

Diagnostic System for Preparing Decision Tree Model to Identify the Changes in Specific Time of Project

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Abstract

Time and schedule management is absolutely essential for project success. Running out of time, like running out of money lead to fail the project management. In construction project, a change refers to a modification to conditions, assumptions or requirements. It can be caused by either direct or indirect factors. Different changes may have different effects or consequences.

This research aims to identify the major elements of changing the specific time of project, and this research also aims to build model tree to identify the causes which lead to change the time of project. The researcher presents decision making tool by using diagnostic system developed by using (VANGUARD SOFTWARE SYSEM) to enable engineers giving an appropriate decision by using decision tree model. The vanguard system is specifically designed to perform a wide range of tasks required in business decision analysis. Vanguard combines decision _making technology with methods to create diagnostic system applications.

الخلاصة

الوقت وإدارة الجدولة الزمنية ضروري جدا لنجاح المشروع. استنفاد الوقت، مثل استنفاد المال، يؤدي إلى فشل إدارة المشروع. في المشاريع الإنشائية يشير التغيير إلى تعديل الشروط والمحددات والمتطلبات. التغيير يمكن أن يكون سببه أَمَا عوامل مباشرة أو غير مباشرة. التغييرات المختلفة لربما لها تأثيرات أو نتائج مختلفة أو متعاقبة.

يهدف هذا البحث لتمييز العناصر الرئيسية لتغيير الوقت المحدد للمشروع، ويهدف هذا البحث أيضا لبناء الشجرة النموذجية لتمييز الأسباب الذي تؤدي إلى تغيير وقت المشروع. يقدم الباحث أداة اتخاذ القرارات باستعمال النظام التشخيصي طور باستعمال (VANGUARD SOFTWARE SYSEM) لتمكين المهندسين من إعطاء قرار ملائم باستعمال نموذج شجرة القرار. إن نظام VANGUARD يصمم بشكل محدد لأداء تشكيلة واسعة من المهام تطلبت في تحليل قرار العمل. تدمج VANGUARD SOFTWARE تقنية اتخاذ القرارات بطرق التحليل لخلق تطبيقات النظم التشخيصية.

1. Introduction:

Project changes can be classified as “anticipated changes” and “emergent changes”. Anticipated changes are planned in advance and occur as intended. On the other hand, emergent changes arise spontaneously and are not originally anticipated or intended [Ref. 1]. Some changes involved affect the nature of the work to be done without increasing its difficulty, requirement for resources or duration. Other changes actually reduced the work to be carried out [Ref. 2].

Managing change in construction projects is also a collective problem process, it requires the sharing of tacit [personalized knowledge] and explicit [codified knowledge]. Knowledge between the project team and appropriate application of the knowledge.

Time is also money. Resources, especially people, cannot be used over time without paying for them. It is very difficult to encompass with all reasons and causes which lead to change the time of project, so, the authors adopts the factors below to explain the issue;

1. Extra/additional work.
2. Defective/deficient plans/specifications.
3. Differing site conditions
4. Disruption.
5. Delays.
6. Acceleration.

2. The Research Methodology

It is hereby concluded that there are several consideration to be taken into account in identifying the changing in time project such as

1. The importance of the work.
2. Site conditions.
3. The quickness in resolving the problems.

The research establishes a tree model to explore the causes of change in time project. This tool is capable of simulating different scenarios of change options by predicting and evaluating their impacts, and providing advice on the causes of actions in response to a change event. The tree model can carried out either at the planning stage or at project execution stage.

Therefore, the author presents the research methodology explained in Fig. 1

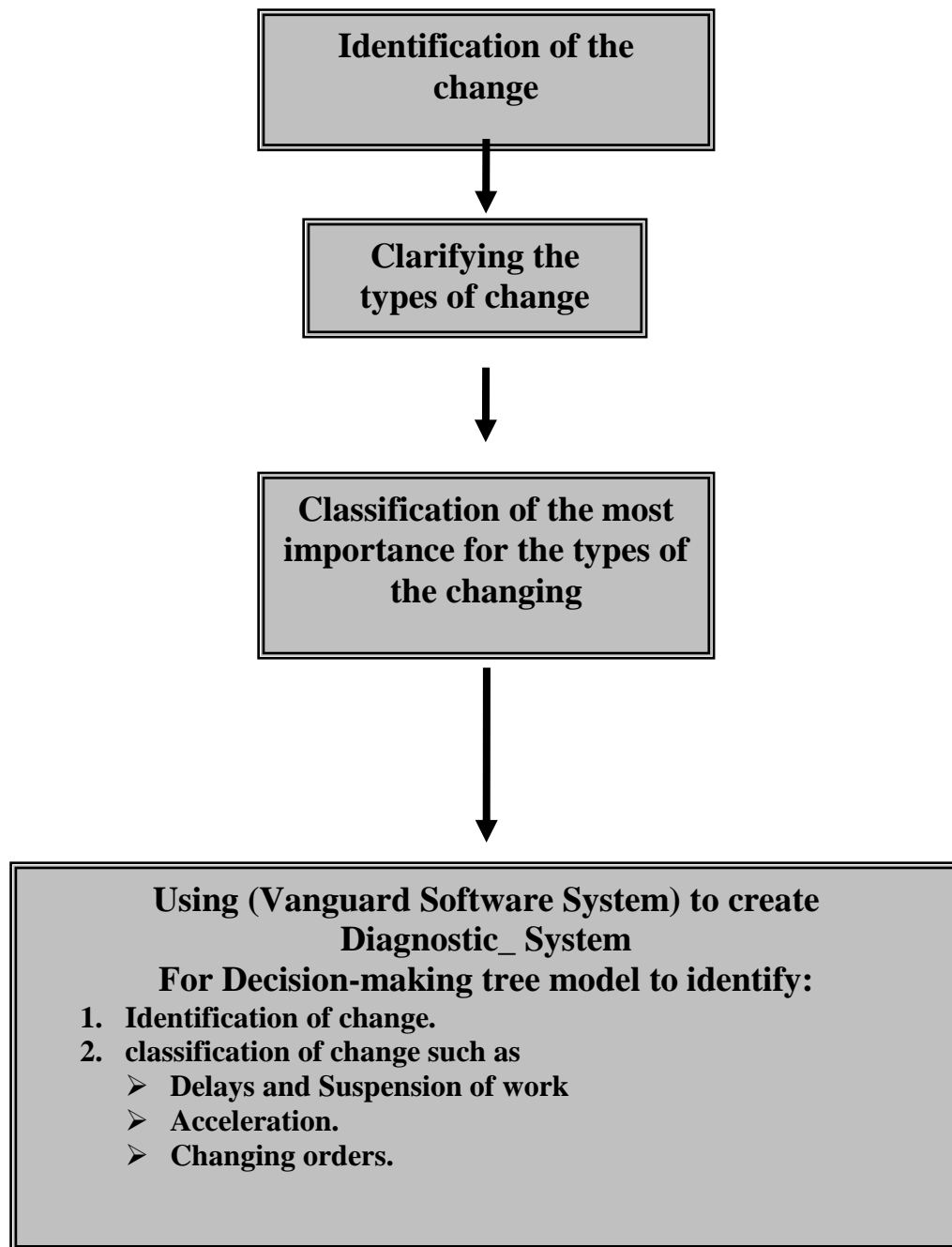


Figure (1) The research methodology

3. Types of Acceleration

There are two types of acceleration [Ref.3], [Ref.4]: actual and constructive. Actual acceleration occurs when the owner demands that the contractor complete the project a head of the originally submitted completion schedule. Constructive acceleration occurs when the contractor is delayed by some action normally an involved change order, or by an owner or architect's delay in reaching a decision on a question posed by the contractor. If the contractor

then requests a job extension and not granted one and the owner subsequently demands that the contractor complete the project according to the original contract schedule, a condition of constructive acceleration has been created. By claiming the condition of constructive acceleration, a contractor can attempt to get monetary relief because of the owner's actions.

4. The Legal Elements of Acceleration Measure

The legal elements of acceleration measure are as follows; [Ref. 3], [Ref.5], [Ref.6], and [Ref 7]:

1. Increased resources: to reduce the time taken for critical activities. The increase may at some level have the effect of reducing productivity and thereby increasing unit cost of construction.

2. Increased man hours: is a means of increasing resource input, but will introduce inefficiency and both quality and health and safety issues.

3. Incentive: will motivate labors to increased productivity.

4. Changed method of working: may open up additional workforces of workplaces as well as introducing economic in the use of plant and equipment.

The contractor must recognize delays for which there is contractual entitlement to a time extension and formally request the time extension. The owner must recognize that any failure to take prompt and appropriate on a time extension request may result in an expensive constructive acceleration claim. [Ref. 8]. Cost of acceleration may include premium pay such as shift different and overtime, additional resources applied (labor, material, machinery and equipments).

5. Types of Delays

The time allowed for execution a project is usually an important consideration for both the owner and the contractor. The delays may be caused by the contractor, the acts of God, or a third party, or several different kinds of delays may happen concurrently so that the time delays can be divided into four major types as. [Ref.9] and [Ref.10];

1. Compensatory delays.
2. Excusable delays.
3. Non excusable delays.
4. Concurrent delays.

Furthermore, Levy [Ref.1], Ahuja, [Ref.11] and Wilson [Ref.12] classified the time delays into three basic categories: -

1. Excusable delays.
2. Concurrent delays.
3. Compensatory delays.

6. Definition of Vanguard Software System

Vanguard is a powerful system used for decision _support analysis and business modeling. The system combines all of the basic quantitative methods in management with features of spreadsheets, artificial intelligence tools, and math application to produce an advanced business modeling system.

The vanguard system is specifically designed to perform a wide range of tasks required in business decision analysis. These tasks include; [Ref. 13]:

1. General modeling and problem solving.
2. Collaborative modeling.
3. Data analysis.
4. Advanced analysis.

Using one or move of the vanguard Add in products can be build models that perform decision making analytic methods such as:

1. Forecasting.
2. Decision tree analysis.
3. Sensitivity analysis.
4. Monte Carlo simulation.
5. Optimization.
6. Application development.

Vanguard is the only application that combines:

1. Advanced knowledge capture techniques.
2. Collaborative development infrastructure.
3. Powerful decision analysis capabilities.
4. Easy integration with existing system, and
5. Flexible, web-based deployment.

7. Steps for preparing Decision Making Tree Model

The current research considers the system as diagnosis system in order to represent the basic information of the whole work. Diagnosis system offers the most obvious use of expert system. The list of possible faults that causes a problem forms the natural list of goals for a system [Ref. 14, 15]

The decision tree model to identify the causes which lead to change the time in this research explained in figure (2) and (3).

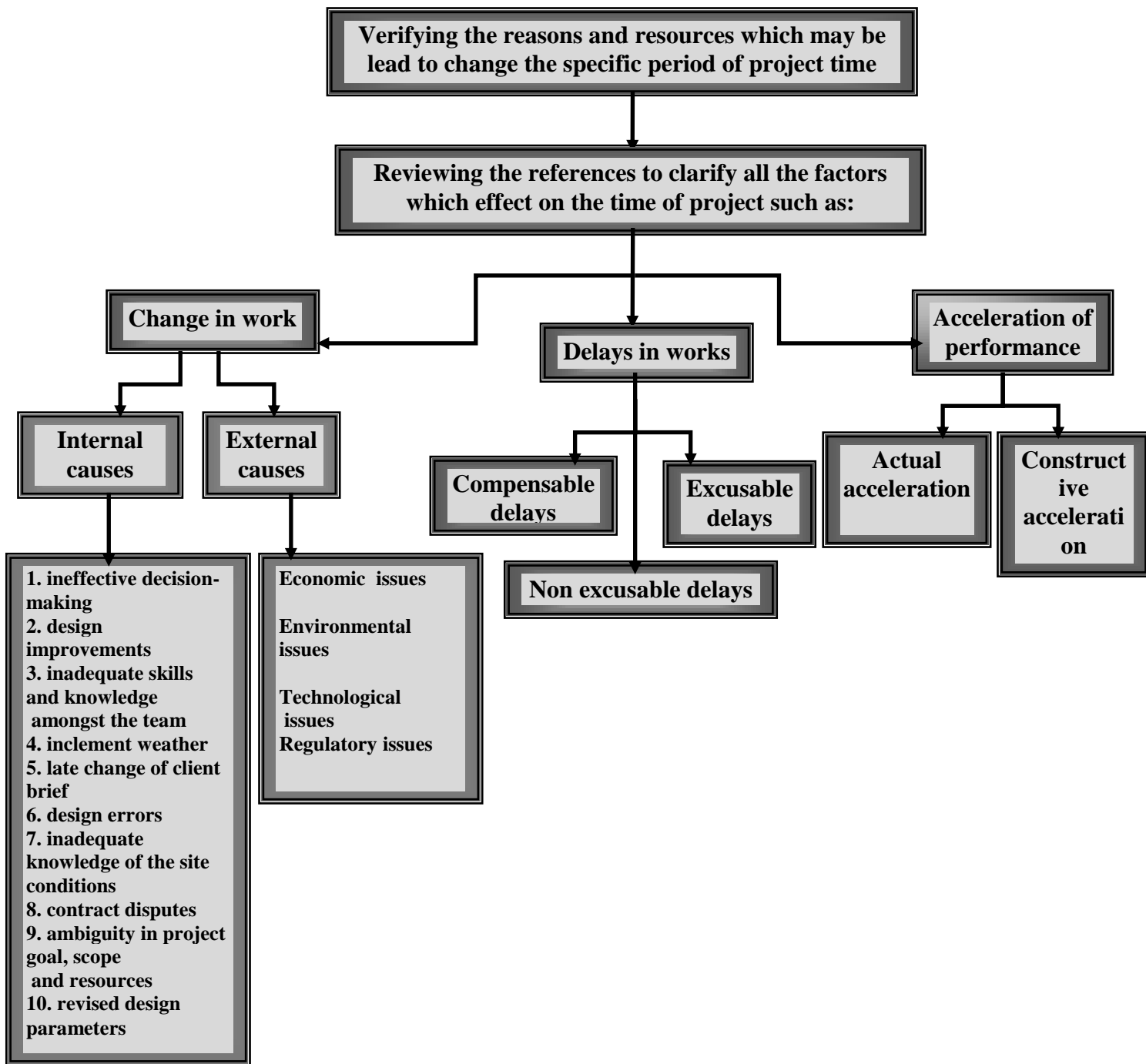


Figure (2)The explanation of Tree Model

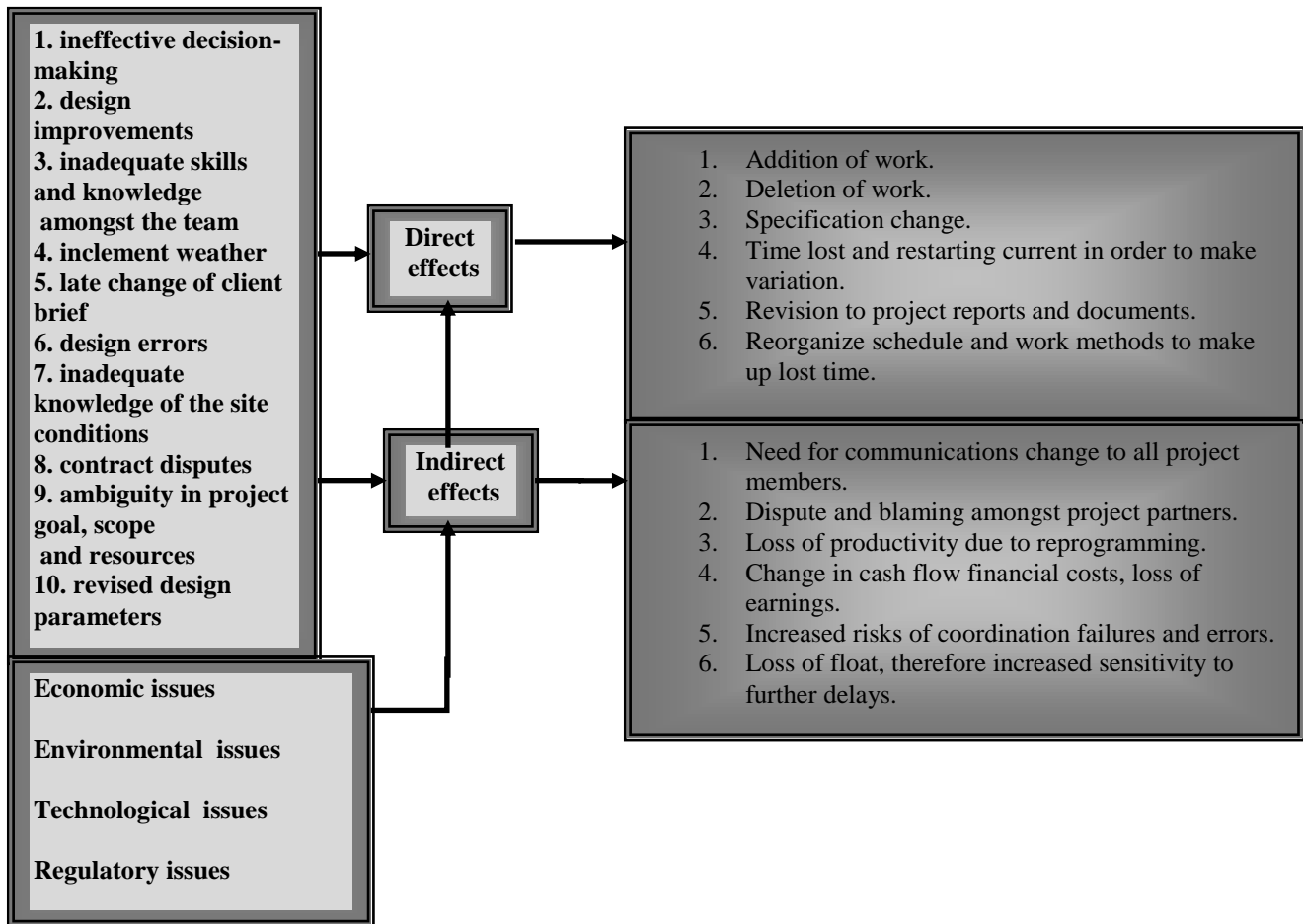


Figure (3) The explanation of Tree Model

8. Evaluation of the Tree Model

The developed program Diagnostic system for identifying the change in specific time of project is designed for criticism and the prototype is gradually improved, by letting some experts and engineers give their comments on the program by revealing new knowledge to improve the program.

The procedure is repeated until those engineers have approved the final stage of developing the system. Experienced and inexperienced users from different contracting companies are then given the opportunity to use the system and give their comments on the system efficiency and its way of usage by answering an evaluation questionnaire form handed out to users of the program.

The evaluation is achieved by presenting the facilities of the developed system and run the program by the respondents in order to give their answers to the questionnaire forms. After collecting the questionnaire forms with the answers of the ten selected experts. The answers are tabulated and analyzed as represented in table (1).

Table (1) Program evaluation answers

Respondent s no.	Experienc e (year)	Runnin g the progra m	Trainin g for manage r and site enginee r	Consider s all types of changes	Saving in time for decisio n making	Applicabilit y decision
1	30	simple	Very useful	Yes	Yes	Very good
2	25	Simple	Very useful	Yes	Yes	Very good
3	20	Simple	Very useful	Yes	Yes	Very good
4	15	Simple	Useful	Yes	Yes	Good
5	10	Simple	Useful	Yes	Yes	Good
6	10	Simple	Useful	Yes	Yes	Good
7	13	Simple	Useful	Yes	Yes	Good
8	14	Simple	Useful	Yes	Yes	Good
9	20	Simple	Very useful	yes	yes	Very good
10	12	simple	useful	yes	yes	Good

9. Conclusions

The main conclusions extracted from the research work can be summarized as follows:

1. All the answer shows that the developed system is simple and easy to be used.
2. Regarding to the question on using the tree model for training:
 - a. Four of the users answered that the program is very useful to improving the experience of the engineers for identifying and making decision on the changes.
 - b. The other users answered that the program is useful for training the site manager and site engineers.
3. To the questions about the program were included all types of change in specific time of project, all the users answered positively.
4. To the question about if program will save time, all users answered that the program would have a good saving in time that is usually spent on making a decision.
5. To the question on the efficiency of the program in identifying the changes, four of the users answered that the program is very good, and six of them answered that the program was good.
6. The users comments on the program are:
 - a. The program is suitable for making a decision for change when projects have been achieved with high accuracy of execution.
 - b. The program should be included a wide explanation to users about the compensation for delays which may be cause change in time of project.
 - c. The conclusion for each type of delay and acceleration should be included with the compensation and the contract parties responsibility in the same decision.
7. In the case of an excusable delay, the contractor is entitled to an extension of time and compensation for costs associated with delay.
8. Contemporaneous project diaries and other reports should indicate the impact to the acceleration on the workers productivity.

10. References

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