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**Research Paper**

# Developing and Verifying of the Inheritance Laws in Islamic Religion through Event-B Modelling

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**Abstract:** The formal design is an achievement in the software engineering field, but we faced challenges to satisfy that. In this paper, we discuss these two issues; developing inheritance laws of Islamic religion in the event-B framework by using refinement technique and verifying the correctness of the model through proof obligations of a formal method. Finally, we could verify that the code generated from the proposed approach is correct and formal to use as a java code. In this research, we can simplify the complexity of the of the Inheritance laws in Islamic religion by building this model gradually "refinement technique "including all complex and difficult cases.

**Keywords:** Formal Method, Refinement, Event-B, Inheritance laws in the Islamic religion.

## 1. Introduction

In this research, we developed the model of inheritance in Islam using one of the formal languages called event-B. Islamic law has established the inheritance system in the best financial systems, sharing the money with men or women through legitimate means. The inheritance of his money and his rights to his heirs are subject to Islam for the inheritance and inheritance system. The subject of inheritance deals with the estate and what it includes, and how to transfer to the heirs. Hence, the provisions of inheritance and inheritance in Islamic jurisprudence occupy a prominent place, because they are scaled rights. The Quran has been concerned with the provisions of inheritance, which has not been achieved in any other aspect legislation as a science related to the last human life. Given this importance, we will view the inheritance system in a new platform called event-B.

Event-B is a formal method for specifying, modeling and reasoning systems. Event-B is an evolution of the B-Method **[1]** developed by Jean-Raymond Abrial. A model in Event-B consists of contexts and machines, Contexts contain the static part (types and constants) of a model while Machines contain the dynamic part (variables and events). The model elements of a context **[2],[ 3]** are of four types: sets, constants, axioms, and theorems. Axioms are various predicates that describe the property of sets, constants, and theorems. A context can extend to more than one context, and also can be seen by several machines. Clause "Theorems" lists the various theorems which have been proven within the context. A Machine consists of variables, invariants, events, theorems, and variants. Variables; define the state of a model. Invariants; constrain variables which are supposed to be held whenever variables are changed by an event. In Event-B, the state of a model is changed by means of event execution. Each event is composed of a name, a set of guards G (t; v) and some actions S (t; v), where t is the parameters of the event and v is the state of the system which is defined by variables. All events are Atomic and can be executed only when their guards hold **[4].**There are various relationships between contexts and machines as illustrated in Figure-1. A context can be "extended" by other contexts and "referenced" or "seen" by machines. A Machine can be "refined" by other machines and can reference to contexts as its static part.

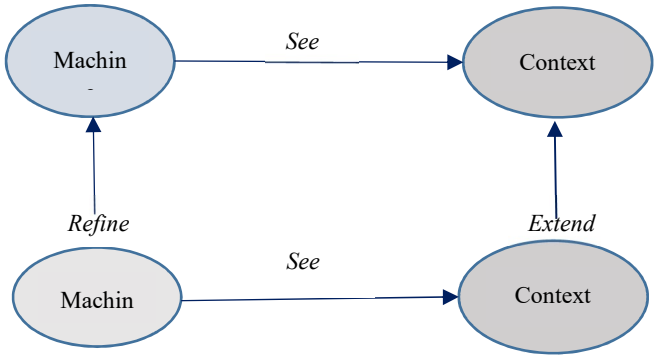



*Figure-1: Machine and context relationships*

Building a model usually starts with a very abstract model of the system, and then gradually details are added through several modeling steps in such a way that leads us towards a suitable implementation which called “refinement”. From a given model M1, a new model M2 can be built as a refinement of M1. In this case, model M1 is called an abstraction of M2, and model M2 will be said to be a concrete version of M1. A concrete model is said to refine its abstraction **[5].**

### 1.1. The concept of inheritance

Inheritance is defined as the transfer of something such as money, land, jewelry and other persons after death, and the other person may either exist or not exist as if he were a fetus in his mother's womb. The definition of inheritance is an entitlement and the division of part of the person's estate Deceased person or group of persons (Heirs) with whom he or she is related as a wife, children, brothers, and others.

### 1.2. The elements of inheritance

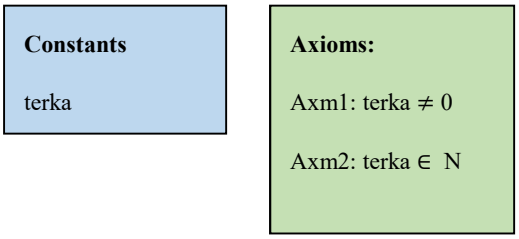
***The heir:*** A person who is alive even if he is a fetus, and who is entitled to own part of the estate for any reason.

*Inheritance:* A deceased person, who has left behind monetary and financial rights.
***The legacy****:* the monetary rights left by the legacy after his death, which divide the heirs after knowing the reason on which they were entitled to inherit.

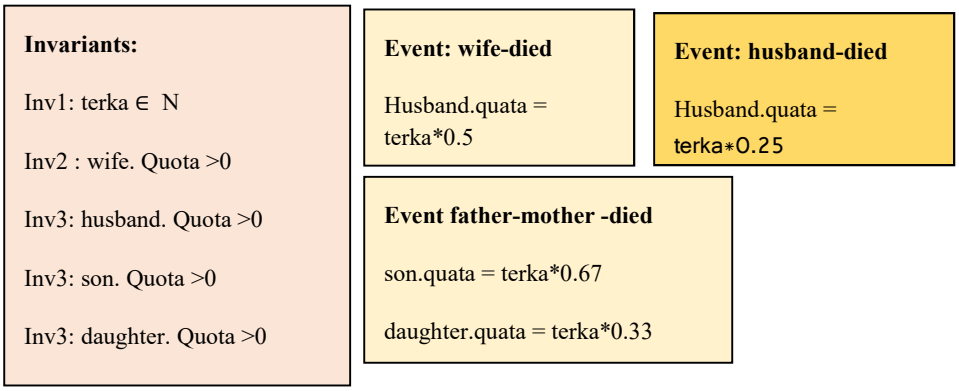
Heirs referred to as primary heirs are always entitled to a share of the inheritance, they are never totally excluded. These primary heirs consist of the spouse relict, both parents, the son and the daughter. All remaining heirs can be totally excluded by the presence of other heirs. But under certain circumstances, other heirs can also inherit as residuaries, namely the father, paternal grandfather, daughter, agnatic granddaughter, full sister, consanguine sister, and mother.

## 2. Developing inheritance laws in Islamic religion though Event-B

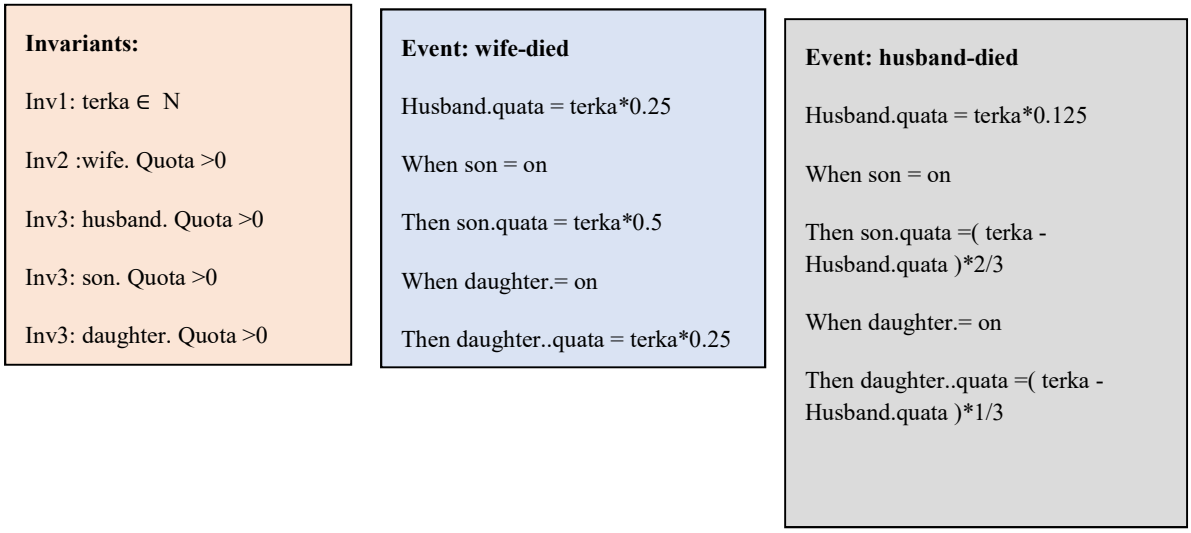
Developing inheritance laws in Islamic religion though Event-B:
We develop the case study through five phases:
**First Phase:** Create the context of the model.




**Second phase:** create the first initial machine for a simple case




**Third phase:** Complex the requirement by creating the second machine "refinement methodology".




**Fourth phase:** Verfiy the event-B model through proof obligation.
In this phase, we ensure from the correctness of all refinement levels from the perspective of proof obligations. The proof technique in event-B platform depends on the set theory first-order logic that allows to proving the model mathematically.
**Fifth phase:** Convert the event-b model to Java code then measure the quality of final code.

## 3. Result analysis and discussion

We discuss these two issues; developing inheritance laws of Islamic religion in the event-b framework by using refinement technique and verifying the correctness of the model through proof obligations of a formal method. We could verify that the code generated from the proposed approach is correct and formal to use as a java code.

## 4. Conclusion

Developing inheritance laws of Islamic religion in the event-b framework by using refinement technique is a new approach to treat the difficulty and complexity of this case. Using Event-B platform allow verifying the correctness of the model through proof obligations of a formal method. Finally, we can simplify the complexity of the of the Inheritance laws in Islamic religion by building this model gradually "refinement technique "including all complex and difficult cases.

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