988) called backward chaining as an exhaustive search technique. (Moynihan, 2000) explanation of backward chaining which is relatively simple to understand described backward chaining as an inference mechanism which starts from some provided hypothesis and trying to prove whether the supplied hypothesis is true or not; and users will be asked questions pertinent to attesting the hypothesis.

2.4.3.2 Forward chaining

Unlike backward chaining beginning with a hypothesis conclusion and tries to work backward in search of existing evidence, forward chaining starts with internal or external data which triggers a certain rule. According to (Rauch-Hindin, 1988) the invoked rules might change the knowledge base or knowledge environment of the system. One may ask, "How did the knowledge base or knowledge environment be changed?" The reason for the knowledge base or knowledge environment to be changed is caused by the fact that forward chaining does not have a goal to prove; rather it accepts data that directs a certain action to take place. That action might change the state of the knowledge base; which as result change the environment. For example, turn some hardware or software to switch on or off.

As can be understood from the above descriptions about the major inference strategies, there are situations where forward chaining is more advantageous than backward chaining. In cases where it is difficult to hypothesize the possible goals, forward chaining is of more appropriate than backward chaining. On the other hand since forward chaining does not have a focus to find, it may not provide its answers efficiently (Ibid).

2.4.3.3. Combination of forward and backward chaining

There are situations where inferring will be made based on the available data and generate a goal and works backward to find the details of the goal. In such situations,

the forward chaining is used to generate the goal and the backward chaining tries to prove the goal or goals. As the result both meet somewhere at the middle. In such kind of situations we said the combination of forward and backward chaining have been employed.

Looking the summary provided by (Anteneh, 2004) might help to further understand forward and backward chaining.

Trait	Forward Chaining	Backward Chaining
Solutions	Not pre-numerated	Pre-numerated
The goal is	Not necessarily known	Known
The objective is to:	Flash out all facts	Infer one key fact
Q and A from the Input required	No	Yes
Strategy	Build solution	Detect Solution

2.4.4. Explanation facility

Explanation facility is needed to explain the various questions that arise from users of the system like "why?" the expert system has asked a certain question and to explain how the system has arrived at a certain conclusion. In most cases these questions are answered by referring to the system goals; that is, to prove something (Cawsey, 1998).

The basic question to answer in this section should be "how to build an explanation facility?" According to (Ibid) to integrate an explanation facility involves keeping track of what rules help in arriving at conclusions and on the bases of which clarification will be made. From this one can understand the importance of keeping track of the rules used in arriving at a certain conclusion; and producing an explanation for the problem question that the user asks following the rules.

2.5. Legal Expert Systems

According to (Edwina et al, 2003) the field of AI and law is at least thirty years old; and within these periods a number of studies have been carried out. Though the aim of this section is reviewing those studies so as to understand how much is done on the area and the application of expert system in law, it would have been difficult to review all those papers that are undertaken since then due to two main reasons.

The first is the inability to find all the studies, and the second is not all the researches are directly related to this study and as the result it would turn out to be out of the scope of this section and this research at large. However, it is worth reviewing some of the studies so as to examine the relationship between expert system and law.

Legal AI studies can fall in to one of the two major categories; that is, legal retrieval systems or legal analysis system (Popple, 1991) (Popple, 1993). Legal retrieval systems facilitate users of the system to look at through databases which contains details of statues and decided previous cases; where as, legal analysis system consider a set of facts and establish the effect of those facts in a given area of law; which is the focus of this research.

Ibid has classified legal analysis systems in to judgment machines and legal expert systems. Judgment machines are machines that play the role of a judge like "X is guilty of violence against Y for the following reasons..." and legal expert systems can be defined in various ways. But for the purpose of this research the following definition is

adapted from (Popple, 1991). Legal expert system is a system that provides answers to legal inquiries that are in a form that one would expect from a human legal advisor.

Simulating a human legal advisor needs a clear understanding of the nature of law. This is due to the fact that the wide varieties of the characteristics of legal domain challenge AI. Moreover understanding its nature prevents obstacles from arising in later stage of developing the system. The following are the characteristics of law forwarded by (Edwina et al, 2003).

- Diverse categories of knowledge

Law has a wealth of cases, rules, theories, procedures, hierarchies of authority, norms and meta-rules.

- Explicit styles and standards of justification

Legal system by nature is made to be socially accountable; and this social accountability is the result of the overt behavior of the standards of justification.

- Different modalities of reasoning

In relation to different types of knowledge, there are different types of reasoning. Reasoning with cases alone, rules alone, and the combination of both are some of the ways of establishing reasoning.

- Specialized repositories of knowledge

There are large collections of cases which are available from different walks of life that contribute for repositories of knowledge in law.

- A variety of task orientations

Advocacy, adjudication, advising, planning and drafting, and administration are some among the varieties of task orientations, in legal areas. In advisory service for example, a lawyer examines a legal situation, typically while it is still evolving and before it becomes a full-blown disputes, and offers advice about alternative course of action and their legal benefits and risks.

- Open-textured concepts

Citing Shannon and Golshani (1988) (Popple, 1991) defines open texture as the natural indeterminacy of the meaning of words that are used to express the predicates of

statutes, sometimes other factors, such as vagueness. Legal concepts use open-textured concepts which need to be handled meticulously.

- Adversarial truth seeking

The major goal in legal process is the conjecture that through extensive examination of cases and rules truth will come out. Having such ideas in mind a law is devised, studied and investigated.

- Highly reflective

The legal domain is a very philosophical rational discipline. It constantly examines and re-examines its fundamental methods and missions.

These are some of the characteristics of law. Since the legal domain deals with many aspects of everyday activities such as commerce, finance, social justice, public health and many other sectors, it offers structure and constraints that may enable AI techniques to handle law's complexity and diversity (Edwina et al, 2003).

Another worth look at area of law in the design of legal expert system is jurisprudence. Quoting Susskind (1986) (Popple, 1993) emphasizes the importance of jurisprudence as "it is possible to build a legal expert system with out jurisprudential insight; but that such a system would be of very poor quality." Considering such fact, the following section reviews some of the major areas of jurisprudence as they have been reviewed in (Ibid) dissertation and considered relevant in the development of legal expert system.

2.5.1. Jurisprudence

Jurisprudence is the philosophy or science of law. Scientific and mechanical jurisprudence, judgment machines, petrification of the law, clear rules and clear cases and legal realism and rule skepticism are the major areas of jurisprudence which should be considered relevant to the development of legal expert systems.

2.5.1.1. Scientific and mechanical jurisprudence

Scientific behavior of law comprises principles for administration of justice. Citing Pound (Popple, 1993) points three things as a key which gives a scientific character of law. These are demand for full justice (for solution that go to the root of controversies), the demand for equal justice (adjustment of like relations under like conditions) and the demand for exact justice (justice which can be predicted in advance of action with reasonable limit). In other words conformity to reason, uniformity and certainty are the scientific aspects of law. Where as, the mechanical task on the other hand, enforces the citation of previous juries consults. In addition, the rules were at hand in a fixed and final form, and cases were to be fitted to the rules.

2.5.1.2. Judgment machines

In short the idea of judgment machines is making a machine judge that is capable of simulation and replacing human judges. This idea has been criticized for overestimating the capacity of machines ability to rationalize issues revolving around a case before making any legal decision which a human judge considers. Using D'Amato's sentence as cited in (Popple, 1993) "Surely computers do not make 'judgments' the way humans do, and so we would lose the 'human' aspect of legal judgments" might explain the reasoning behind the criticism in a much more vivid way. This idea is criticized since the main objective of legal expert system designers is building systems which provides advice to lawyers or lay people.

2.5.1.3. Petrification of the law

This happens when judgment is made on future predication based on past experience. This occurs when the computer is programmed, settled and stop progress. As the result individuals quit taking initiative to the future by stopping to take consideration of the new problem and the new phase of the old problem which imposes the idea of one generation on other [pond cited in (Popple, 1993)]

As (Popple, 1993) contends petrification has to seriously be considered in designing legal expert systems as it may cause the fore mentioned problems which judges and legal bodies need to be aware of.

2.5.1.4. Clear rule and clear case

This is another issue that rotates around the design of legal expert system. The argument here is what constitutes a legal system should clearly be identified though as (Edwina et al, 2003) says building a clear rule based system only or a case-based system alone is difficult. (Popple, 1993) advises the need of considering what the view of the law allows before adopting clear rules or clear cases or both so as to resolve the problem that may arise in building legal expert system.

2.5.1.5 Legal realism and rule skepticism

Drahos and Parker cited in (Popple, 1993) explain the underlying idea behind legal realism and rule skepticism as follows:

According to Karl Llewelly a characteristic feature of Realism was the rejection of simple (by which he meant general) rules and the substitution of more detailed classificatory schemes which better captured the skepticism emerges as a set of doubts about the veracity of legal actors' claims to be following the legal rules they say are. This is not rule skepticism in the strongest sense of denying the existence of rules, however legal actors may simply be followed some other rules. The rule skepticism of American realism could perhaps be more accurately described as rule cynicism.

As it can be understood from the above explanation realism concentrates on producing details rather than considering simple (general) rules which can't capture the specific nature of rule-making in courts. Rule skepticism on the other hand doubts the trueness of legal issues which are forwarded on the bases of legal rules.

Since the legal expert system is designed using a rule-based approach, it would be good to review some of the legal expert systems designed using a rule-based approach.

2.6 Rule-based systems

As (Popple, 1993) has discussed the work of McCarty, Bench Capon, Kowalski and Sergot, Gardner and Sussking as the most important rule-based systems, in the subsequent section these works will be reviewed. However, before dwelling in to the works of those experts, it is better to look at some of the works that have been done in the area so as to have a glimpse of the development of rule-based systems.

The first proposal for rule-based system according to (Ibid) was made by Buchanan and Headrick in 1970. Their approach is based up on the assumption that problems can be broken down in to a set of sub problems and the solution to any sub problem requires a series of decisions that are governed by decision rules.

The Judith system which uses rules to represent parts of the German civil code was developed by Popp and Schlink. The approach used to develop Judith is similar to that of MYCINE. The other is the Michaelsen and Michie's TAXADVISOR (which is designed to help lawyer to advice clients on taxation and estate planning.) is implemented using MYCINE.

Litigation DecisionMaking System is a rule-based system made by Waterman and Pererson. It does not determine whether liability exists, but is designed to assist legal expert in settling product liability cases. Stamper's LeGOL language also uses rules to represent legal norms. Pattison and Ciesielski use rule-based system to review contracts. SoftLaw's STATUTE, a commercially successful system uses rules to represent statutes, regulations and departmental guidelines in taxation, social security and veterans' affairs law.

2.6.1. McCarty

He is one of the giant figures in the field of AI and Law; and that is why he is described as "the father of AI and Law". His TAXMAN project was concerned with the development of a computational theory of legal reasoning, using corporate tax law as an experimental problem domain.

He claims that a computer-based legal consultation system must be able to represent the "facts," at some comfortable level of abstraction, and the "law," which would consist of a system of "concepts" and "rules". These concepts and rules are relatively abstract (i.e., they subsume large classes of lower-level factual descriptions), and they have normative implications (i.e. they specify which actions are permitted and which are obligatory).

Following the assumption legal analysis, in its simplest form, would then be a process of applying the "law" to the "facts", McCarty concedes the representation of facts in such a system as more difficult than in other expert system since the fact of a legal case involve all complexities of daily life like human actions, beliefs, intentions, motivations etc. addressing such complexities is not an easy task.

2.6.2. Bench-Capon, Kowalski and Sergot

They use prolog to model statutes. They believe that the formalization of legislation by means of rules has almost all the characteristics of an expert system. They say that before knowledge can be formalized, it has to be elicited from the subconscious of an expert and eliciting this knowledge is the major bottleneck in the construction of expert system. However; it is completely absent in the case of legislation which is formulated and written down. Thus the uses of expert system techniques for representing legislation have virtually all the advantages of expert systems without the attendants' disadvantages of eliciting the knowledge.

2.6.3. Gardner

The aim of Gardner's research is not to develop a program that "solves" legal problem instead the objective is to enable the program to recognize the issues a problem raises and to distinguish between those it has enough information to resolve and those on which competent human judgments might differ.

Gardner's system has four different levels, the last of which is not implemented. The Network level is an alimented transition network which represents legal-states and events. The rule level is a set of rules which operate on objects at the first level. These rules are definition of the major concepts in the law of offer and acceptance. The Third level is a set of examples which explain those predicates in rule level which are undefined, but whose resolution is clear this indicates (non-legal) common sense knowledge.

2.6.4. Susskind

He has involved in the development of the latent damage of system; a legal expert system concerned with the time periods within which claimants may start negligence proceedings where they have suffered latent damage or loss.

He believes that statutes and some cases- the clear cases- can and should be represented using rules.

2.7. Domestic Studies

After examining what has been done by scholars out side Ethiopia, embarking upon some of the studies that have been done locally specially available here in the bibliographic lab of the department of information science will be good to understand how much has been done on the area of expert system in general and legal expert system in particular. In the following section the works of Samir (2001), Tesfaye(1997), Melaku (1997), Ethiopia (2002), Gadissa (1996), and Anteneh (2004) and Azene (1996) will be reviewed.

Samir tries to explore the applicability of expert system in the area of species selection and demonstrated it by developing a prototype. In his six-chapter thesis he tried to achieve his objective by employing interview (both structured and unstructured) followed by a prototyping approach. He used knowledge pro and tries to test the prototype by analyzing the acceptability of the recommendation produced by the system by users and experts.

His thesis is organized in to six chapters. The first chapter deals with the introduction of the research including objectives of the study. Review of literature on expert systems and application of expert in the area of forestry is presented in chapter two. He gives some highlights about plantation information in chapter three. Chapter four is the knowledge acquisition section which includes the interview made knowledge structuring and modeling process. In chapter five, the development of the prototype expert system has been discussed using a sample demonstration of the user interface. Chapter six presents recommendation accompanied by concluding remarks.

Another work on expert system is Tesfayes's paper on exploring the possibilities of using expert interfaces to hypertext databases for business information storage and retrieval. In his paper he tries to explore the possibilities of using expert interfaces to hypertext databases for business information storage and retrieval. He tries to integrate the expert user interface with the hypertext for those users interested in using the expert interface and get a more condensed and narrow and relatively precise result. Though his paper falls in to IR, the design of the expert user interface makes it share some of the domain in expert system.

Melaku's paper tries to integrate expert system and hypermedia technology to develop a tourist information system. His main objective was to design and develop a prototype information system containing integrated expert systems and hypermedia technology for

guiding tourists planning to visit Ethiopia. He employed prototyping approach and used an expert system shell to develop the system.

Anteneh tries to develop a prototype knowledge based system with a view to explore the applicability of expert systems for highly active anti-retroviral therapy (HAART). He used the rule-based knowledge representation method and knowledge-pro as a system development shell.

Another endeavor on expert system is Azene Zenebe. He developed a prototype expert reference advisory system for Ethiopian Studies for demonstrating how the expert system technology could be used to solve the problems of the reference service in the domain. He collected required data and knowledge for the study using literature review, interview, protocol analysis and observation of actual activities at the selected library and used prototyping approach and knowledge Pro to develop the system.

Gadissa's thesis is a prototype expert system for personnel selection and promotion: a case study of federal civil service commission of Ethiopia. He tries to experiment the applicability of expert system for personnel selection taking personnel selection for promotion specifically in federal civil service commission of Ethiopia. He extracted knowledge from domain specialists using discussion, written documents and analysis of actual cases processed and implemented using shell.

The theses that are reviewed briefly above show how much work is done so far in relation to expert system. They may not be related directly to this thesis however; a more related thesis would be the one developed by Ethiopia. The thesis tries to demonstrate the application of case-base reasoning for Amharic legal precedent Retrieval. She developed a prototype using a CBR0works after collecting decided cases on the bases of similarity measure. Her thesis differs from this thesis in the following way. Her thesis is a legal retrieval system which uses previously decided cases to

retrieve cases that are potentially relevant to new cases or query. However this thesis is a legal analysis system which uses rules (codes) as its main source of knowledge.

This chapter reviews various essences of expert system and studies that have been done both locally and internationally. This section dwells in depth in to legal expert system to establish an overview of the works that have been done. The next chapter concentrates on women and legal domain in Ethiopia.

Chapter Three

3. Women and the Legal Domain in Ethiopia

3.1. Introduction

In this chapter the major legal issues associated to women of Ethiopia and one of the organizations taking initiative to create awareness towards women legal rights are discussed. In addition a brief summary of the Revised Family Code and the Labor Law is also given. Towards the end of this chapter a comparison of the programming tools available to AI are discussed on the bases of which the programming tool to be employed for this thesis is chosen.

3.2. Representation of Women in the Legal Domain

Various legal analyses have been carried out to examine the representation of women in Ethiopian legal domain. The studies tries to see whether the practice in courts conform to the written codes. In this section we tried to summarize those studies.

In addition to the civil code, the Ethiopian takes in to account Fetha Negast, Sharia, and the Geda system. Fetha Negast combines both spiritual and secular matters, Sharia is the religious law of the Muslim, Geda is the socio-political system of the Oromo people of Ethiopia (Daniel; 1980). Let's take one social aspect to make representation of women in the customary laws more clear. For example, for marriage the Fetha Negest suggest 15 years of age for women and 18 years of age for men, the Sharia 9 years for women 12 for men, and the Geda system suggests 16 for women and over 20 for men. This fosters men to assume a parental role in relation to his wife due to his maturity and experience in life once he marries a woman younger than himself (Ibid).

This customary attitudes and practices are deep-rooted in the society. Such practices account for and explain women's representation in the customary laws. This is an instance depicting women representation in the customary laws. Wiping these traditional attitudes and practices at once could be an infeasible act. However;

combating them gradually in one side and providing affirmative action on the other side is the most appropriate way of approaching such practices and attitudes.

Affirmative action implies the purposeful use of criteria (age, race, gender, nationality) for the purpose of benefiting a previously discriminated group against some criteria (Emazat; 2001). We have seen an example on how women are represented in the customary practices of Ethiopia. In addition, domestic problems of Ethiopian women are far from being fully recognized by various concerned bodies. This is mainly due to the fact that any act of violence occurring within a family is kept behind closed doors (Rakeb; 1997). Due to these and many other unreported reasons the women experience discrimination as the result implementing affirmative action would be one way of fighting against discriminatory customary practices.

Domestic violence includes all acts of gender-based physical, psychological and sexual abuse by a family member against women (Rakeb, 1997). This abuse may range from simple assaults to aggravated physical battery, threats, intimidation, coercion, humiliating, verbal abuse, destruction of property, sexual violence, marital rape, female genital mutilation, violence against household workers and last but not least attempts to commit such acts. In her research Rakeb tries to establish how deep and how wide the problem is by taking a sample from Addis Ababa police offices. She further tries to establish the magnitude of the problem by taking different sample cases. In her finding Rakeb contends that the charges given by the courts for the abuses are not compensatory.

3.3. Ethiopian Women Lawyers Association (EWLA)

One organization currently working to promoting the economic, political, social and legal rights of women in Ethiopia is the Ethiopian Women Lawyers Association. As has been pointed in the organization activity report of January to December 2003, few women lawyers found the organization in 1995 with the view of achieving the following specific objectives:

- ✓ The elimination of all forms of legal and traditionally sanctioned discriminations against women,
- ✓ The ensuring of equal treatment of women with men in education, employment, access to public services and benefits,
- ✓ The advocacy of remedial and affirmative measures of women to redress accumulated consequences of discrimination.

With the view of achieving such objectives, the organization is currently undergoing lots of activities like Research and law reform Advocacy, Public Education, Training and Advocacy, and Legal Aid services.

Researches have been undertaken in EWLA, which will be used as sources of law advocacy and public education program with respect to women. In addition, training for female students and women employees, and publications are some of the activities done under Public Education, Training and Advocacy Program. Moreover EWLA is providing legal aid services to women who are victims of gender-based violence free of charge. The services include legal advice/ counseling, writing court briefs such as court charges, affidavit and representing clients in court. Currently the association has branch offices in Bahir Dar, Awassa, Diredawa, Nazerth, Gambela, Assosa and its head office is in Addis Ababa. EWLA has 60 voluntary committees at woreda and Zonal level. As compared to the magnitude of the problems women are facing, the researcher contends that the branch offices and the voluntary committees are not enough. Consequently there should be a way to disseminate both the services and the knowledge of those voluntary expert workers.

3.4. The Revised Family Code

The Revised Family Code is organized under thirteen chapters. Each chapter has its own sections and articles with in the sections. It becomes necessary to make existing Ethiopian Family Law in accordance with the socio-economic development of the society. With the constitution of the consent of spouses, which guarantees the equality

of the spouses during the conclusion, duration, and dissolution of marriage, the family law has been revised and made applicable to the general public as of 4th of July 2000. The code has 323 articles circulating around different issues like marriage, upbringing of child, settling disputes arising in family and the like. Since most Ethiopian woman problem is domestic, the Revised Family Code is used here in this study to develop the desired expert system.

3.5. The Labor Law

The labor law proclamation No. 377/2003, which is used for this study, has twelve parts. Each parts with its chapters and sections. It circulates around the principles that govern worker-employer relations and labor administration. The law is also applicable to employment relations based on a contract agreement that exist between a worker and an employer. The proclamation is not applicable to relations contracts for the purpose of upbringing, treatment, care or rehabilitation or contracts for the purpose of educating or training other than apprentice. Though there are various articles in the Labor Law, only articles that are relate to women working conditions are represented for the development of the prototype.

It has been tried to establish in the above section that most Ethiopian women problem is domestic. In addition, according to the report of EWLA, marital disputes and cases of paternity are the most prevailing civil cases that are mostly brought to the legal aid center. Issues like this are addressed in the Family Code. Moreover, there is a special section dedicated to the working conditions of women in the labor law that is represented in the knowledge base of the expert system. Though the other sections also concerns women in one way or another, they are not represented in the knowledge base of the prototype since the problems are not gender-specific and their occurrence are relatively less persistent.

3.6. Programming tools

For the development of the prototype expert system various artificial intelligence programming tools were considered. The following section dwells on the comparisons made to choose the reasonable programming tool for developing the desired expert system. There are about three distinct types of programming tools which can be used to build expert systems. These are programming languages, knowledge engineering environments and shells (Melaku Kebede, 1997).

3.6.1. Programming Languages

These are programming languages, which the programmer starts writing the program from the scratch to build the desired system. Examples of artificial intelligence programming languages include prolog and lisp. They require programming experience and takes extra time of development as compared to other programming tools of expert system development.

3.6.2. Knowledge Engineering environments

They provide a set of building blocks, which aim to accommodate programmer's need, sometimes known as toolkits. They fall between shells and programming languages. Knowledge engineering environments provide a flexible building blocks approach.

3.6.3. Shells

Shells help to build an expert system. They already have the inference engine and a knowledge base editor which the programmer has to spend a relatively large amount of time in developing the knowledge base using these available editors. The developer need not necessarily be a programmer. In addition, shells provide easy interfacing, fast development, runs on standard hardware, and low initial cost. Considering the above advantages of shells, a shell known as Knowledge Pro for windows is used for the development of the prototype.

Chapter four

4. Knowledge Acquisition

This chapter deals with the process of knowledge elicitation and modeling, and the consequent concepts obtained about Ethiopian women legal advisory services.

Knowledge acquisition is the transfer of problem solving expertise from some knowledge source to a program. Some sources of knowledge include: human experts, textbooks, databases and personal experience (Anteneh, 2004).

4.1. Steps in knowledge acquisition

Citing Benchimol, Levine and Pomerol (1987) (Anteneh, 2004) pointed out that knowledge elicitation is the most crucial section of knowledge acquisition process.

In this research, the Revised Family Code and the Labor law are used as a primary source of knowledge. Concepts needed in women advisory service were learned in consultation with a lawyer professional, providing consultancy service to women, in the Ethiopian Woman Lawyer Association. In addition, discussion with lawyers is made for solving open-textured concepts. Important parameters were identified by a thorough examination of the codes.

The process where knowledge engineers use concepts found during knowledge elicitation phase to build model is knowledge structuring. The knowledge used for building the expert system is divided into three modules, i.e.

- knowledge regarding women advisory service related to
Family problems
- knowledge regarding women advisory service related to
Labor Problems
- Other comprises problems different from the above two.

A hierarchical tree structure is used to model the above concepts. That is to say a concept is depicted at the higher level of the hierarchy and branching out of the main concept down to the hierarchy represents factors. The hierarchical tree modeling is preferred due to its ease of use for modeling and simplicity to explain the facts used in women advisory provision.

In the hierarchical tree modeling, circles are used to represent the concepts and the arrows moves from the higher level to the branch till there exist no successor of the branches.

4.2. Conceptual Modeling

Conceptual modeling is an activity, which provides an implementation independent model of the knowledge to be represented in the knowledge base. WoLA is an expert **Women Legal Advisory**, which is rule-based advisory system. The main reason to make it a rule based advisory system is the legal system in Ethiopia is based on rules.

Though consultation is made with people in the Ethiopian Women Lawyer Association (EWLA), for conceptual modeling of WoLA, the researcher found it better to model his system using the Revised Family Code and The Labor Law. This conclusion is arrived after analyzing the fact that most Ethiopian women are reluctant to report their problems and seeking for advice due to so many social influences. As the result the researcher believes the cases gathered from EWLA might not be a representative of the problems facing and circulating around women. In addition, WoLA is not a case-based reasoning which bases it self on previous cases.

The Revised Family Code can broadly be classified under topics such as: marriage, filiations, adoption, obligation to supply maintenance and minors. To address women in the labor law, part six of the labor law, which states the working condition of women, would be uses.

Broadly speaking, the marriage topic focuses on issues of conclusion of marriage, effects of violations of essential conditions of marriage, effects of marriage, dissolution of marriage, liquidation of pecuniary relations between spouses, proof of marriage, irregular union, and settlement of disputes arising out of marriage and irregular union. Working condition of women in the labor law gives a general remark about women employment and maternity leaves.

4.3. WoLA

WoLA indicated In Fig 4.1 has three major components. These components of WoLA are the major topics in which women advisory are made. The topics are Family related problems, labor related or others.

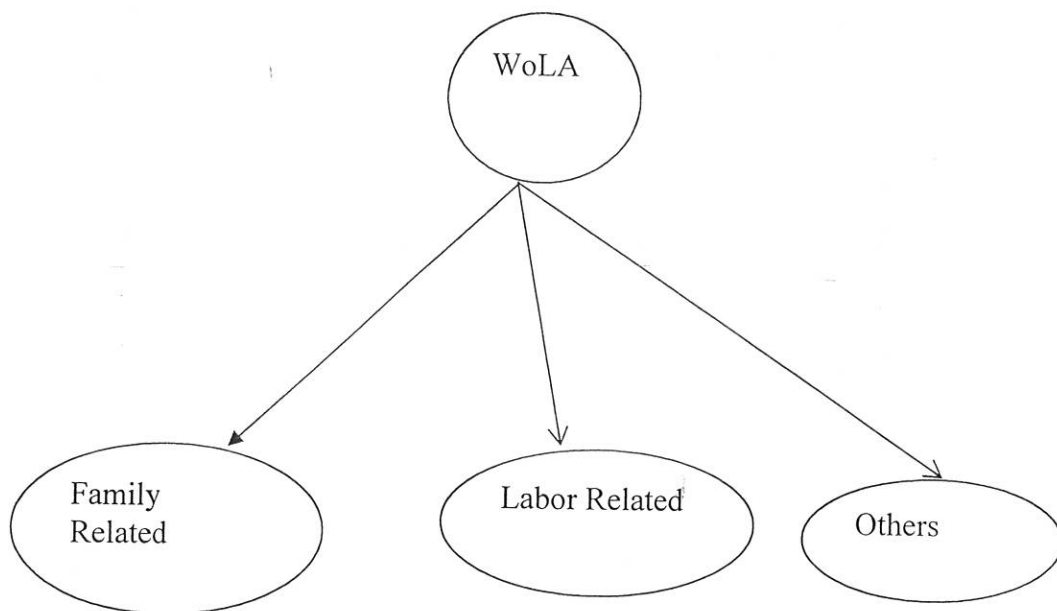


Fig 4.1. Major concepts in Women Legal Advisory

4.3.1. Family Related

As has been stated above, the family related problems are found in the Revised Family Code. The Revised Family Code focuses on many topics, from these major topics,

marriage is the topic that will be used to represent for the advisory. This is due to the fact that marriage is the major problem that would directly associate to problems facing women in Ethiopia (EWLA, 2003). Fig 4.2 indicates the major components of Family Related Problems.

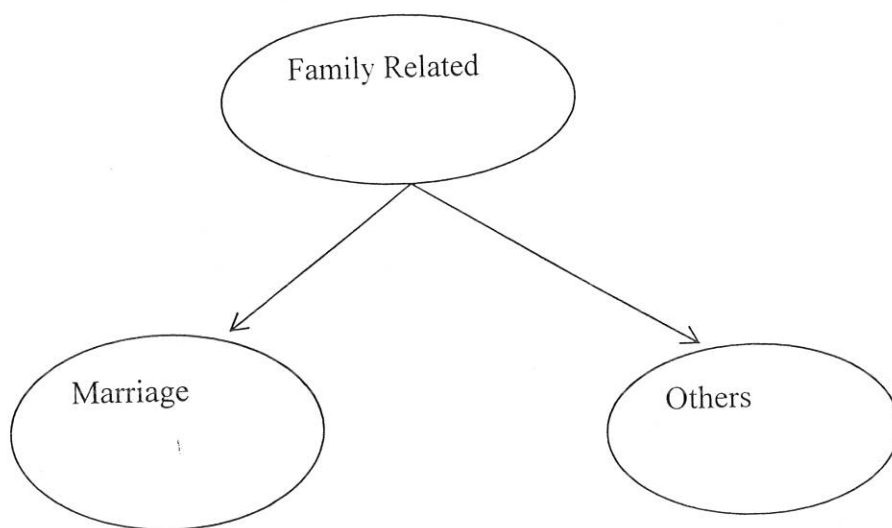


Fig 4.2. Concepts under Family Related Problems

Marriage

Marriage is one of the major topics employed in the advisory service. It is a family related issue, which is found in the Revised Family Code. Marriage is dealt from chapter one to eight in the Revised Family Code. Each chapter has its own issues to focus on. Conclusion of marriage, effects of violations of essential conditions of marriage, effects of marriage, dissolution of marriage, liquidation of pecuniary relations between spouses, proof of marriage, Irregular union and settlement of Disputes arising out of marriage and irregular union are the topics from chapter one to eight respectively which are indicated in Fig 4.3.

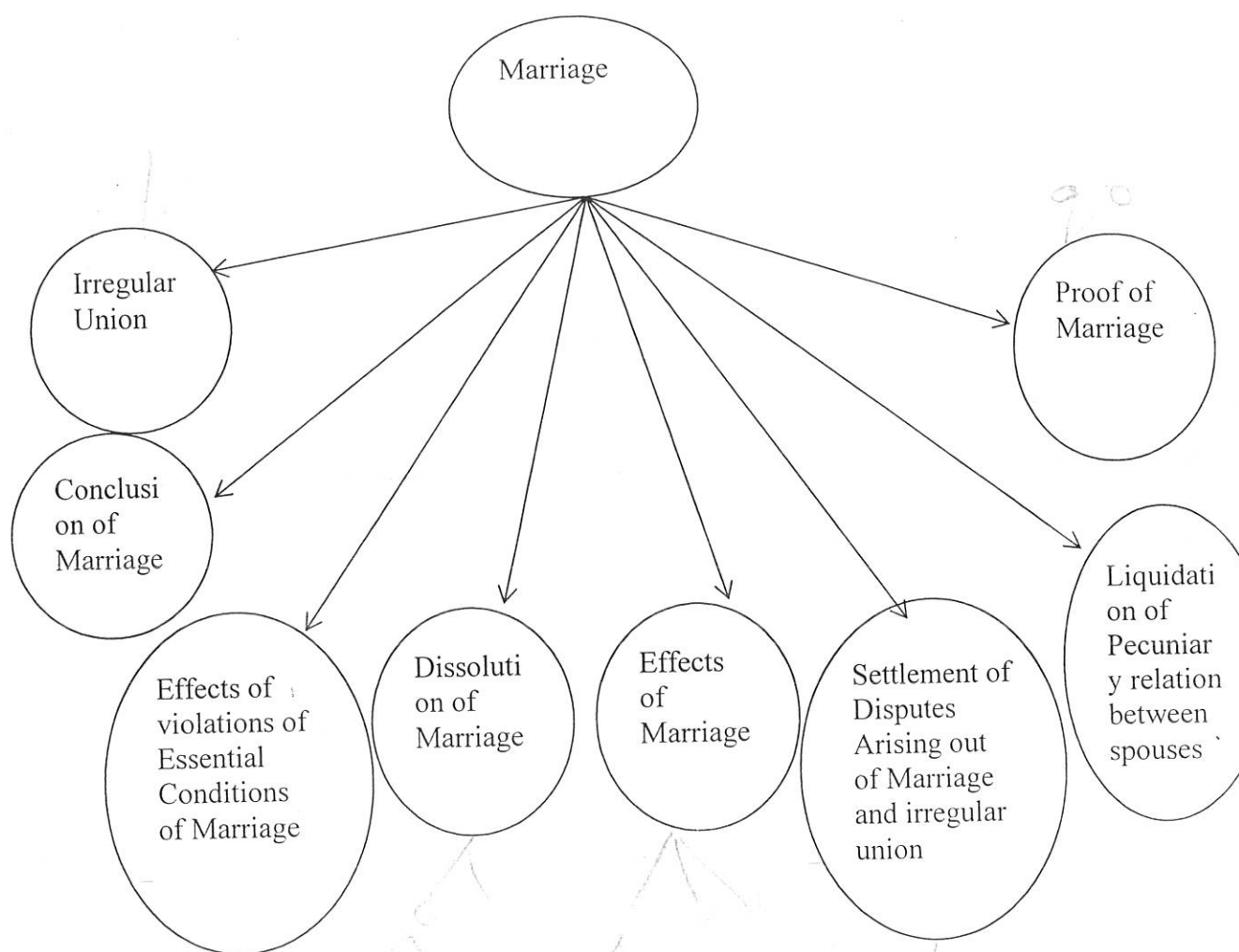


Fig. 4.3 Major concepts under marriage

Conclusion of Marriage

Conclusion of marriage refers to arrival on decision of getting married by a woman or a man. This parameter consists of six sections under it, which is: general issues about marriage, essential conditions of marriage, opposition to marriage, marriage celebrated before an officer of civil status (civil marriage), other marriages and lastly registration of marriage as indicated in Fig 4.4. These topics will help women to understand some highlights about conclusion of marriage. In addition, these issues will help women to

understand about essential conditions like how old women have to be before getting married and what is the essential thing she has to know before concluding her marriage.

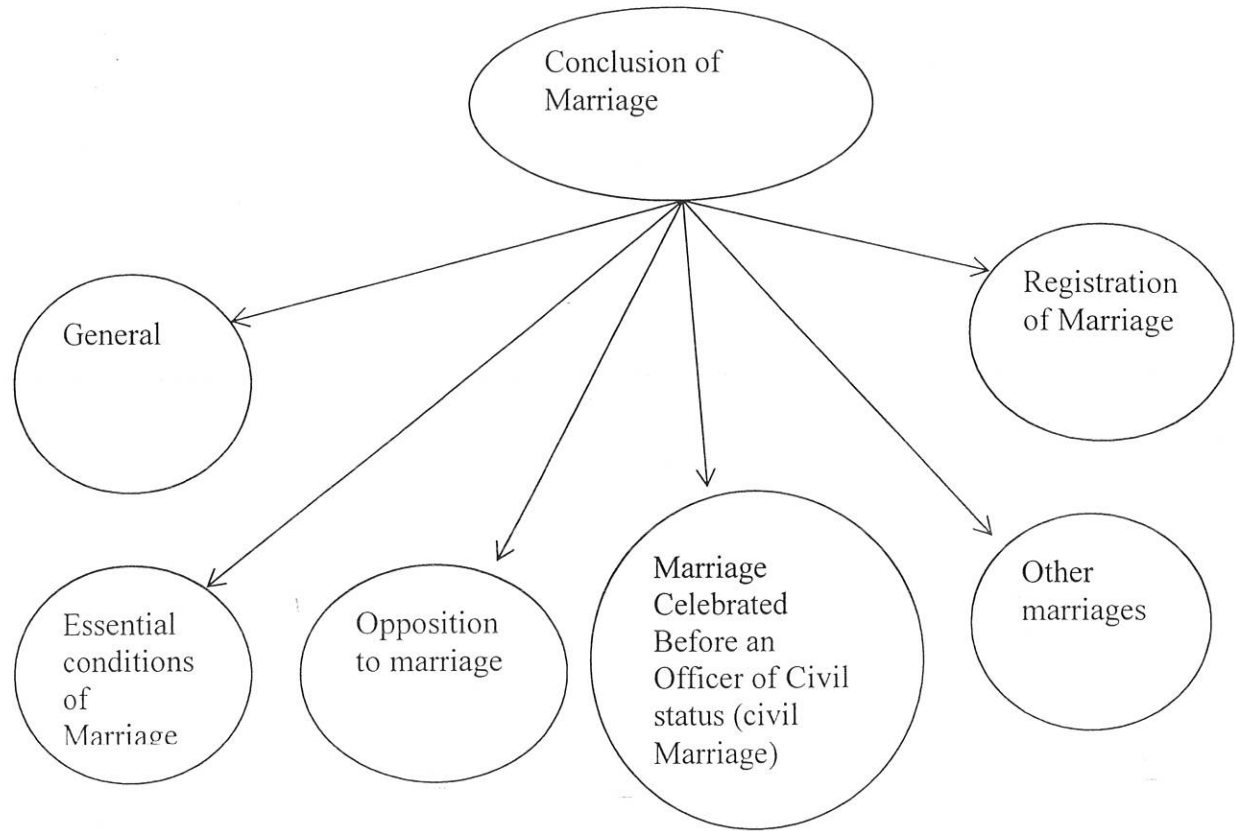


Fig 4.4. concepts used to model the conclusion of marriage

General

The general section under conclusion of marriage has five articles that state about the various forms of marriage, marriage concluded before an officer of civil status, religious marriage, marriage according to custom, and marriage celebrated abroad which are indicated in Fig 4.5. This section helps to understand the foreground about conclusion of marriage, which in turn facilitates the advisory service provision.

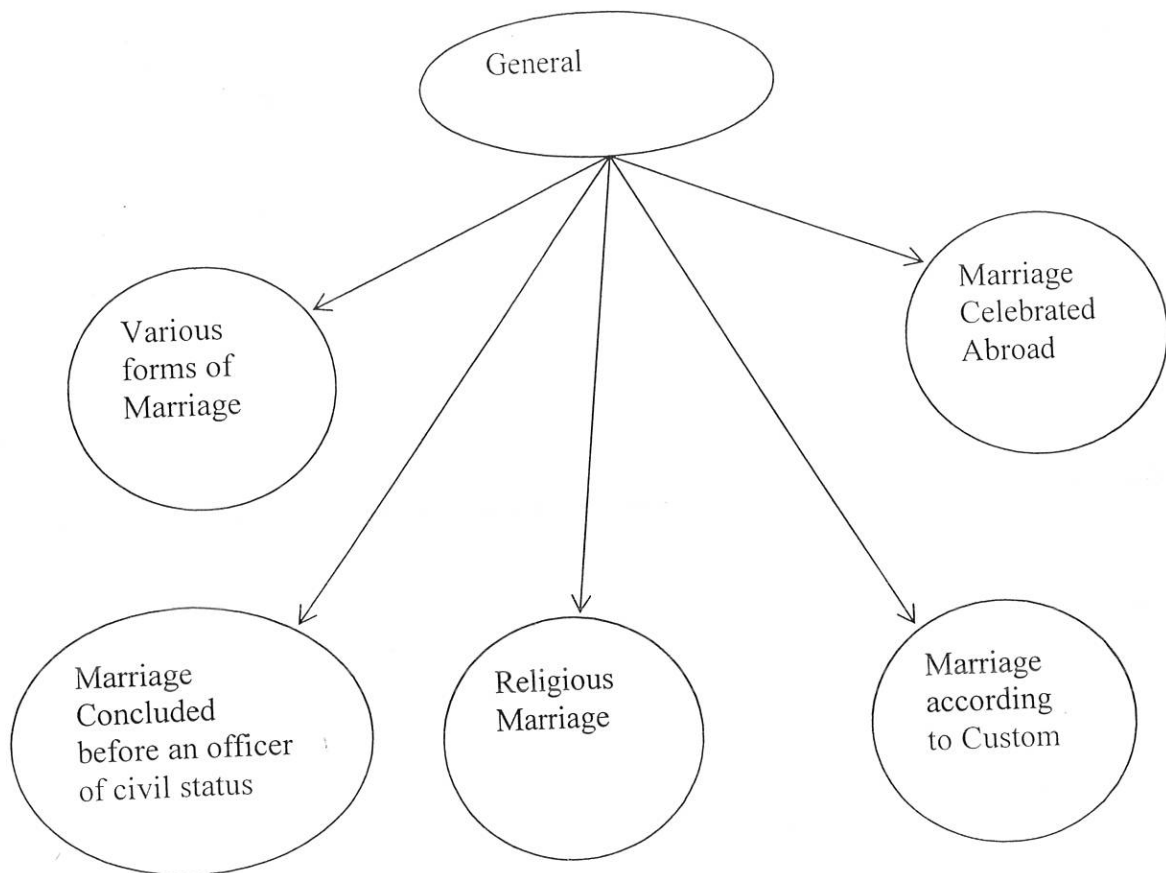


Fig 4.5. General concepts in conclusion of marriage

Essential Conditions of Marriage

As we can easily see from the section topic, there are essential conditions that should be fulfilled before concluding a legal marriage. For example, to prove whether a legal marriage has taken place or not, one has to know what the essential conditions of marriage are. The same is true for the advisory service provider, the service provider supposed to know the elements of these essential conditions of marriage, so as to give a better service. Fig 4.6 indicates the concepts depicting the essential conditions of marriage.

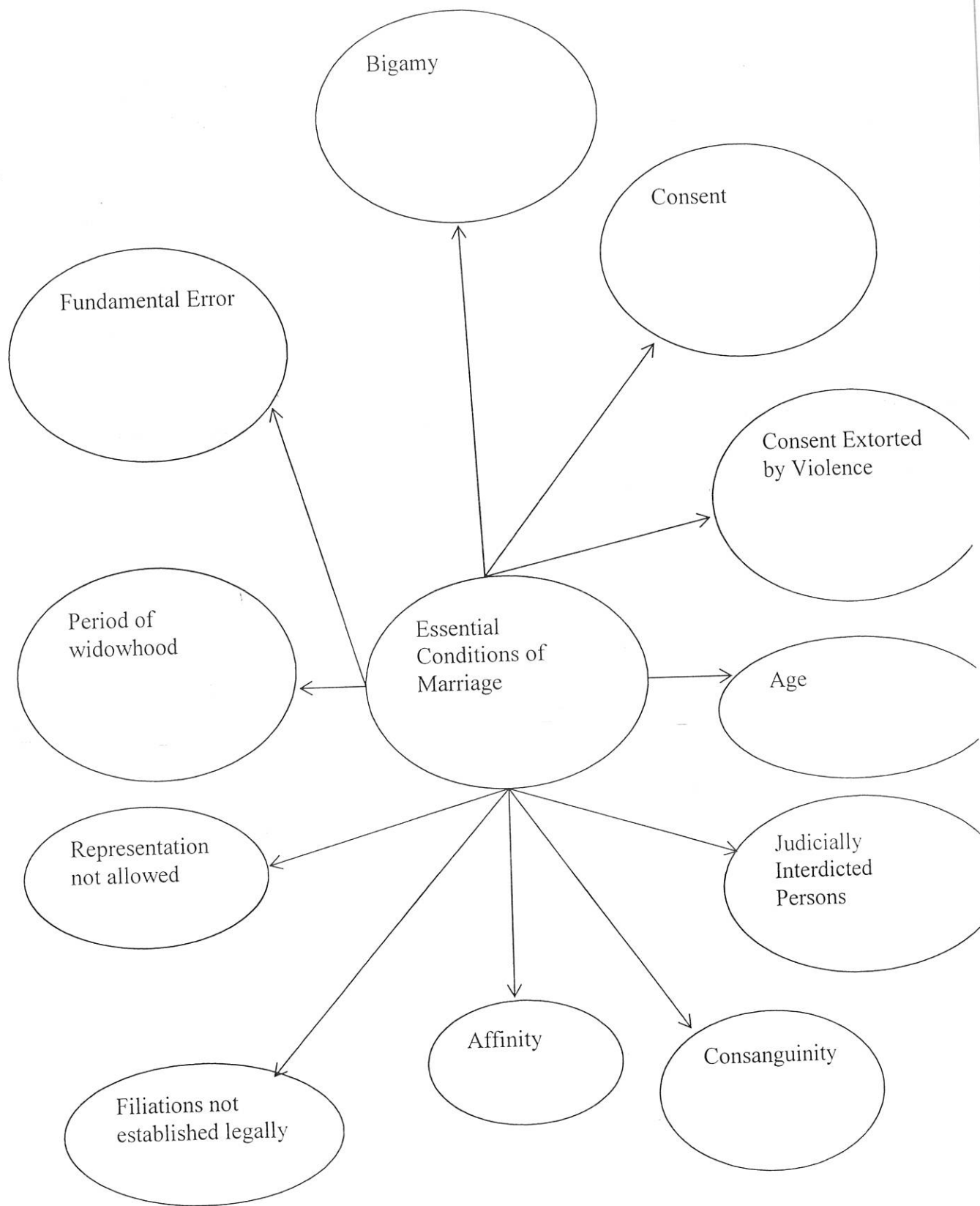


Fig 4.6. concepts depicting the essential conditions of marriage

Opposition to Marriage

This is another important section under the concluding marriage topic. This section will help advisory seekers and advisory provider, to understand and examine how opposition to marriage can be made. The concepts used in the opposition to marriage are indicated in Fig 4.7.

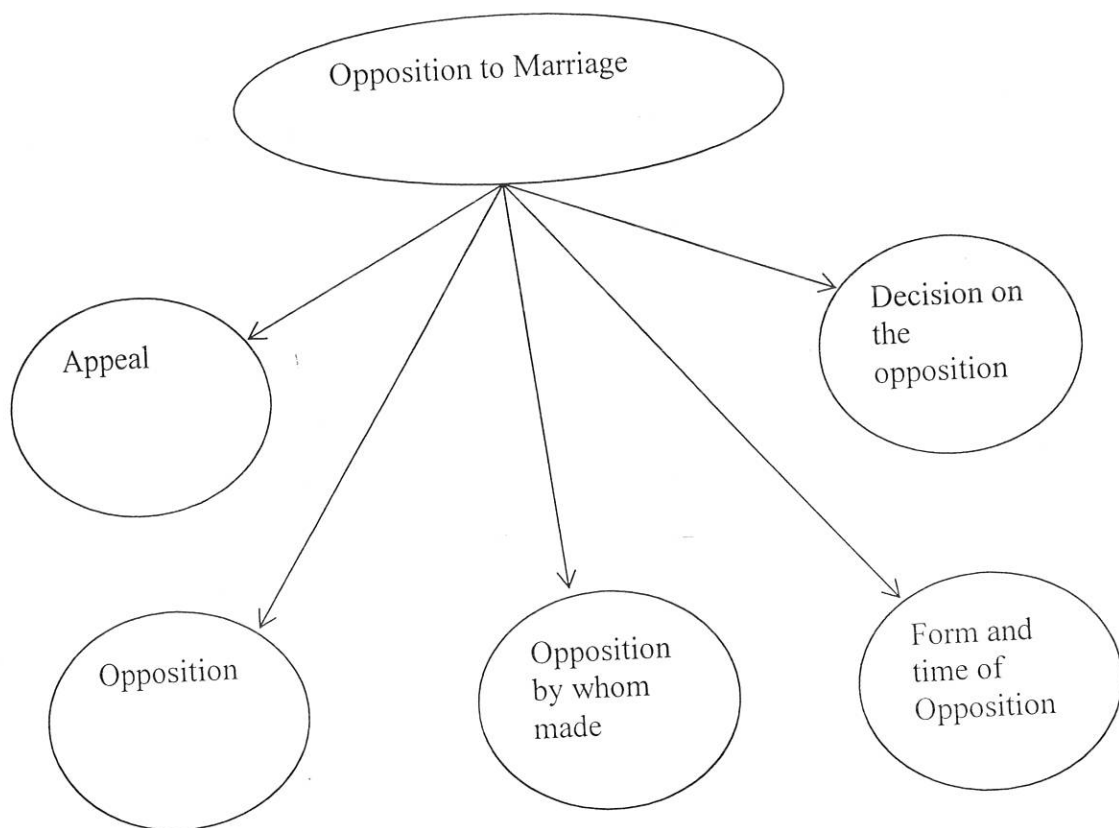


Fig 4.7 concepts used in the opposition to marriage

Marriage celebrated before an officer of civil status

(Civil Marriage)

This section discusses about how marriage shall be concluded before an officer, how shall the future spouses inform the person of civil status and such similar topics. This will help in understanding the legal ideas about conclusion of marriage before an officer of civil status. The representation of the concepts is indicated in Fig 4.8.

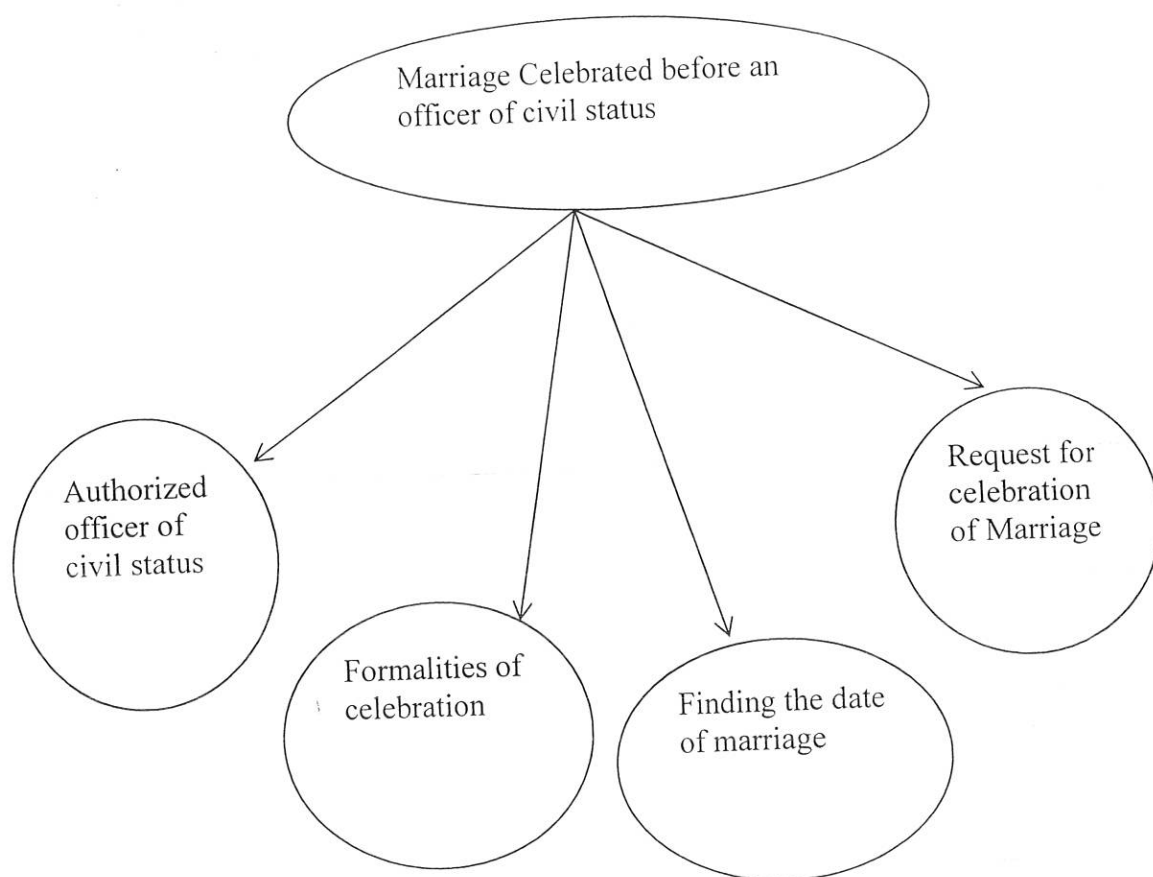


Fig 4.8 major concepts used in validating marriage celebrated before an
An officer of civil status

Other Marriage

This section provides legal information about other types of marriage that took place according to culture or religion of the spouses. This again helps both the advisory seeker and the advisory provider how acknowledgment of customary and religious marriage will react within the legal codes. Fig 4.9 indicates the concepts represented under this topic.

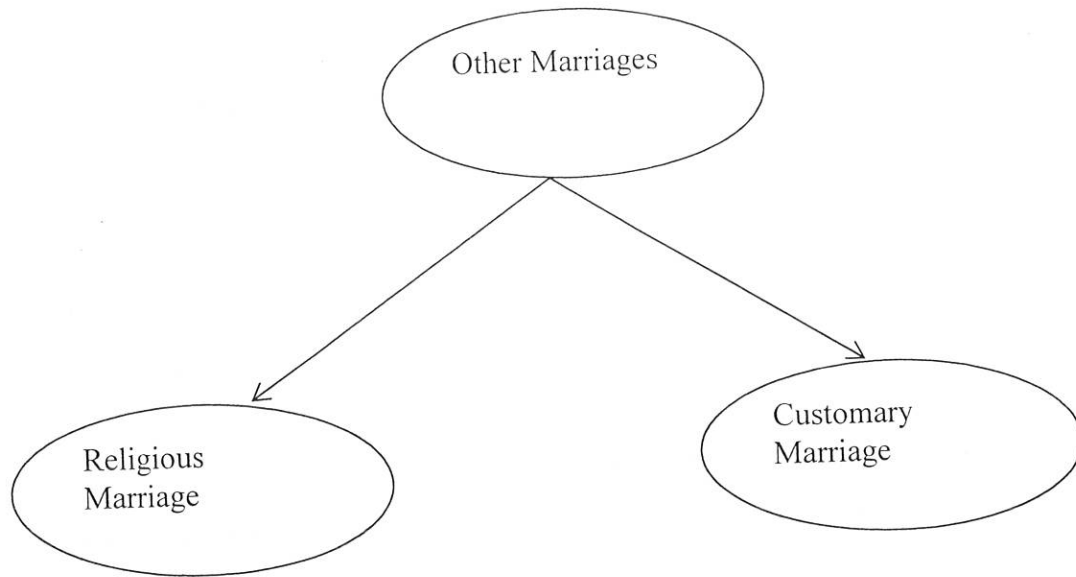


Fig 4.9 concepts used in modeling the different types of marriage

Registration of Marriage

Legal bodies or other legally authorized parties should recognize the concluded marriage. As a confirmation to this, the concluded marriage should be registered. Being aware of such fact will help advice seekers to understand the necessary legal requirements about the conclusion of marriage, which is indicated in Fig 4.10.

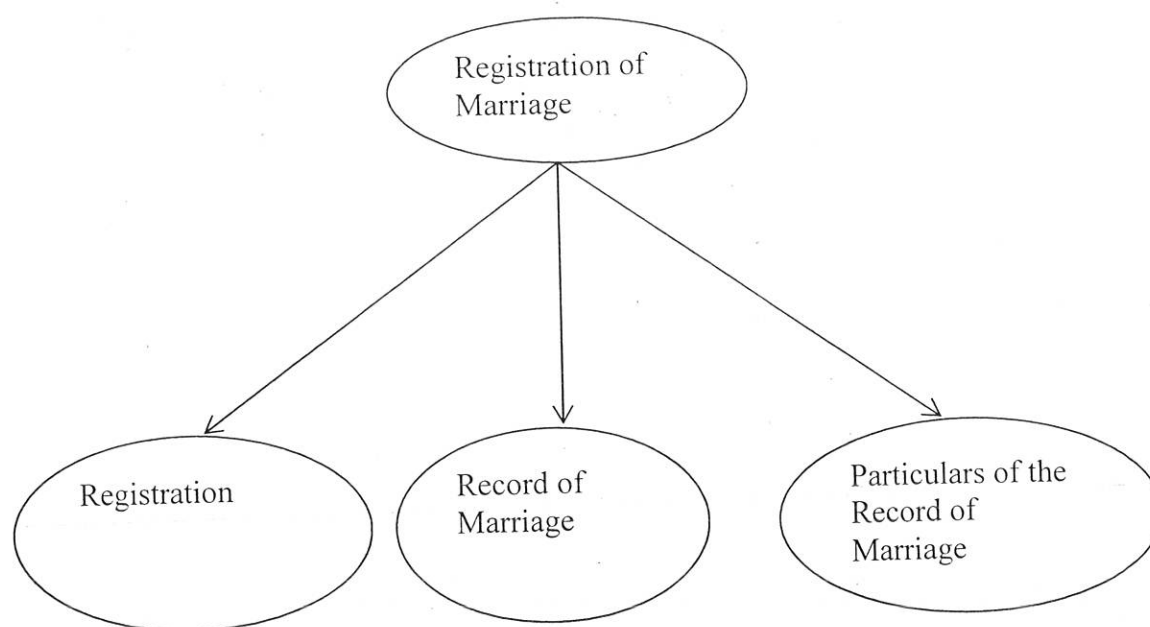


Fig 4.10 Important concepts in the Registration of Marriage

Effects of violations of Essential conditions of Marriage

This topic is another important section for women advisory. Especially for women who do not know what the law enforces if any act of violence has been taken place on them. This topic, which are indicated in Fig 4.11, has eight articles stating about Age, Consanguinity or Affinity, Bigamy, Dissolution of Marriage of Judicially Interdicted person, Act of Violence, Error, Period of Widowhood, Incompetence of officer of civil status and Non-observance of Formalities.

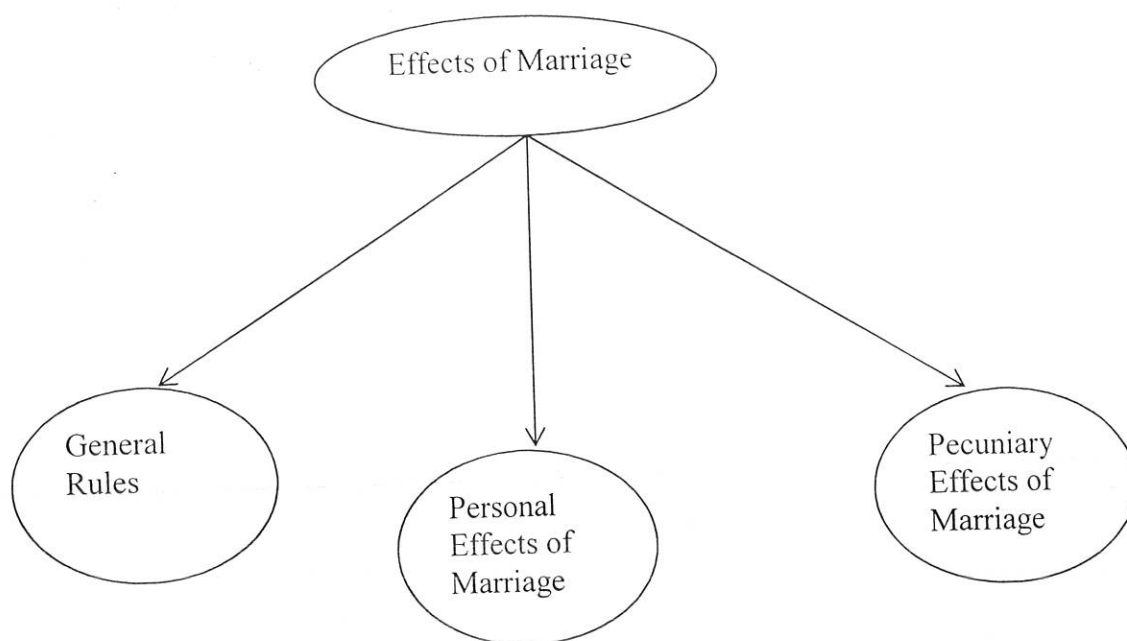


Fig 4.12 Effects of marriage

General Rules

This section has nine articles as indicated in Fig 4.13, which states about the various forms of marriage equivalent, Consummation of marriage, contract of marriage, incapacity of Spouses, forms of Contract, Deposit of contract, Restrictions to Freedom of Contract, modification to contract marriage and legal regime. These issues are also important in the provision of advisory.

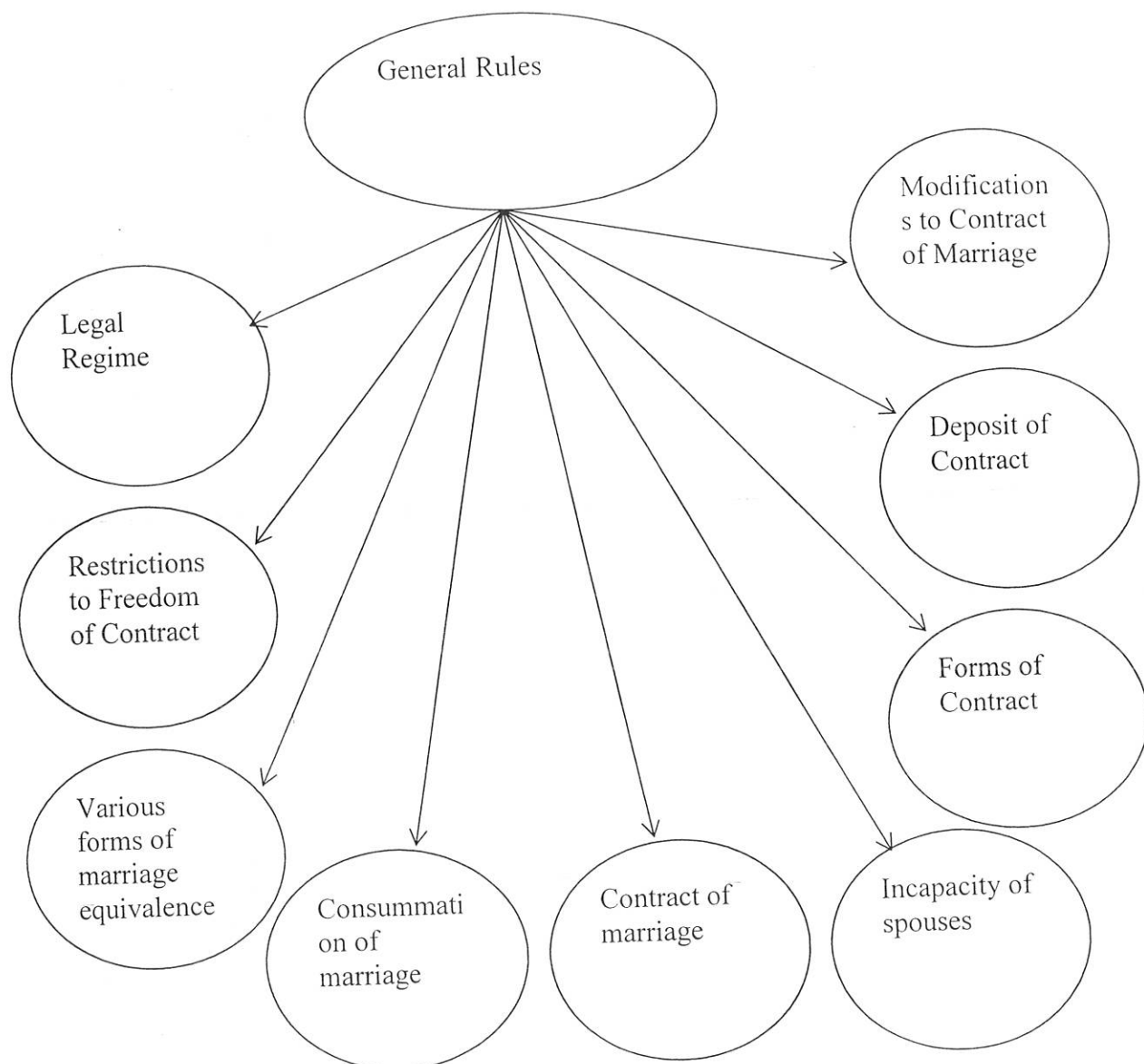


Fig 4.13 General Rules on the Effects of marriage

Personal Effects of Marriage

As one goes along the hierarchical tree structure of marriage, personal effects of marriage is another significant area of consultancy provision to women since women have to know about the personal effects of marriage, which are indicated in Fig 4.14 as areas where advisory providers should be aware of.

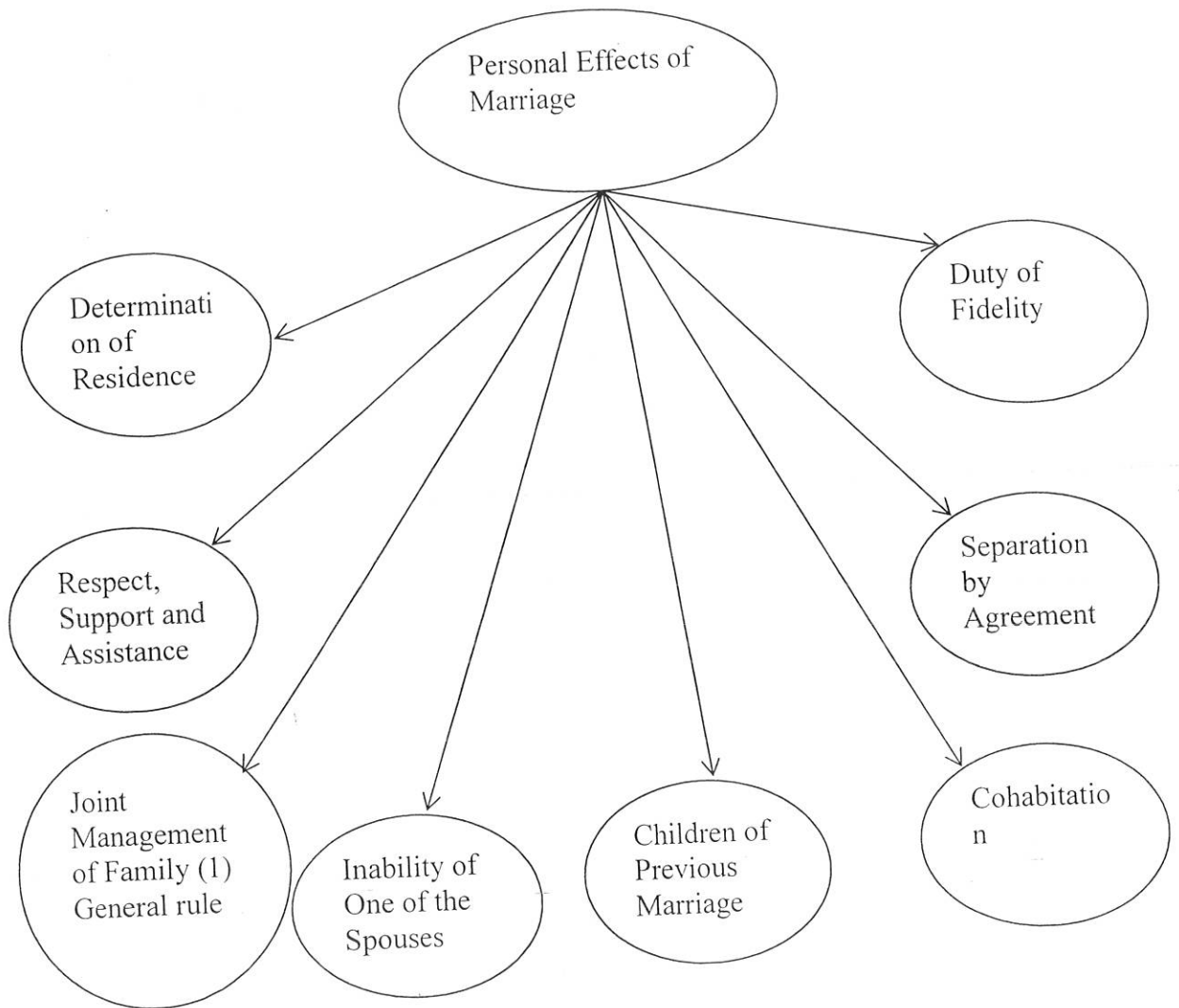


Fig 4.14 Personal Effects of Marriage

Pecuniary Effects of Marriage

This section focuses on personal property of spouses, administration of property of spouses, determination of contract of marriage, agency, common property of spouses and the like which provides a great source of information to advisory provision which are indicated in Fig 4.15.

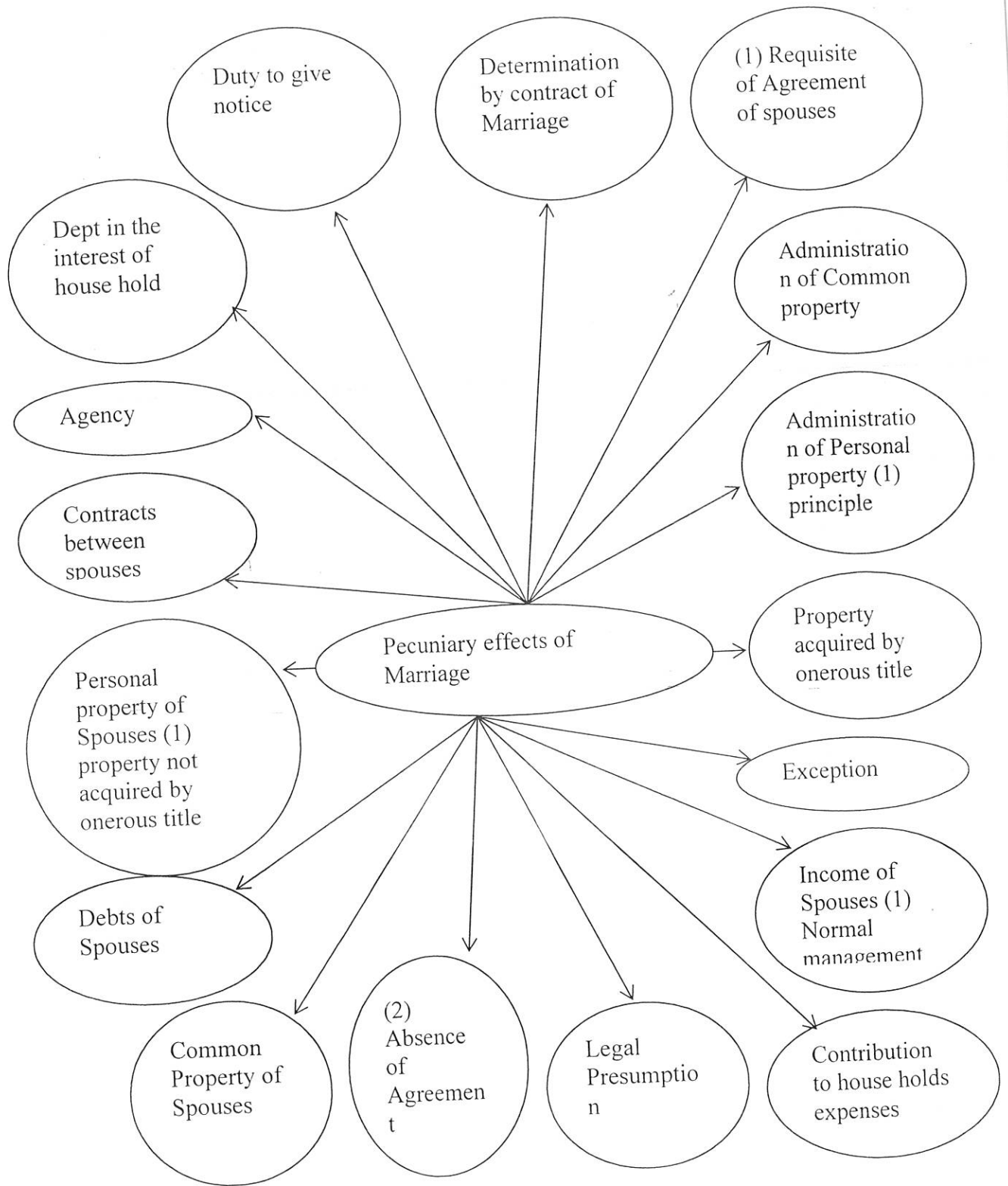


Fig 4.15 Pecuniary Effects of Marriage

Dissolution of Marriage

Another major problem faced by women in Ethiopia is problems arise in the dissolution of marriage. So, understanding what is written in the legal codes would help to solve the problem legally. The Fig 4.16 shows the major legal sections circulating behind dissolution of marriage.

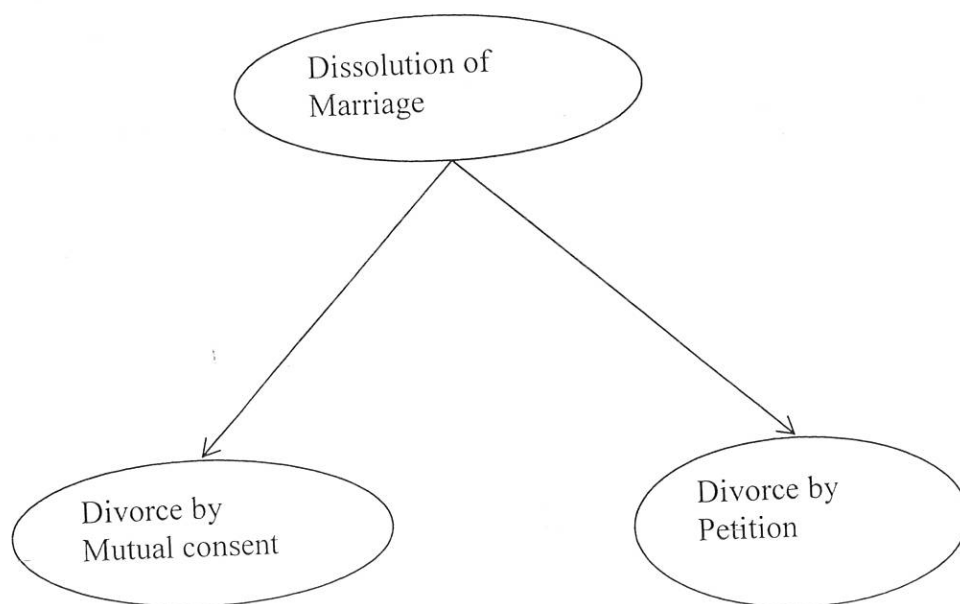


Fig 4.16 Dissolution of Marriage

Divorce by Mutual Consent

A major section in the dissolution of marriage is divorce by mutual consent. The dissolution of marriage is an area that needs careful analysis of the situations giving around the marriage so that the consultancy provided would legally be acceptable. Moreover, divorce is the area that most Ethiopian women face a huge problem. Fig 4.17 indicates the conceptual modeling of the divorce by mutual consent.

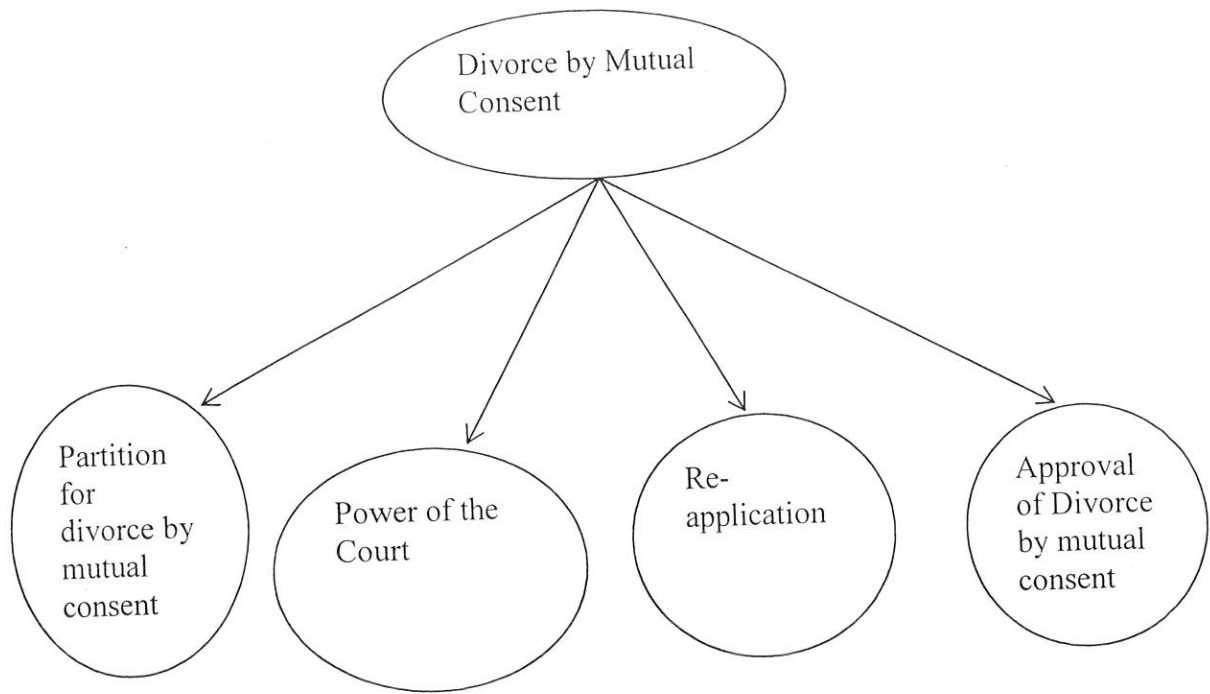


Fig 4.17 Divorce by Mutual Consent

Divorce by petition

Another type of dissolution of marriage is divorce by petition, which is a written request for divorce. Fig 4.18 indicates the concepts of divorce by petition.

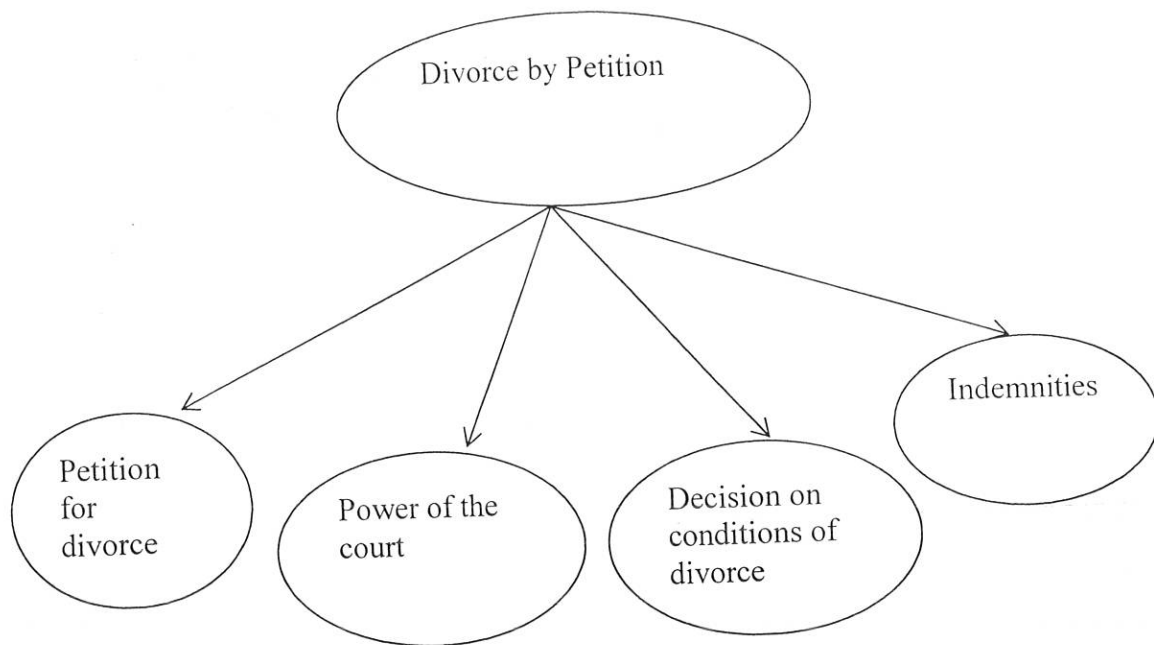


Fig 4.18 Divorce by Petition

Liquidation of Pecuniary Relation between spouses

This topic focuses on checking the properties of spouses for dissolution of the marriage and how to provide compensation for the people who are treated unfairly. This situation is the one most women in Ethiopia faces. The topic has nine articles under it, which as indicated in Fig 4.19 states about: liquidation by agreement, Retaking of Personal Property, Indemnities, unlawful Enrichment, protection creditors, Partition of common property, rule of partition in kind, properties which are difficult to divide, and debt of spouses due after dissolution of the marriage.

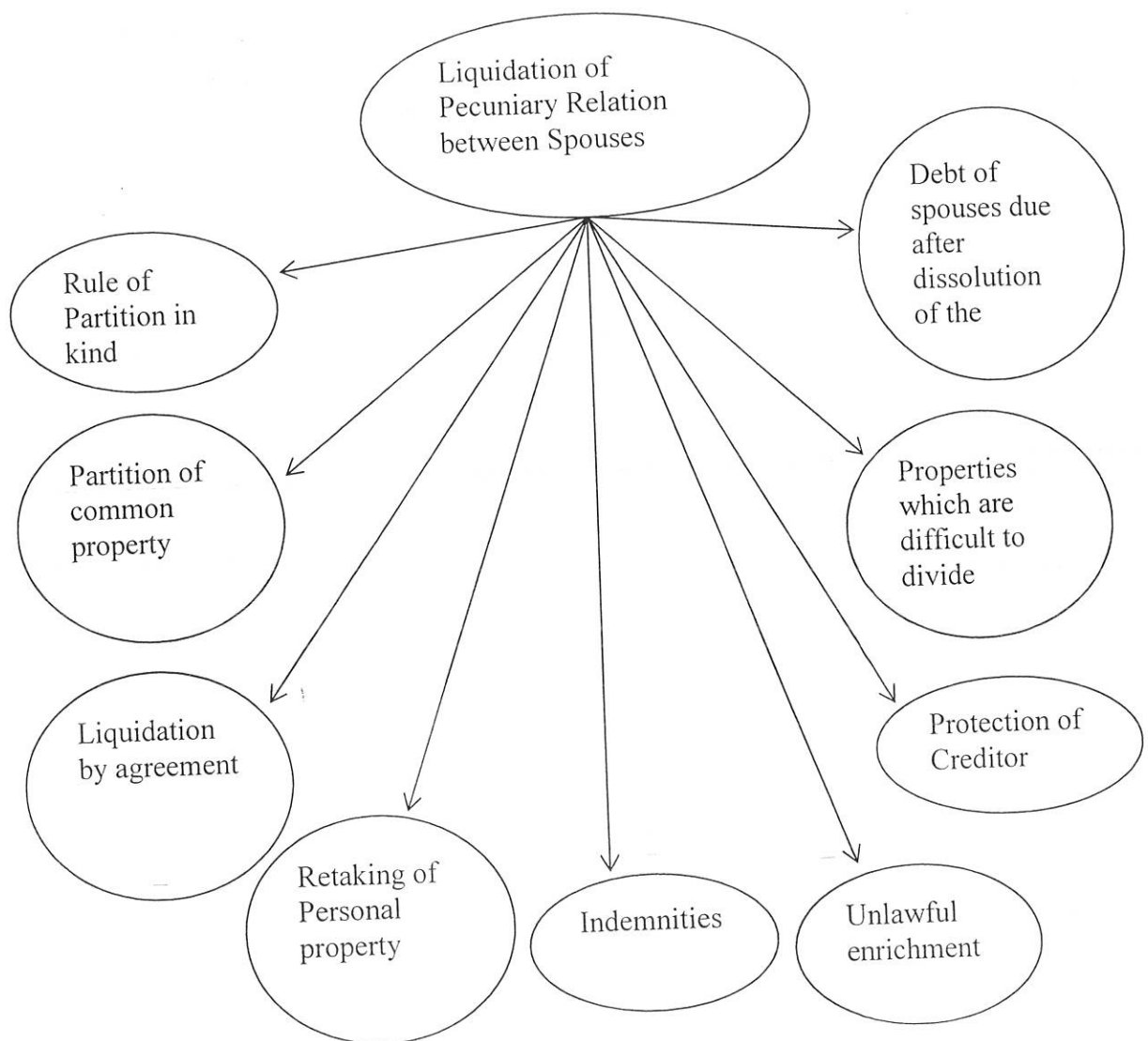


Fig 4.19 Liquidation of Pecuniary Relation between Spouses

Proof of Marriage

This section talks about the various issues needed to proof marriage as legal. This will help women to be aware of proofs needed to be inquired or owned so as to claim that the concluded marriage is a legal marriage. Fig 4.20 depicts concepts under proof of marriage.

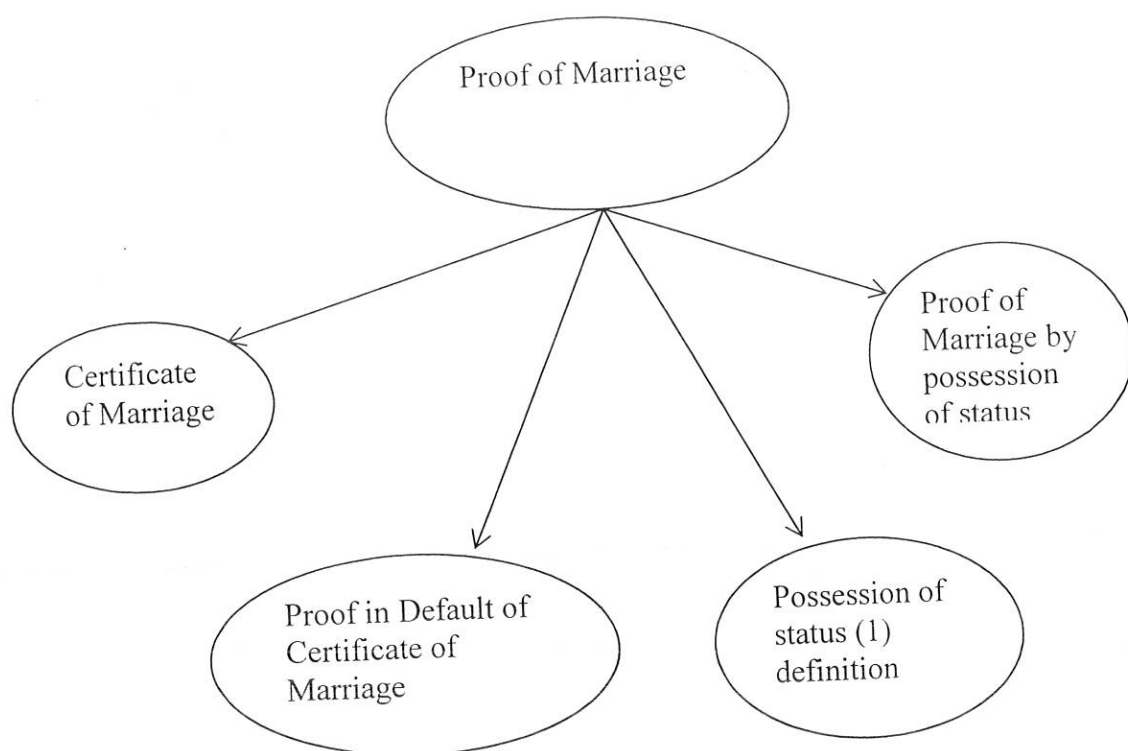


Fig 4.20 Proof of Marriage

Irregular Union

The ten articles under this section include: the definition of irregular union, explanation of irregular union, and other articles circumscribing to irregular union which are indicated in Fig 4.21. Irregular union is another major issues that Ethiopian women face. As the result, knowing about irregular union will help them to systematically deal with problems they may face after or to understand its consequences before hand.

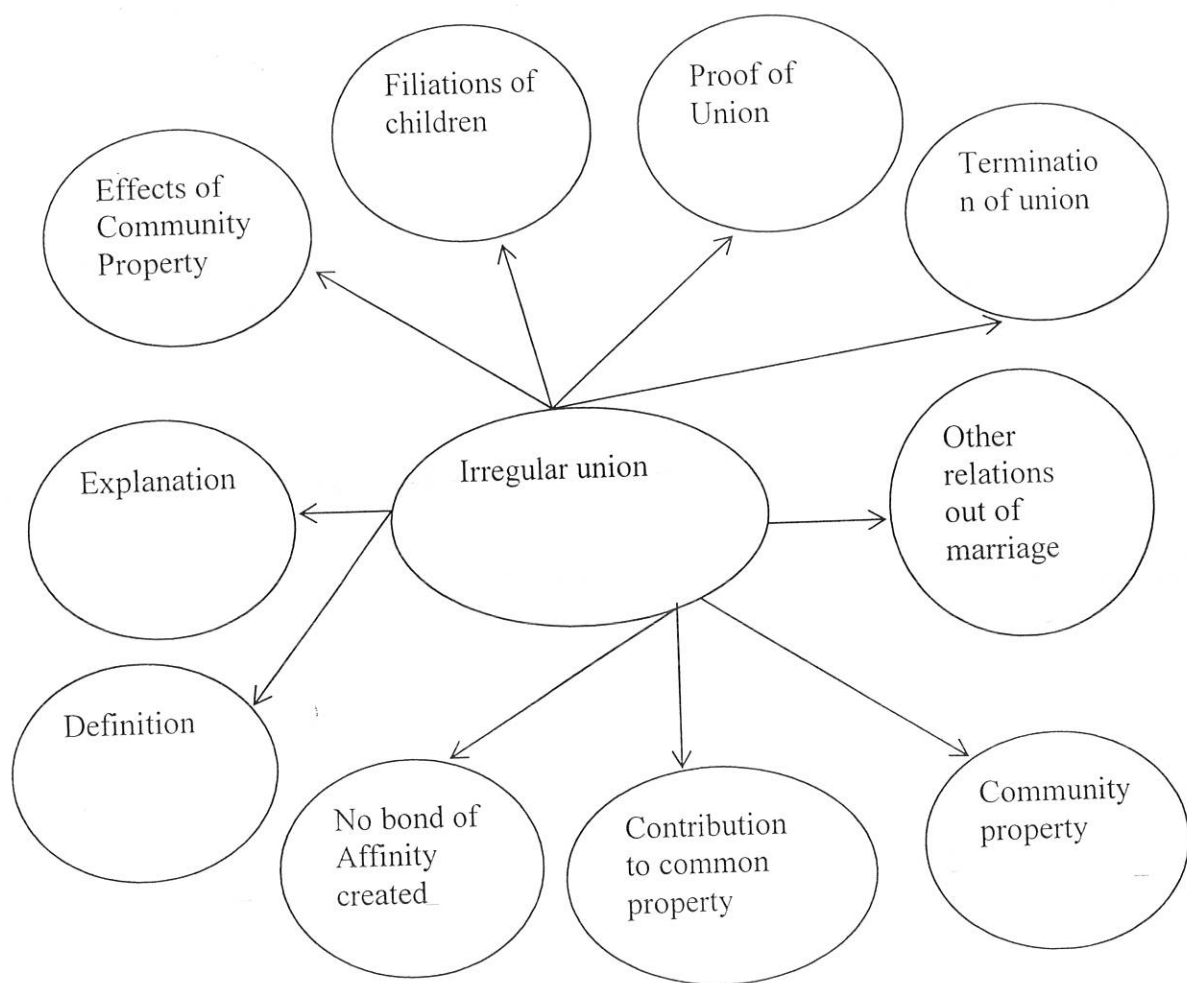


Fig 4.21 Irregular union

Settlement of Disputes Arising Out Of Marriage and Irregular Union

As indicated in Fig 4.22, the chapter discusses around the general provisions, power of the court and arbitration, which is significantly important to be aware of both the advice seekers and advice provider.

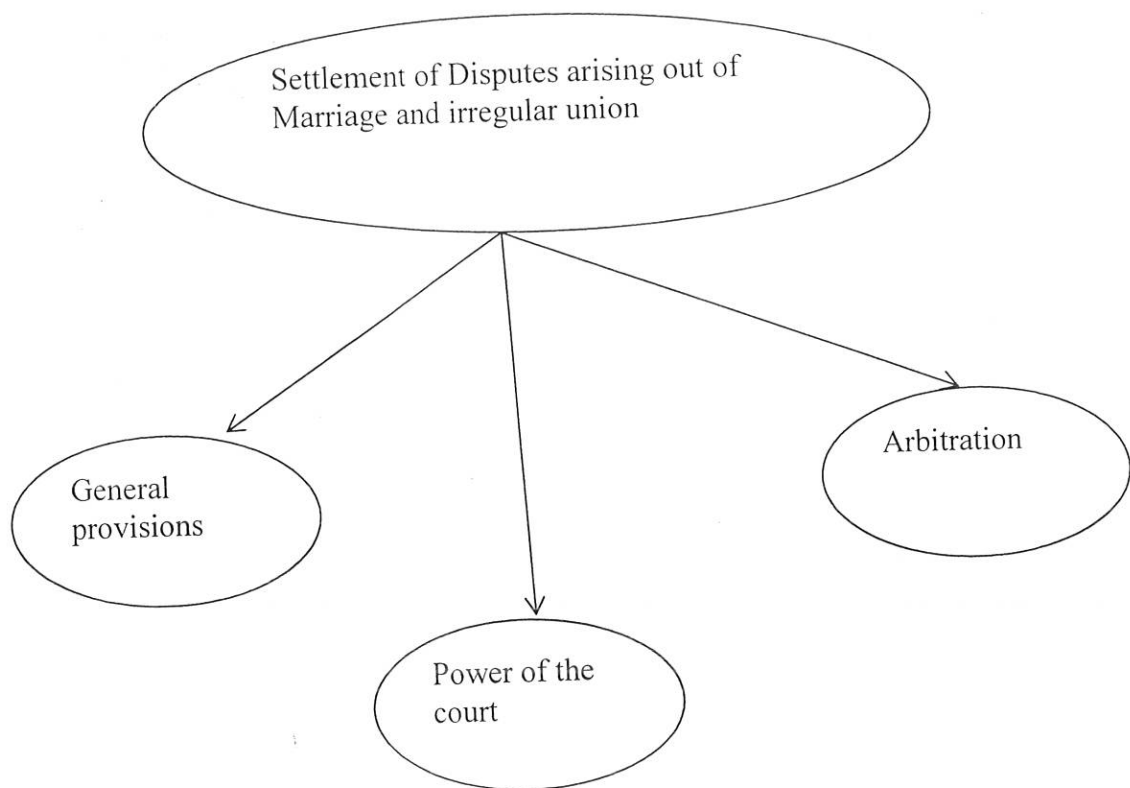


Fig 4.22 settlement of Disputes arising out of Marriage and Irregular union

General Provisions

One of the major areas where women face a great deal of challenge is in the settlement of disputes arising out of marriage and irregular union. Having a clear understanding of these major areas, which are indicated in Fig 4.23, of problem will greatly facilitate the provision of advisory service.

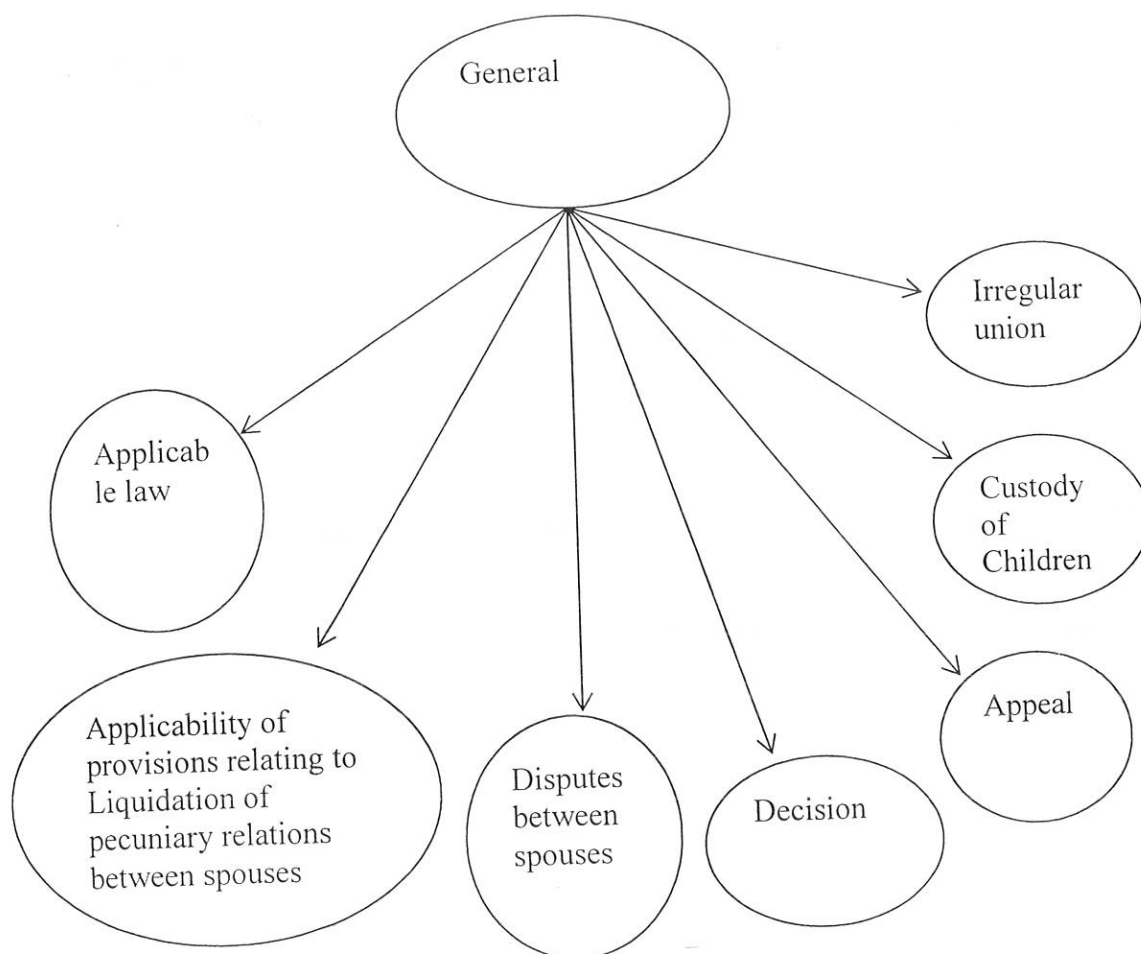


Fig 4.23 General Provisions in the settlement of disputes arising out of marriage

Power of the Court

Another worth looking point in the advisory provision service is the power of the court. Understanding the power of the court will help women in arranging the requirements of the court during the settlement of disputes. Fig 4.24 indicates the requirements of the court.

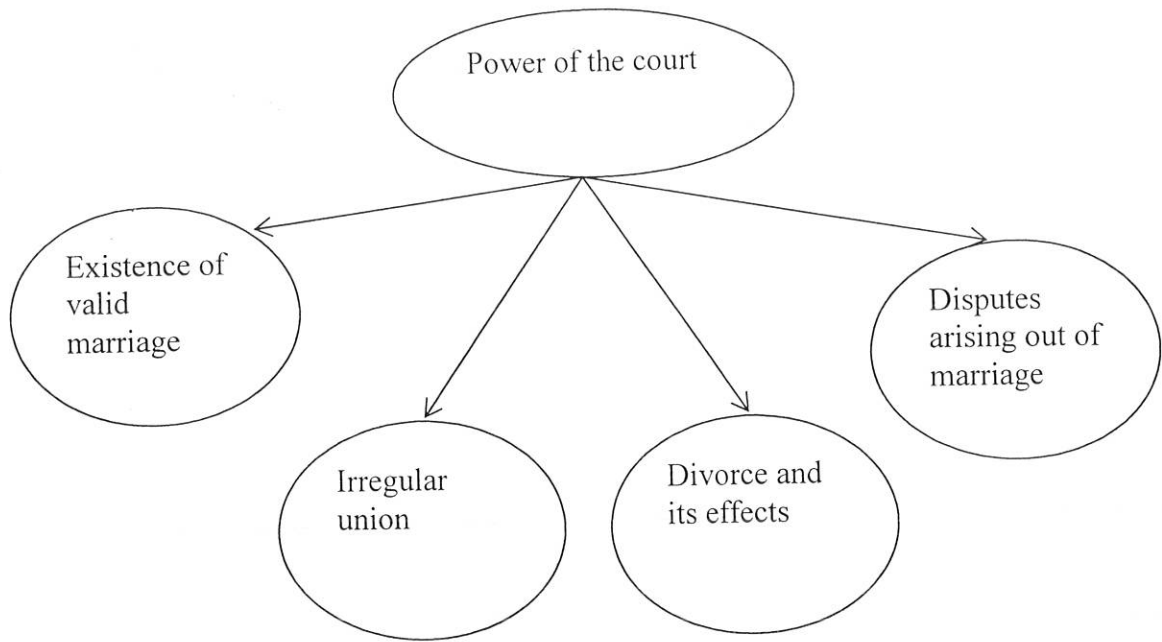


Fig 4.24 Power of the court

Arbitration

This is another section under the settlement of disputes arising out of marriage and irregular union. The section has four articles each of which states about appointment of Arbitrations, Additions time, responsibility of Arbitrators and failure to submit report, which are indicated in Fig 4.45. All of these articles are crucially significant for women advisory provisions.

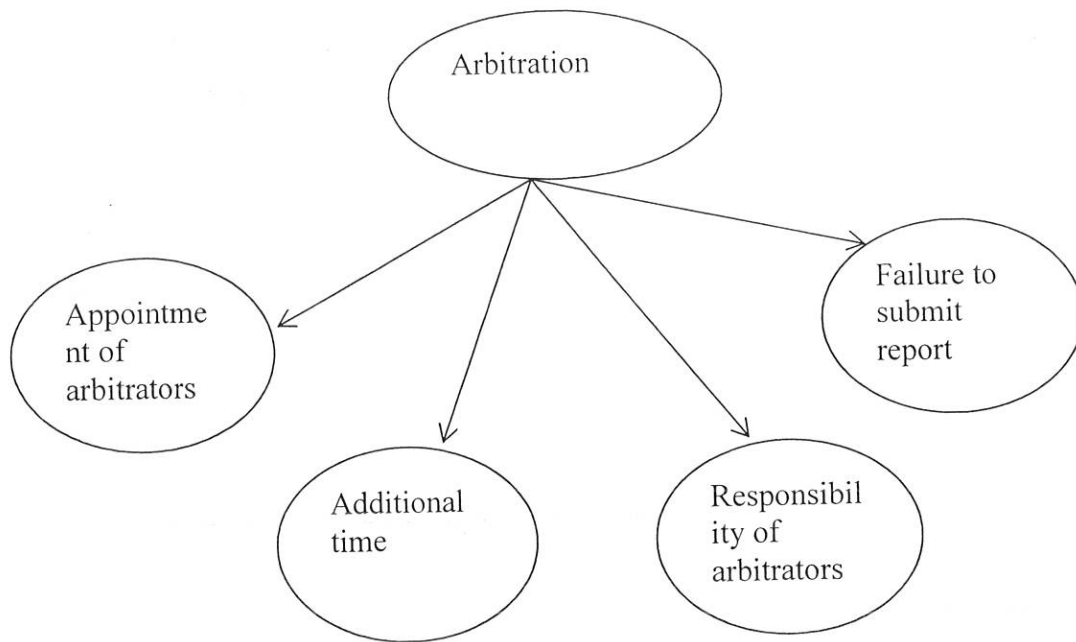


Fig 4.25 Arbitration

4.2.2. Labor Related

The conceptual model, which we revised till now, is done based on the Revised Family Code. The conceptual modeling of this section is modeled using the labor law and for its accomplishment working condition women is used which is indicated in Fig 4.26.

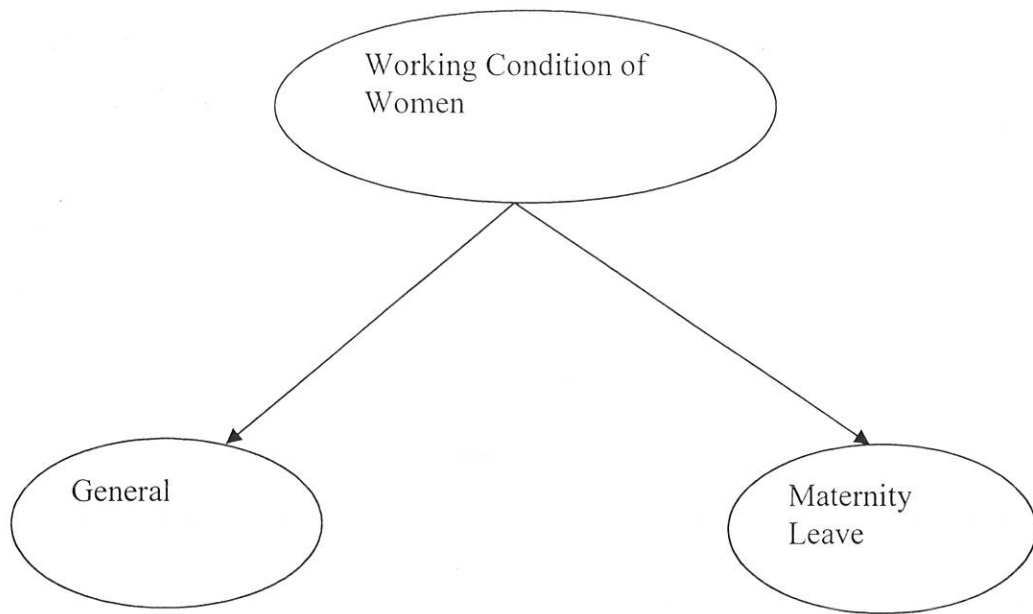


Fig 4.26 Working condition of women

This chapter concentrates on acquiring required concepts using hierarchical modeling method. In the next chapter, the representation of the acquired concepts using Knowledge Pro is dealt with.

Chapter Five

5. Knowledge Representation

5.1. Introduction

In the previous chapter, the conceptual modeling on how to develop the expert system has been dealt with. By extending the previous chapter, this chapter focuses on the representation of the knowledge acquired in the previous chapter in to the knowledge base in a rule form. So, this chapter concentrates much on framing the rules and developing the rule base.

5.2. Knowledge representation

Using a simple hierarchical tree structure, the conceptual model has been acquired from the Revised Family Code and the Labor law. It is the model acquired in the previous chapter that is used to develop the knowledge base of the desired expert system. The knowledge base is comprised of rules. The rules are a simple combination of rules having the form If.....then. The If parts are conditions to be checked so that the then part will be confirmed. In other words, the system works backward to check the conditions so that the given advise is appropriate relative to the conditions given.

5.3. The Knowledge base

The knowledge base is a collection of rules of the area under investigation. As has been highlighted above, the rules are framed in If....then manner. The following lines shows a sample taken from the knowledge base developed using the Knowledge Pro Gold shell:

Sample rules from advise

topic advise.

set_number_of_values (advise,100).

if ?'family marriage' is yes

and ?divorce is yes

and ?effect is no

and ?'conditions of decision for divorce' is no

and ?'common property of spouses' is no
and ?'causes of dissolution of marriage' is yes
and ?'separation by agreement' is no
then advise is

'The following shall be causes of dissolution of marriage

- (a) death of one of the spouses, or declaration of absence by the court of
#n one of the spouses #n#n
- (b) dissolution order by court due to violation of one of the essential
conditions #n of marriage #n#n
- (c) divorce'.

if ?'family marriage' is yes
and ?divorce is yes
and ?'conditions of decision for divorce' is yes
and ?'causes of dissolution of marriage' is no
and ?effect is no
and ?'separation by agreement' is no
and ?'common property of spouses' is no
then advise is

'Marriage shall dissolve by divorce where:

- (a) the spouses have agreed to divorce by mutual consent and such
agreement#n is accepted by the court; or
- (b) the spouses or one of them made a petition for divorce, to the court'.

Sample rules from the questions to be asked:

topic 'dissolution of marriage'.

ask ('is the claim about dissolution of marriage ?

Note: This question helps the system to determine whether the marriage problem is related to dissolution of marriage or not since dissolution of marriage is a key factor in identifying a family related problem', 'dissolution of marriage', [yes, no]).

end. (* dissolution of marriage*)

topic 'divorce by mutual consent'.

ask ('Is the problem related to divorce by mutual consent ?

Note: This question helps the system to determine whether the marriage problem is related to divorce by mutual consent or not', 'divorce by mutual consent', [Yes, No]) .

end. (* divorce by mutual consent *)

As can be seen from the above samples, the underlying rules for advice has a uniform format and the same is along the samples of questions to be asked. For instance '?' mark in the rules is similar with the 'value of' variable in the traditional structural programming languages. For example '?effect' has a similar meaning with 'the value of the variable effect'. In addition to this, there is an 'is' operator in each of the rules like '?effect is yes' means assign the value yes to the variable effect. The other worth noting point is the topic. The topic is a name that is used to retrieve the values of the associated parameters. For example, 'topic advise' is used to declare a topic named advice and later values of advice will be returned. Whereas on the other hand the 'set_number_of_values (advise, 100)' sets the number of different values that can be assigned to a topic. In other words, 100 in this particular example specifies that the topic can hold 100 different values.

5.4. Explanation facility

It has been established in the review of literature that one of the components of expert system is its explanation facility. This feature is also embedded in the prototype in a way that would help users of the system to understand the relevance of why a certain question is being asked. This feature is forwarded in a note form along with each

question. For example, along with the question "Is the problem related to dissolution of marriage?" a note is given to answer why this question is asked; that is, 'This question will help to determine whether the problem is related with dissolution of marriage since dissolution of marriage is a key factor in identifying a family related problem associated with dissolution of marriage' and this is one way of providing the explanation facility to legal expert systems which has predefined existing rules.

5.5. Systems control structure

To explain the control structure of WoLA, let us take the following English like sample rule from the rule base of WoLA:

if

family is yes, and

marriage is yes, and

effects of marriage is yes, and

personal effects of marriage is yes, and

common property of spouses is yes, and

dissolution of marriage is no, and

divorce by mutual consent is no, and

conditions of decision for divorce is no, and

causes of dissolution of marriage is no, and

separation by agreement is no

then advise is

'1. All income derived by personal efforts of the spouses and from their common or#n personal property shall be common property. #n#n

2. All property acquired by the spouses during marriage by an onerous title shall be common property unless declared personal under article 58(2) of the Revised Family Code.#n#n

3. Unless otherwise stipulated in the act of donation or will, property donated or bequeathed conjointly to the spouses shall be common property.'.

The systems inference engine works backward to determine the value of the parameters and that is why we refer WoLA as a system that uses a backward chaining rule interpreter. In other words, the rules is retrieved from the knowledge base and simultaneously start examining the advice and in a similar fashion it start interacting with the rule interpreter to match the value of the parameters to provide the advice.

In this chapter discussion of how the knowledgebase is developed based on the knowledge acquired in the previous chapter is given. As the result, this chapter can be considered the crucial part of this thesis due to the fact that the rules acquired are represented in the knowledge base and consequently the knowledge base is built and the system becomes ready to be used and tested for practical application. In the next chapter, how the system actually operates based on the decision taken after each parameter will be discussed.

Chapter six

6. Knowledge Application Phase

6.1. Introduction

In chapter five discussion of how the knowledge acquired in the provision of women consultancy service is represented in the knowledge base. In this chapter a methodical discussion of how the represented knowledge is described to be employed in the real situation is discussed using the model prototype. Subsequently the thesis output starting from the interface screen to the final advice output screen is described in this chapter.

6.2. User Interface

The user interface is the welcoming screen that a user of the system encounters first. Fig 6.1 shows the user interface of WoLA.

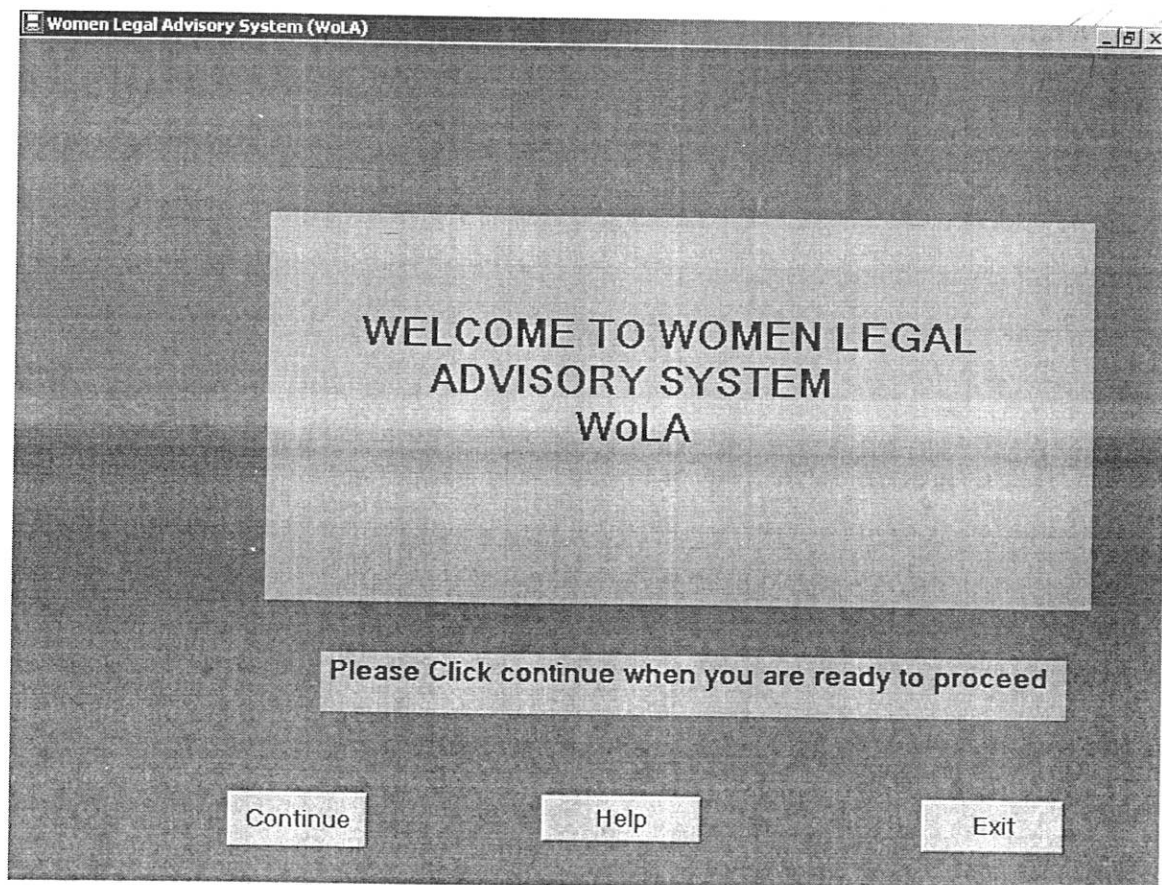


Fig 6.1 The User Interface of WoLA.

WoLA welcomes the user with the message 'WELCOME TO WOMEN LEGAL ADVISORY SYSTEM (WoLA)' and in the same screen there are three buttons which the users are free to choose whichever they want. If the user clicks on to the continue button a new window pop ups giving highlights about the system. Clicking on to the help button will invoke a new window with hyperlinks to the help topics with description pop ups. Selecting the exit button will enable the user to quit from the program. Then after a user becomes ready to proceed, the system start asking questions; and the user is expected to answer the questions either by double clicking or selecting and pressing the enter key from the keyboard.

The first question asked by the system is shown in fig 6.2. This question helps the system to check whether the problem is family related or labor related or other. Identifying the nature of problem is a key for understanding legal problems; which further narrows dawn the scope to which advice providers should concentrate on. In addition it is not necessary to ask a family related problem questions to labor problems.

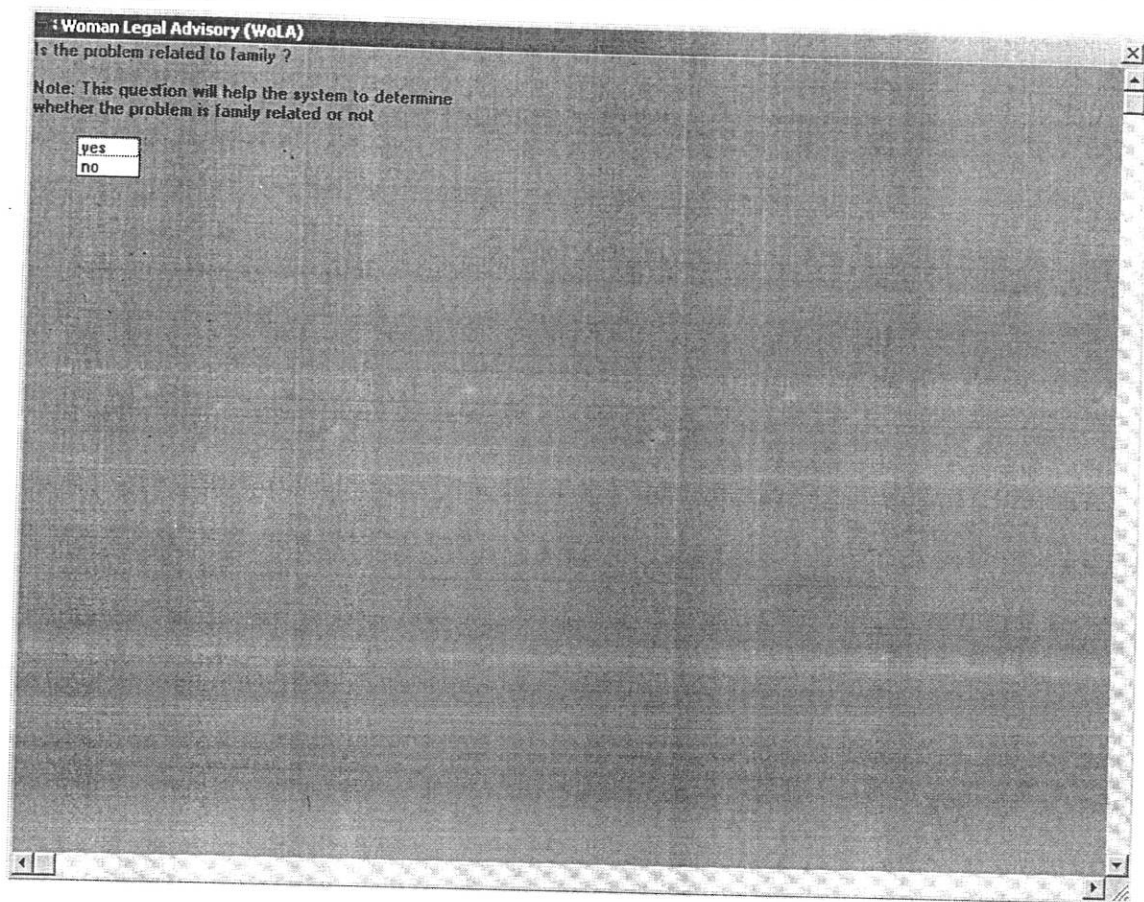


Fig 6.2. The first question in WoLA

After getting response to this question the system produces another screen based on the response given. If the user selects "yes" then the system start asking family related question; whereas, if the user selects "no" the system starts asking another question which helps to check whether the problem is related to labor or other. Fig 6.3 shows the screen produced after the user selects 'no' to the first screen.

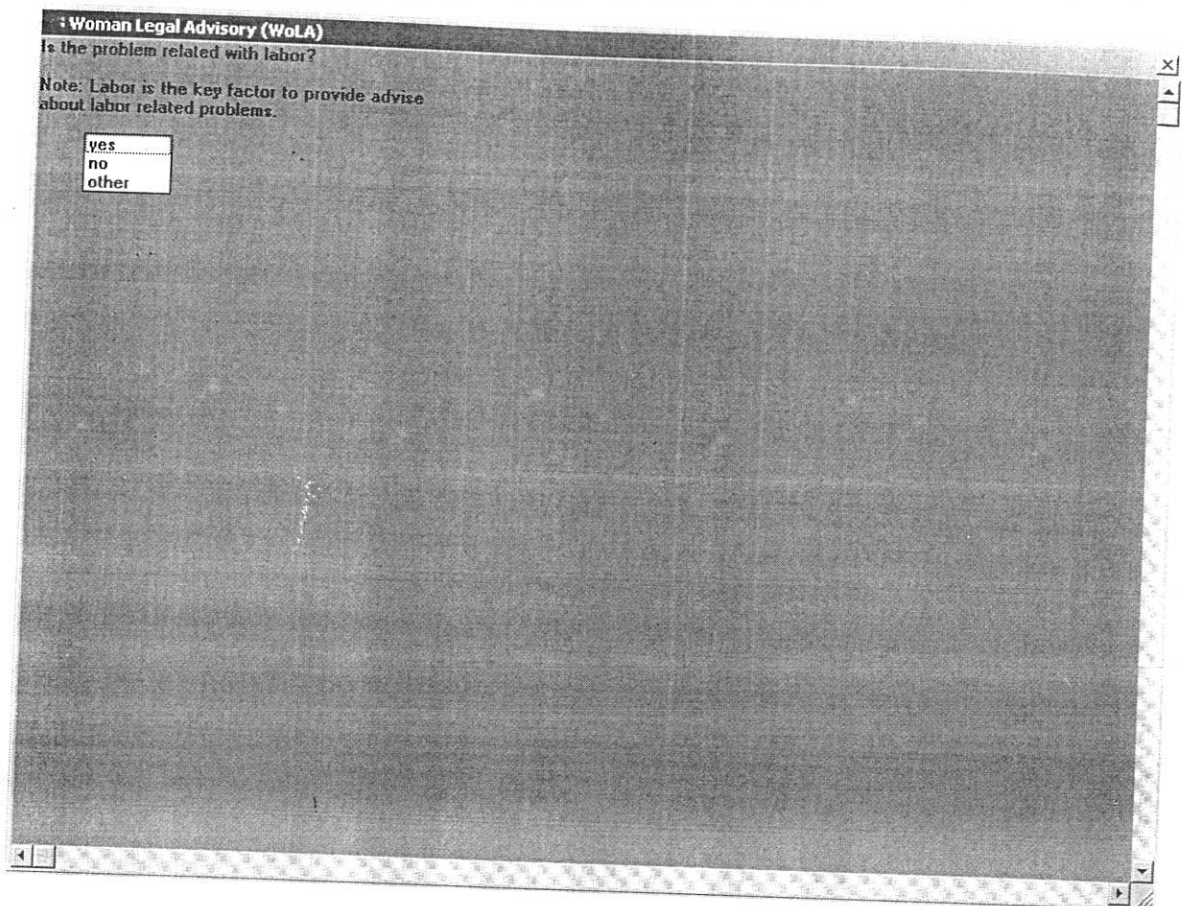


Fig 6.3. The next screen produced after answering 'no' to the first question

A 'yes' answer to the above screen produces another question regarding labor related problems. The next question to be asked is whether the user is looking for general information about the working conditions of women. Fig 6.4 shows the screen produced after a 'yes' answer to the previous question that asks whether the problem is labor related.

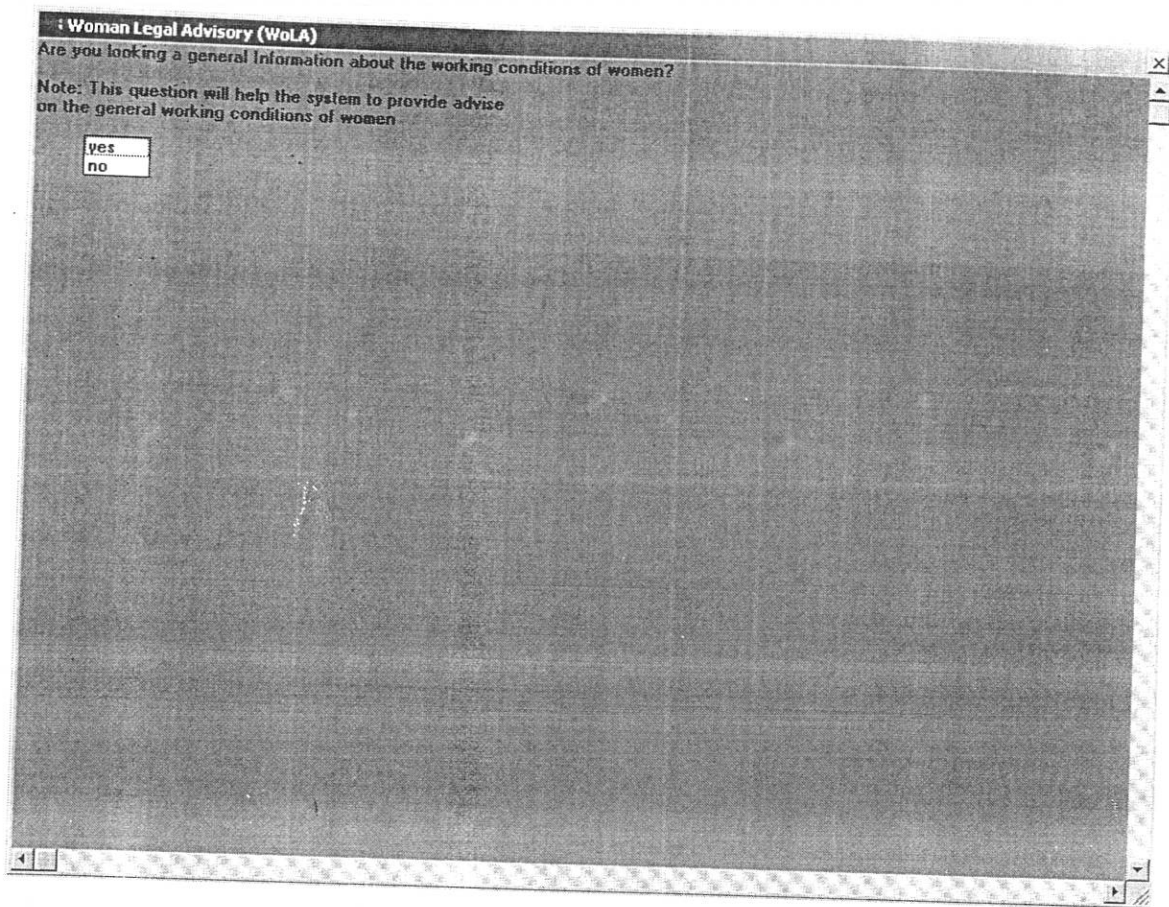


Fig 6.4. The second question of WoLA after a yes answer to labor.

If the person is looking for general information about the working condition of women, the third question to be asked is about is narrowing the topic in to only working conditions of women (Fig 6.5).

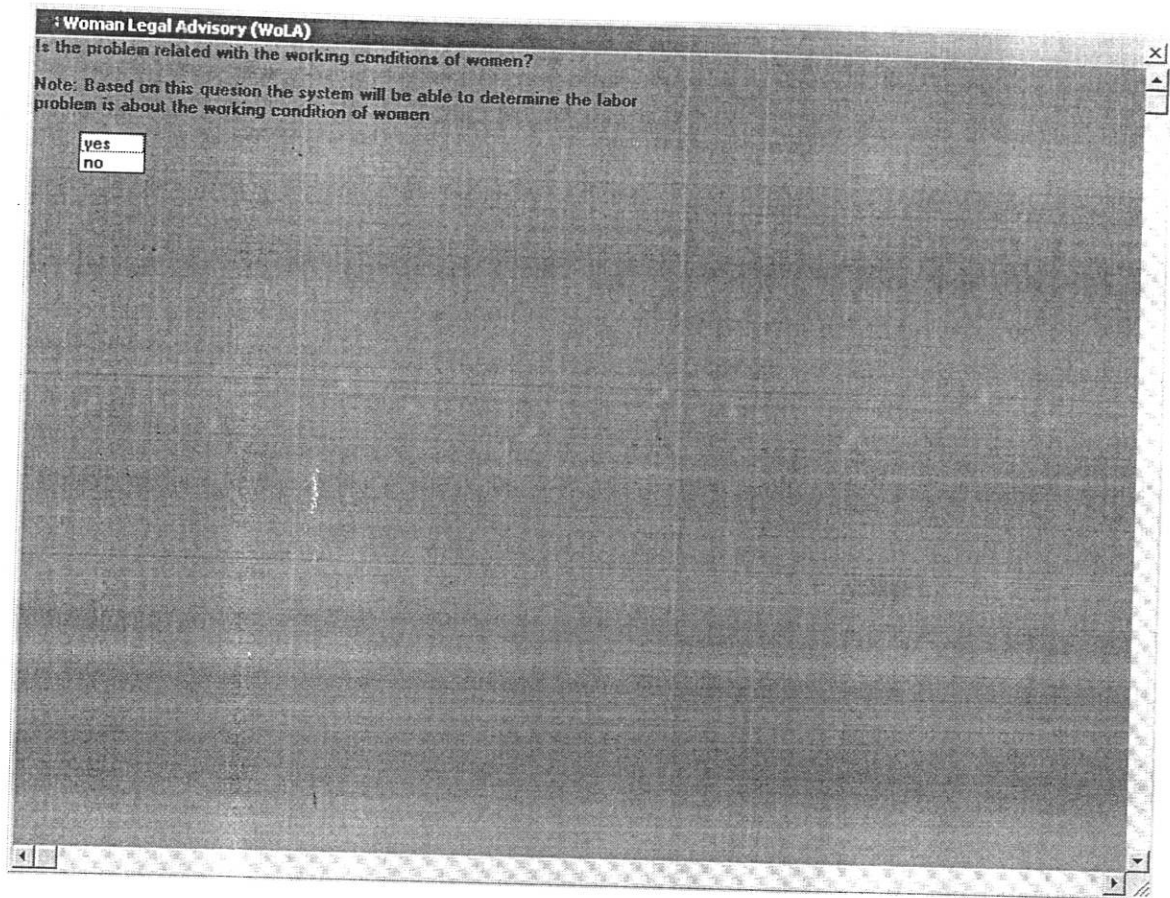


Fig 6.5. The system inquires if the problem is related to working conditions of women.

The next question asked again helps to further frames the problem down in to checking whether the problem is related with maternity leave or not. Fig 6.6 shows this screen.

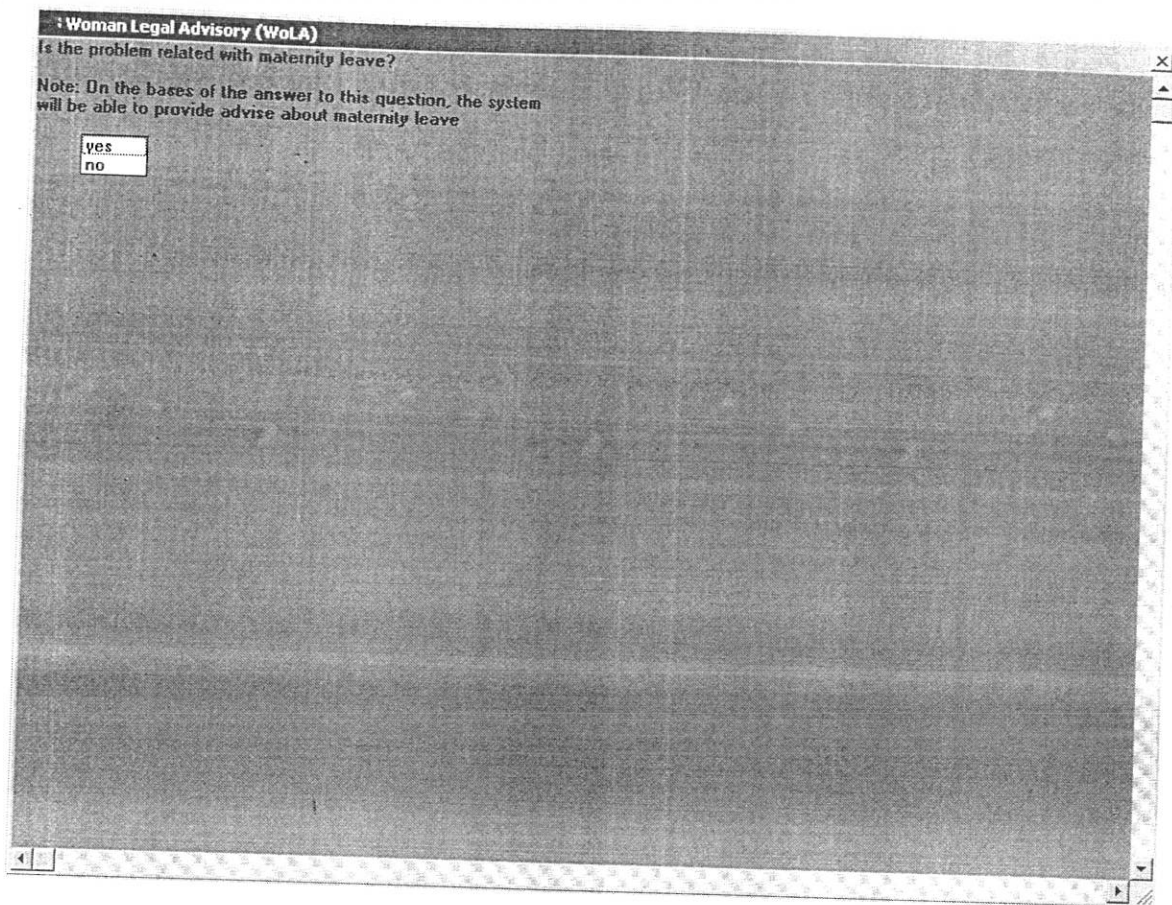


Fig 6.6. The system inquiring about maternity leave

If the person does not want to restrict the problem to maternity leave and want a general advise about the working conditions of women and selects no, then the following advise output will be produced (Fig 6.7).

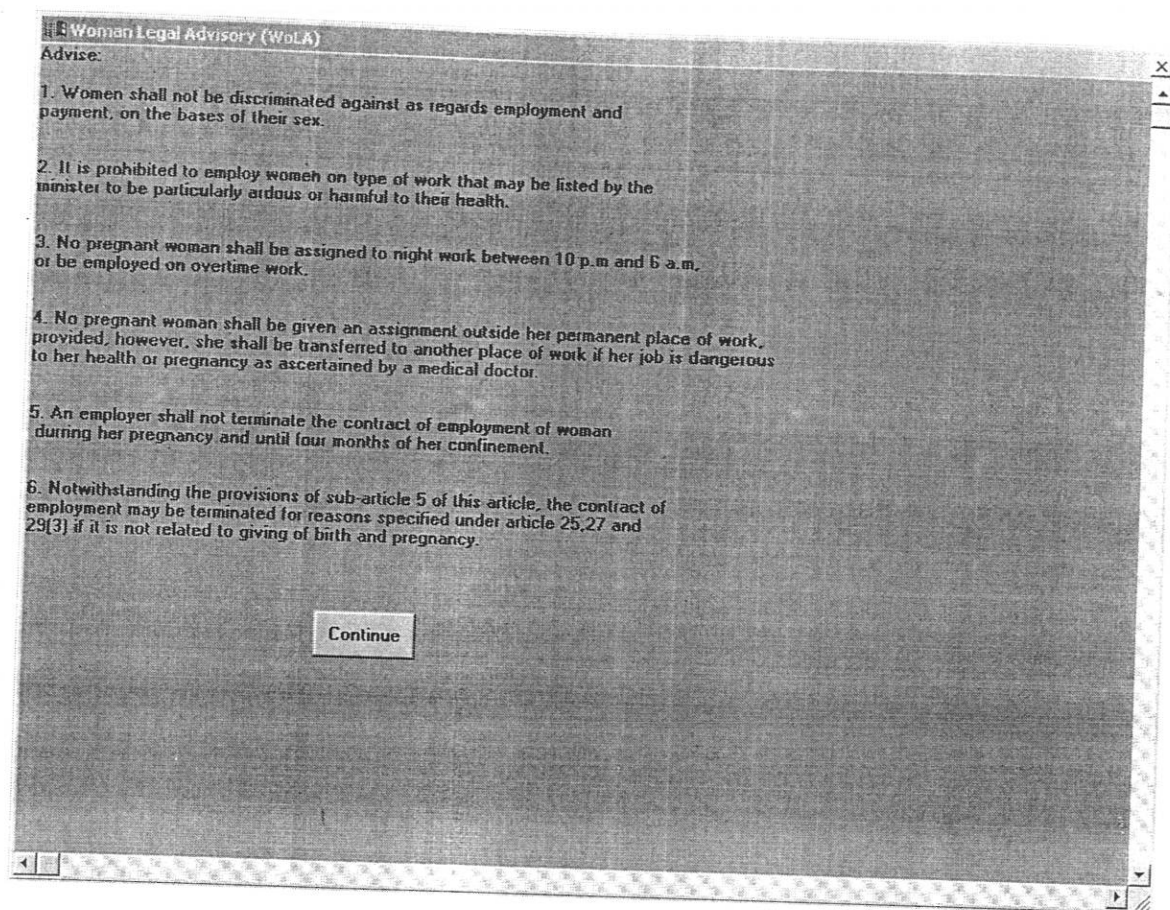


Fig 6.7. Advice output produced by the system.

As can be seen from fig 6.7 a click on continue button asks whether the user wants to examine the case of another person or not. Selecting no button will exit from the system and a yes answer takes the person back in to the previous cycle.

6.3. Testing and Evaluation

There are features in which systems are tested. The features are consistency, free from duplication, and completeness. Consistency refers to the ability of the system to provide similar advice to a problem at different times. In other words, being free from producing logically contradictory outputs from consistent input provision makes systems consistent. Duplication as the name implies is the existence of logically similar items over and over again; which have the same function, in the system. Items like these create redundancy. Being free from redundancy is one of the ways in which systems are

tested before used. Completeness refers the inclusion of the necessary structures. If necessary structures, which help to arrive at valid outputs, are left out then the system is thought to be not complete.

These, consistency, free from duplication and completeness are achieved by carefully revising and analyzing the rules in the knowledge base; and in view of that WoLA is tested on these bases.

After testing systems has to be validated. Validation measures the achievement of the system in terms of the reason why the system has been developed. WoLA is developed for providing advice for problems faced by women in Ethiopia especially in the areas where there is shortage of experts specialized in women legal advisory provisions. So, answering the question 'does WoLA provides appropriate advice to women legal inquiries?' would help to analyze the issue of validation.

To understand how validation of WoLA has been done, it is good to examine how consultancy service is done in the Addis Ababa branch of Ethiopia Women Lawyers Association- one of the organizations rendering legal advice to women in Ethiopia. Advisory providers work in shifts and usually it takes not less than a week to provide an advice for a case. Noting this point, submitted similar family and labor related cases for advice were given to four stakeholders of the consultancy provides as an assignment. Two of the experts were given the developed expert system and the other two as usual without the expert system. The professionals who has used the system has confirmed that the system has really assisted and enabled them to go through their assignments faster than the usual since the system helped them to quickly access the required rules from the legal codes which is the most painstaking job in the case of manual searching for rules.

Though the system is not fully functional, the results obtained are promising and encouraging with regards to the application of knowledge base system to women legal

advisory services. It is with further investigation in to the area that realization of a fully blown legal expert system to women legal advisory comes in to reality.

6.4 Implementation

Software Requirements

Knowledge Pro Gold version 3.0 is needed to use the prototype. The prototype is tested to run successfully on window 2000 and Xp professional. It is also possible to use WoLA in a networked environment. To use it in a network environment network operating system is required.

Hardware Requirements

WoLA is made to run on systems having at least 4MB of RAM and 133MHz processor speed. To work along with Microsoft products like Visual C++ a minimum of 8MB of RAM is needed.

6.5 Maintenance

Even though changes made in legal domains are slower as compared to other areas like health, the mechanism of keeping track of those changes to update the knowledge base of WoLA has to be pointed.

As much effort as possible has been invested to document the code that is written for WoLA. On the bases of the documentation provided along with little knowledge of the developing environment Knowledge Pro, it is possible to easily maintain the knowledge base of WoLA.

The chapter focuses mainly on the practical aspects of the system developed. These aspects include explanation of how users can interact with the system. In addition how the system has been tested is described in this chapter. In addition, the evaluation of

feedback has also been provided. Furthermore, implementation issues like hardware and software requirements along with maintenance issue have been dealt with. In the next chapter the conclusion arrived at and recommendations will be embarked up on.

Chapter seven

7. Conclusions and recommendations

7.1 Introduction

This is the final chapter of this thesis. In this chapter conclusion based on the overall activities undertaken to deal with this thesis will be given. In addition, recommendations will be forwarded based on the results and conclusions arrived at.

7.2 Conclusions

On the bases of the so far undertaking of this research, the following conclusions are made:

- The study is conducted with the aim to explore the possible application of knowledge base system in women legal advisory provision and develop prototype, which assists advisory providers in providing advice to individual cases.
- WoLA is a system that has built from rules and that is why it is described as a rule-based expert system.
- The system was tested by way of comparison with reports made by a group four legal experts. The result of the test shows that the system produces acceptable advice outputs.
- The system was produced in prototype to see if further advancement is possible; and based on the initial investigation it is found out that it is possible to pursue along the same line.
- The knowledge is acquired from the legal codes of Ethiopia, namely the Revised Family Code and the Labor Law; and a hierarchical approach is employed to model the knowledge.
- On the bases of the model, rules are used to represent the knowledge and Knowledge Pro Gold Version 3.0 for windows is used to develop the prototype of WoLA.

7.2 Recommendations

The following recommendations are made for further work to augment the operation of the prototype WoLA in addition to building up a new system related to legal domain:

- Providing adequate time and wherewithal, the entire Revised Family Code, Labor Law and associated women related legislations could be represented in WoLA; which ultimately expand the knowledge base of WoLA. So, expanding the knowledge base of WoLA is an area worth investigating.
- To translate the entire codes, law and associated women advisory rules in to the rule base of WoLA, some sort of rule handling mechanism should be formed. This is because in creating WoLA it was observed that great numbers of rules are requisite to represent only small number of advices. Without a rule management system, developing the rule base would become costly in terms of budget, time and efficiency. Efforts are needed in the area of rule management.
- Incorporating open textured concepts and analysis of rules to expert systems like WoLA should be further investigated since rules are not adequate solely by themselves.
- A way of further testing and evaluating the system is necessary with further criteria like quality of advice produced; which ultimately facilitates the road for making the system available to the general public.
- A way of integrating this rule-base with already existing systems should be further investigated. Questing of integration inquires protocols for error free communication and integration among the existing systems needs further undertaking.
- Cost-benefit analysis should be made to quantify the effectiveness of the knowledge base system.
- Though Ethiopia is a civil code country- country where legal sectors operate on the bases of rules- it is worth exploring case based expert systems to women legal advisory provisions, which is capable of learning from previous decided cases and produce previously provided advice.

- Despite the study is made on only to women legal advisory, it is also an asset to explore in to the dimension of legal regimes governing other parts of the society like children, criminals and others.
- Developing a system that would assist women on how to forward their cases to courts based on the advice provided by WoLA is another plausible are of further investigation.

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Appendices

Appendix I

Sample rules from the knowledge base of WoLA

topic advise.

set_number_of_values (advise,100).

if ?'family marriage' is no
and ?'labor working' is yes
then advise is

- '1. Women shall not be discriminated against as regards employment and payment, on the bases of their sex.#n#n
2. It is prohibited to employ women on type of work that may be listed by the minister to be particularly arduous or harmful to their health.#n#n
3. No pregnant woman shall be assigned to night work between 10 p.m and 6 a.m, or be employed on overtime work.#n#n
4. No pregnant woman shall be given an assignment outside her permanent place of work, provided, however, she shall be transferred to another place of work if her job is dangerous to her health or pregnancy as ascertained by a medical doctor.#n#n
5. An employer shall not terminate the contract of employment of woman durring her pregnancy and until four months of her confinement.#n#n
6. Notwithstanding the provisions of sub-article 5 of this article, the contract of employment may be terminated for reasons specified under article 25,27 and 29(3) if it is not related to giving of birth and pregnancy.'

if ?'family marriage' is no
and ?'labor working' is no
then advise is

- '1. An employer shall grant leave to a pregnant woman worker without deducting her wages for medical examination connected with her pregnancy, provided, however,

- that she is obliged to present a medical certificate of her examination.##n
2. A pregnant woman worker shall, upon the recommendation of a medical doctor, be entitled to a leave with pay##n.
 3. A woman worker shall be granted a period of 30 consecutive days of leave with pay preceding the presumed date of her confinement and a period of 60 consecutive days of leave after her confinement.##n
 4. When a pregnant woman worker does not deliver within the 30 days of her prenatal leave she is entitled to an additional leave until her confinement in accordance with 2 of this article. If delivery takes place before the 30 days period has elapsed, the post-natal leave under 3 of this article shall commence. '.

if '?family marriage' is yes

and '?effect is yes

and '?separation by agreement' is yes

then advise is

'1. Notwithstanding the provisions of article 53(1) of the Revised Family Code, the spouses may agree to live separately for a definite or indefinite period of time##n

2. Any agreement made to this effect may be revoked at any time by one of the spouses##n provided that such revocation is not arbitrary'.

if '?family marriage' is yes

and '?effect is yes

and '?common property of spouses' is yes

and '?divorce is no

and '?conditions of decision for divorce' is no

and '?causes of dissolution of marriage' is no

and '?separation by agreement' is no

then advise is

'1. All income derived by personal efforts of the spouses and from their common or##n personal property shall be common property. ##n

2. All property acquired by the spouses during marriage by an onerous title shall be common property unless declared personal under article 58(2) of the Revised Family Code.#n#n

3. Unless otherwise stipulated in the act of donation or will, property donated or bequeathed conjointly to the spouses shall be common property.'.

if '?family marriage' is yes

and '?divorce is yes

and '?effect is no

and '?conditions of decision for divorce' is no

and '?common property of spouses' is no

and '?causes of dissolution of marriage' is yes

and '?separation by agreement' is no

then advise is

'The following shall be causes of dissolution of marriage

(a) death of one of the spouses, or declaration of absence by the court of #n one of the spouses#n#n

(b) dissolution order by court due to violation of one of the essential conditions#n of marriage#n#n

(c) divorce'.

if '?family marriage' is yes

and '?divorce is yes

and '?conditions of decision for divorce' is yes

and '?causes of dissolution of marriage' is no

and '?effect is no

and '?separation by agreement' is no

and '?common property of spouses' is no

then advise is

'Marriage shall dissolve by divorce where:

(a) the spouses have agreed to divorce by mutual consent and such agreement#n

is accepted by the court; or

(b) the spouses or one of them made a petition for divorce,to the court'.

if ?'family marriage' is yes

and ?divorce is yes

and ?'petition for divorce by mutual consent' is yes

then advise is

'1. When the spouses have agreed to divorce by mutual consent, such agreement, which shall also regulate the consequences thereof, shall be submitted in writing to the court for approval.#n#n

2. Notwithstanding the provisions of article 1 of this article, spouses whose marriage lasted for less than six months shall not be permitted to divorce by mutual consent,#n#n

3. Spouses who petition for divorce by mutual consent are not obliged to state the reasons thereof.'.

if ?'family marriage' is yes

and ?divorce is yes

and ?'approval of divorce by mutual consent' is yes

then advise is

'1. When the spouses have agreed to divorce by mutual consent, such agreement, which shall also regulate the consequences thereof, shall be submitted in writing to the court for approval.#n#n

2. Notwithstanding the provisions of article 1 of this article, spouses whose marriage lasted for less than six months shall not be permitted to divorce by mutual consent,#n#n

3. Spouses who petition for divorce by mutual consent are not obliged to state the reasons thereof.'.

Appendix II

Sample cases used during testing along with the outputs of WoLA are presented below.

1. A 30 year old lady come up with a marriage problem stating that she wants to know issues related with properties specially which properties can be possessed together during the contract of marriage.

The problem is organized in the following manner:

Family related problem Yes

Marriage problem Yes

Effects of marriage..... Yes

Pecuniary effects of marriage Yes

Common property of spouses Yes

Advice produced:

1. All income derived by personal efforts of the spouses and from their common or personal property shall be common property.
 2. All property acquired by the souses during marriage by an onerous title shall be common property unless declared personal under article 58(2) of the revised family code.
 3. Unless otherwise stipulated in the act of donation or will, property donated or bequeathed conjointly to the spouses shall be common property.
-
2. Another problem was the case of a 22-year-old woman living with her husband for a year and half wants to terminate her marriage due to repeated savagery treatment by her husband and his families.

This case has been studied carefully and broken down in to sub-problems described as 2.1 and 2.2.

2.1. The first sub-problem is that she wants to dissolve her marriage which the experts have to investigate the possible reasons of dissolution of marriage; and the problem is organized in the following way:

Family related problem..... Yes

Marriage problem ... yes

Dissolution of marriage yes

Causes of dissolution of marriage ... yes

Advice Produced:

The following shall be causes of dissolution of marriage

- (a) death of one of the spouses, or declaration of absence by the court of one of the spouses;
- (b) dissolution order by court due to violation of one of the essential conditions of marriage; or
- (c) divorce.

2.2. Based on the advice given by the system and analysis made by the first problem divorce is found to be the reason for the dissolution of her marriage. Then after, the condition for decision for divorce is examined since the initiate of divorce is taken by her only.

Family related problem.... Yes

Marriage problem Yes

Dissolution of marriage Yes

Conditions for decision for divorce Yes

Advice produced:

Marriage shall dissolve by divorce where:

- (a) the spouses have agreed to divorce by mutual consent and such agreement is accepted by the court; or
- (b) the spouses or one of them made a petition for divorce, to the court.

3. The third case used for testing the system is the case of a lady seeking advice on how to proceed for forwarding their petition after agreeing with her husband to dissolve their marriage with divorce came for advice and subsequently her request is organized in the following manner:

Family related problem ... yes

Marriage problem Yes

Dissolution of marriageYes

Divorce by mutual consent Yes

Petition for divorce by mutual consent yes

Advice produced:

1. when the spouses have agreed to divorce by mutual consent, such agreement, which shall also regulate the consequences thereof, shall be submitted in writing to the court for approval.
2. notwithstanding the provisions of article 1 of this article, spouses whose marriage lasted for less than six months shall not be permitted to divorce by mutual consent,
3. spouses who petition for divorce by mutual consent are not obliged to state the reasons thereof.