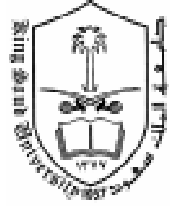

**King Saud University
College of Engineering
Industrial Engineering Department**



An Integrated Approach For Pre-Release Decisions In Flexible Manufacturing Systems

By:

**Eng. Abdulmajeed Ateeq Al-Sadi
423121477**

Supervised By:

Dr. Abdurrahman M. Al-Ahmari

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We hereby approve the thesis entitled:

**"An Integrated Approach For Pre-Release
Decisions In Flexible Manufacturing Systems"**

Prepared by: *Eng. Abdulmajeed A. Al-Sadi*

Committee Members:

Adviser: _____
Dr. Abdurrahman Al-Ahmari

Co-Adviser: _____
Dr. Abdulaziz Al-Tamimi

Examiner: _____
Dr. Ibrahim Al-Harkan

Examiner: _____
Prof. Dr. S.M. Darwish

Examiner: _____
Dr. Naceur Azaiez

DEDICATION

This Work rather this "Master" Degree is a result of the hard effort and long time invested during the past years, all the praises and thanks are to Allah for his prosperity.

The times spent for this project, were supposed to be for my honorable parents, my wife and my beautiful sons. Therefore I'm presenting this work as little compensation esteem their kind patient and usual support.

ABSTRACT

Pre-release decisions in Flexible Manufacturing Systems (FMS) are operational design decisions, which include part selection, machine selection, tools selection and machine loading problems. The pre-release decisions become very complicated when dealing with variety of parts, limited available tools and machines. In this thesis, pre-release decisions of FMS are considered using hybrid methodology (Expert System and Optimization), that solve part selection, tool selection, machine selection and machine loading problems in integrated way, to utilize the FMS resources and bridge the gap to find an integrated solution for pre-Released decisions.

The methodology is carried out in two phases. In the first phase, an Expert System (ES) is developed to narrow down the part type selection based on a work envelops of the machine tools database. Required machines, which fulfill the operations requirements of parts types, are then short listed by the developed ES. Tools are selected for every machine tool based on process capability. The output of the ES is used as input to the second phase of the suggested methodology. In the second phase; the developed mathematical model is used to select machine tools and solve machine loading problems, where the objective is to minimize the total production cost, taking into account several practical constraints.

It has been found that the use of ES to support the pre-release decisions, make fast and accurate decisions. Furthermore, the volume of data used is not totally need to be changed each time the decision maker need to do a new plans, since most of the data are about the specifications of the machines, which are normally fixed.

the integration of the ES and the optimization model provides a challenging problem solver where a large problem can solved optimally, without much effort.

The thesis consists of five chapters, an introduction of FMS technique and definition of the problems associated with FMS has been covered in this chapter, the research objectives of this thesis are further defined at the end of his chapter also. In second chapter the relevant literature of FMS are reviewed. Chapter three has

introduced the Expert System (ES) and the developed ES software, where the structure of the software is explained and the decision tree is also discussed. The optimization model is presented in the same chapter. The model illustration examples are done in chapter four. Finally, the overall conclusion, implications and future recommendations are listed in chapter five.