Title: Premature Termination in Different Project Types

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PREMATURE TERMINATION IN DIFFERENT PROJECT TYPES

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I. INTRODUCTION :

Failure in the projects is a sensitive area. Different organizations may have different criteria to define and measure the failure of a project [5]. R&D projects were previously focused to obtain the relevant factors [3]. These critical factors are monitored and measured to obtain relative figures to compare with the planned state of cost, schedule and performance. The degree of conformance for this figures are the basis for type of corrective actions necessary to improve the system. The high variance between these figures may result in the early termination of the project. The problem is the amount of uncertainty embedded in the nature of the information gathering and estimating the future events, which is the basis for the planning, review and termination of the project.

The approach selected here is gathering the factors under different project types and rank them. The classification and frequency of occurrence at different stages of life cycle combined with other concepts like, the decision authority and the percent of terminated projects for each type are discussed and related in the paper.

Termination prior to project completion or in another words premature termination of a project is the focus of the study in this paper.

Terminating a project in an organization is highly related to the criteria set for the failure, or simply the way failure is defined. In a broad sense the success or failure of a project is decided based on the performance, cost and schedule of the designed versus actual project. It must be noticed that each of the three criteria stated above show different characteristics in each project. Here, the general approach is tried to be classified and grouped with its relation to different project types and the different project phases.

The project type approach highlights the similarities in failure criteria eases the forecasting of uncertain occurrences in a project.

Phases of a project or the life cycle approach brings another dimension and helps us to break down the project and identify the point where different issues or factors [4],[15], gain importance and affect the success of the project and thereby the employees, managers and the entire organization.
Based on the variation in definition of failure in different organizations no specific categorization can be specified here. Instead a ten factor approach used by [4],[5] is discussed used and modified by the survey to relate the issues stated here.
These factors and some additional ones that are considered to be important are included in the survey instrument. Another aspect that is included in the survey is a question relating to the reason why exactly the different organizations find a project difficult to terminate, or accept the failure. This types of questions are expected to bring an insight to definition of the failure by looking in to the reasons that make the organization hesitate to accept the failure.

II. THEORETICAL BACKGROUND :

II.1 Termination Methods:

All projects tend to complete same phases throughout their life cycles. Termination is the last phase of the life cycle. Termination is a painful process and most of the times it is hard to decide to end a project. Buell [9] states that the termination of the project has not much impact on technical success or failure, but it has a great impact on the residual attitudes of the projects.
Badiru [15] summarizes the following operations as the required actions for a smooth termination :

1) Coordination of personnel on termination of project
2) Coordination of required actions for termination
3) Reassignment- reallocation of workers to new projects or their old functions
4) Allocation of equipment,tools, and other resources for new projects

Even for the projects that meet the requirements of performance, time, and budget, termination process has still great difficulties for all types of projects. The reason is the transition period for the project team during termination. Project manager has to accomplish this phase with minimum disturbance for the team and administration. Lee and Mantel [6] reviewed the common problems associated with the termination decision. Mainly the lack of required information and data for timely review and evaluation is important for the organization. Project termination decision requires an updated model and relevant data information and feedback system. Another reason is due to the locus of the termination decision. The project manager and project team have subjective judgments on project during the review period. This leads to some biased evaluation.

Most of the time decision directly comes from top management using their power. In this study, survey looks into the question of termination authority. Special project termination manager and an evaluation team are other alternatives that might be used to evaluate and terminate the project [14]. Reasons that makes the decision difficult can be stated as: Risk of early termination, Lack of sufficient information about project progress, Informal relationship between project manager and top management, Type of customer, and acceptance of failure by project manager and project team.

Three Ways of project termination process are available and used: Mantel and Meredith [14] suggested three possible ways for a smooth termination process. Each of them has specific characteristics and is applicable to both failed and successfully finished projects. These methods are defining the procedure, not the criteria for termination of the projects.

These can be stated as :

1)Termination by Extinction:
Project is ended whether it is successful or unsuccessful. Project has been accomplished. Internal and external factors imply that no further improvement can be seen. Consequently, project team is released, and members are assigned to other activities. At the end a final report is prepared.

2)Termination by Inclusion:
In this case, project becomes a part of parent organization. Project team is transferred to organizational unit divisions. Since project is institutionalized this approach is ~~completely~~ different from the first one. In some cases , project team members are not willing to be a part of organization. They look for new challenges with new projects instead of being strictly dependent on one division.

3)Termination by Integration:
This is the most common way to terminate a successful project. Output of the project becomes a "standard" part of the parent organization. Termination by integration shows similarities with.termination by inclusion .

A project can be terminated for three possible reasons according to Roman[11];
-project objectives accomplished
-for convenience
-due to failure of project objectives.

Achieving project objectives brings the end of the project, a final report and distribution of resources are performed and the project is ended. In this study termination for failure and termination for convenience are considered under the same category. Termination for convenience is possible in case of change in external conditions of the project environment. Danger of technical obsolescence, changes in customer needs, changes in governmental regulations are known examples of project termination for convenience. In this case, project team has usually no active role on the external factors, conditions may change the project profitability. The presence of other potential investment opportunities may result in termination of an on going project.

The worst case for the project team is the termination for the failure. The project is stopped due to unsatisfactory technical performance, cost and time overruns. A project is said to be failed if "it cannot meet the objectives for which it was defined designed, and cannot meet any other objectives sufficiently valuable to the sponsoring organization to merit continued support or implementation" [6].
Survey targeted the High-Tech firms is searching for possible failure reasons of a project. Reasons are divided into two main groups: external and internal.

II.2 Causes of Project Failure :

In their study [1], Balachandra and Raelin have tried to classify the failure factors in to two groups: The first four being the critical factors leading to the termination of a project and the following twelve that are not dramatically critical but may lead to the project failure in conjunction with other factors. The factors are stated below with brief explanation in Table - I

TABLE-I

Critical Factors :

Availability of appropriate technology in a planned time frame.

Change in market orientation or market size.

Change in governmental regulations.

Sudden shortage in the availability of raw material (inc.price)

Factors Delaying the successful completion :

Top Management Support

Rate of new product introduction

Probability of technical success

Technology Route (New Tech. Development and understanding)

Project Manager as a project champion

Association between marketing and technical aspects

End users (loss of focus in product design)

Effectiveness of Project manager (handling changes)

Commitment of project workers

Life cycle of product (marketing effect)

Internal Competition (For available resources)

Cost - Schedules

It must be noticed that the efficiency of the system of control relying on these factors to identify or predict the possibility of failure, is highly dependent to the project review period.
The intervals that the data are gathered through monitoring and evaluated for control and corrective action purposes is detrimental.

The review period is generally a function of factors like : perceived value of the project for the organization, size of the project, type of the project, phase of the project, familiarity of the organization with the project and the organizational structure of the company.
The evaluation of the project on consistent time intervals is necessary and is usually performed by the project manager. Jeffrey K.Pinto and Samuel J.Mantel JR. [5], stated in their study that two approaches are mostly used by managers to evaluate the projects : first one being the decision rules/or decision support systems and the second is development of a set of indicators or identifiable conditions so that problems of a project can be identifiable or addressed before it has failed. Considering the fact that the failures are unique occurrences and that the causes of failure are idiosyncratic to the firm, or perhaps to the project, it seems not to be relevant to come up with a certain type of process to identify or generate an exact system to capture the factors or causes totally before it occurs.
It may be even easier to use a combination of factors considering the success and failure of the project. Since the failure is only one portion of the process, elimination of all possible factors causing the failure may not guarantee the required rate of success on the project. Consequently ten factors for successful completion of a project are stated [5],[4]. These ten factors will be mentioned and positively related to the different stages of the project life cycle, and the degree of importance of each at different stages will be mentioned in the life cycle concept of the paper.
This paper relies on the factors stated above and develops ~~tries to create~~ its own point of view by introducing some additional questions in the survey and relating them to the subject during the analysis. Generally the important factors in our approach is divided under two headings: Internal and External.
The internal factors are dependent on the project based performance as a function of cost,time and etc., where the external factors are subdivided into four major groups and each group is addressed using its specifications or characteristics. These four external factors are simply gathered as,: Technological, Economical, Market conditions and Political.
Another aspect that was considered as a separate factor was the type of-customer which is important to identify the companies sensitivity on the customer needs and degree of satisfaction of these needs. It should be noted that the type of the company addressed (which is the High-tech. industry here) has a significant importance in the relationship with customers and in determining the relative importance of this factor in the evaluation process for the company.

In Balachandra & Raelin

~~Also~~ another study, ~~performed by the same people~~ [3], ~~tried to~~ measure the relative effects of different factors. The discriminant analysis which is a weighted scoring method for factors ~~are used~~ relying on ten quantitative and thirteen qualitative factors. These factors are selected from a large number of factors due to degree of change they can capture. The selected factors are seemed to be optimal considering the time and cost constraints due to large amount of computations involved in case of including more factors in the analysis.
Eight of the quantitative factors measure the characteristics of the project by comparing the old and the new state of the project for each desired factor. The remaining two combine the effect of these eight factors to measure the degree of control available on the progress.

The thirteen qualitative factors also are used to measure the changes, mostly external (environmental), that are based on market or organizational dimensions of the project (will be mentioned later).
Here the ten quantitative factors [3] are stated in table - II to show the important factors in measuring the different project performances :

TABLE - II

Quantitative Factors :
Probability of Commercial Success
Anticipated Annual Growth Rate
Capital Requirement
Risk Distribution
ROI
Profitability (on sales)
Annual Cost of Project / R&D Budget
Probability of Technical Success
Fraction of times Schedules met
Fraction of times Cost Schedules met

The survey and the literature search also directs us towards life cycle approach and its importance in defining different terms and easing the process to evaluate and control different projects. Therefore life cycle approach, the different stages and the important factors at each stage are referred here and the material will be combined with the research in the analysis.

II.3 Project Life cycle Concept :

There are different approaches to project life cycle stages. In [5] Jeffrey K.Pinto and Samuel J.Mantel JR. used a two stage life cycle model :Strategy/tactics. The first one considering the external and the following using the internal effects. Although this approach is quite useful in evaluating and formulating the stages at which different types of planning must be considered, it doesn't provide the necessary insight from our approach. The one that is found to be appropriate for our study is a four stage model [4],[14],[15],[16].

This model considers the stages to begin with conceptual, planning and execution and end with termination. This type of breakdown is pretty similar to the breakdown stated in [14], as conceptual, definition, production, operational and divestment. During the first stages the needs of the systems are determined and different ways are tried to overcome the differences between the needs and the existing system. Then the compatibility of the system and the alternative ways to accomplish the objectives are considered.
The resources necessary and initial design for the systems are performed. Towards the end of the first stage detailed plans are prepared and realistic cost and schedule figures are obtained and the necessary support systems are determined. The execution stage which is the equivalent for the production and operation phase is modified by updating the plans and designing the final product components and putting them to work. The last phase stands for the end of process, whether its shutdown of a one time activity or the continual production of the same product. This stage can be used for feedback, evaluation, transfer of responsibilities and resources and to cover the lessons learned from the project.
The nature of each stage and its characteristics are different and therefore creates its own problems. The types of conflicts and factors effecting the success of the project are all function of the stage of the project. The degree of importance of each factor affecting the success was stated to be the function of the stage. The study performed on the R&D projects [4], tries to combine the ten factors critical for the success of the R&D projects with different stages of the life cycle.
In this study Jeffrey K.Pinto and Dennis P.Slevin have used the same breakdown for the life cycle and have classified the ten factors in each stage. This breakdown can be observed from Table-III:

TABLE-III

Stage 1: Conceptual

O Project Mission
O Client Consultation
O Personnel
O Urgency

Stage 2: Planning

O Project Mission
O Environmental Effects
O Schedule
O Monitoring and Feedback
O Client Acceptance

Stage 3: Execution

O Project Mission
O Technical Tasks
O Top Management Support

Stage 4: Termination

O Project Mission
O Schedule
O Client Acceptance
O Technical Tasks
O Personnel

Are the given factors certain in a certain order??

~~As it is observed~~ the most important factor that have a significant impact at each stage is the project mission, which is generally the clarity of goals and directions [4]. The purpose of this statement is to keep the underlying purpose of the project clear and important for all members of the project.
Client consultation also seems to be effective at the conceptualization and the termination phases since the organization works with the client from the beginning to prepare a common scope of the work and during the termination the client is again involved to control whether the previously set criteria are met or not (i.e to accept the job done or reject it). Consequently the nature and type of company (government, commercial etc.) and the degree that the original company is customer oriented effects the relative weight of this factor among the others. Here it is also mentioned that the client acceptance is necessary during the planning and execution such that the client will be hands on business and have a control on the process till the end.
All the remaining have significant impacts on the stages that are classified in. These success factors used by Pinto and Slevin [4], will be modified by using the factors for failure stated in the survey and analyzing their effects on each other and different stages of project, but it is essential to remind again that

elimination of the failure factors will not be sufficient and emphasis must be made on the success factors stated above to increase the efficiency of the project performance.
Another concept similar to the life cycle is the concept of the project types.

II.4 Project Types :

The projects are ~~tried to be~~ classified in four different categories so that the similarities can easily be identified and related to the failure and termination criteria. The previous study performed by Pinto and Mantel [5] ~~have mentioned~~ the concept and used it in their survey and proved that the hypothesis is in fact positively related to the failure factors, but they have only tried to figure out the difference between two project types : construction and R&D.
The reason is simply because these two types are at the two extremes of the project type breakdown. The differences are significant in subjects like : level of uncertainty, utility of comprehensive project scheduling, and the precision with which outcome specification can be defined [5]. Two factors appear to play predominant roles in determining failure for construction projects, lack of the technical expertise and support (technical tasks) and lack of adequate trouble-shooting mechanisms [5]. A wider variety of causes is associated with failure in R&D projects : while using internal efficiency (implementation process) to define failure, ineffective scheduling is strongly related to failure. When client satisfaction is the failure criterion, personnel and monitoring and feedback have strong predictive impact. When internal assessment of quality is used, the lack of clear statement of project goals is associated with failure.
As stated earlier the clear differences between these two project types are used to show the degree of importance of different factors.
The four project types used by this study can be stated to be: R&D, design, Implementation/maintenance and Construction/manufacturing. the additional two project types included in the study provide a continuous transformation between two different ends of the spectrum (R&D vs Construction). The survey instrument has been used to bring light into the relationship of each type to the factors (internal vs external). The types of projects involved by each respondent is identified at the beginning where the percentage of failure is asked for the corresponding project type. The stage at which the projects are mostly terminated is also searched by using a question asking it as a percentage of completion of the project. Each project type is influenced in a different manner from changes in technology and other unexpected events in environment (political,market condition, economical). The significance of each and their components will be related using the analysis on the survey instrument.
Using these questions and the degree of importance of each factor determined for each project type the relation between the project types, project life cycle and relevant factors for each will be done in the analysis.

II.5 Project Termination Approaches:

Available literature focused on developing a decision support system and evaluating methods for ongoing projects to assist the true timing of project termination. Another stream of research focused on the development of a set for successful implementation, interrelated to first group. Most of the organizations are in lack of a completely developed termination decision support system. There is no adequate suggested system for project termination. Buell [9] reasoned that information scarcity, the lack of guidelines and criteria for termination contributed to a dearth of information on the termination decision.

Early studies looked to termination decision problem as a continuation of project selection. This approach uses the same decision criteria for ongoing projects and possible new projects to decide whether to continue a project or not. This is a reevaluation of the project. Balachandra and Raelin [3] argued two major drawbacks of this approach:

1) Techniques used in project selection. Even the simple scoring models, require a large amount of data. It means more time and higher costs for evaluation and review.
2) Evaluation of projects which are in different stages of their life cycle may not lead to consistent results. Criteria such as technical success, expected cost are in favor of new projects due to lack of information and optimism about the potential success of the new projects. When more information is gathered, the probability for achievement can be corrected to a more realistic value. These two limitations lead to a biased form of decision.

To overcome these drawbacks Balachandra and Raelin [3] proposed a "Discriminant Model".

They listed 23 factors which are used in reviewing projects. These criteria have ability to evaluate the changes in the attractiveness of a project. They grouped this set into two types of factors: Qualitative and Quantitative factors (were quantitative factors were stated before).

Qualitative factors:

1. Disposition of major consumer groups.
2. Government regulations.
3. Competition ability to react successfully.
4. Degree of innovation.
5. Degree of linkage with other ongoing projects.
6. Degree of support from top management.
7. Degree of support from R&D management.
8. Degree of commitment of project leader.
9. Degree of commitment of project workers as perceived by top management.
10. Degree of commitment of project workers as perceived by R&D management.
11. Degree of commitment of project workers as perceived by project leader.
12. Influence of project leader.
13. The presence of a person at any level of organization with sufficient influence to keep the project going.

The qualitative factors are focused on measurement of environmental conditions of project. In discriminant model weights are developed to be associated with each relevant factor for the decision. Any given project is rated by using these factor scores, then they added to obtain the "Discriminant score" of the project. This given discriminant score of project determines whether the project should be terminated or not by comparing its score with a preestablished cut-off value. This cut-off value changes from organization to organization regarding the nature of projects and the firm objectives. Balachandra and Raelin [3] developed this model for R&D projects like most other available models. But it can easily be expanded to other type of projects.

Most of the other authors used same factor set for evaluation with different methods. Like, in the case of other assignment of values, discriminant model uses subjective factor values.

Lee and Mantel [6] developed an expert system for project termination. They included "realism, capability, flexibility, ease of use, and low cost" characteristics to their system. They also adopted a project selection model for the termination decision, using a generalized weighted scoring model. This model gave them flexibility of handling rapid and inexpensive data updating, and capability of easy modification.

In short, they use different extensive operating information systems (marketing, production, finance, etc) and information from project management, internal and external environment, as input to the expert system. Proposed system evaluates each projects decision score. Manual Decision System enters to model if the output is uncertain.

Unlikely the Balachandra and Raelin [3] model, Lee and Mantel [6] use the project selection model for the termination decision. Their expert system has the flexibility of updating data by making use of wider information sources, and changing decision criteria.

In 1985 Balachandra and Raelin [2] categorized the factors for termination. This category involves:

-strategic
-economic
-environmental
-technological
-operational
-behavioral
-organizational factors.

Then in 1988, Bard, Balachandra, and Kaufmann [10] proposed an interactive approach for R&D project selection and termination. In that paper, they set governmental regulations, raw material availability, market conditions, and probability of success as the critical factors. Any significant deterioration of a criteria leads to immediate termination.

Otherwise, the project would then be evaluated with respect to the "key variables" [10]. Key variables can be classified as:

-environmental related variables
-project related variables
-organization related variables

Each of these categories cover several variables. Their methodology evaluates first 4 critical factors and then 14 key variables.

Each calculated project value compared with a threshold value to decide whether the project should be terminated or not.
The actual appliance and importance of these factors are gathered from the survey instrument.

III. SURVEY INSTRUMENT :

III.1 Samples :

High-tech. industry has been targeted for the study. The aim is to relate the project termination to the factors in this specific industry. To support the research material, the survey instrument is used, and sent to different companies (mostly Oregon based). 140-150 questionnaires were mailed and 45 responds are obtained with a 31% respond rate.

III.2 Analysis :

When problems are multidimensional and three or more variables are involved, multidimensional analysis is being utilized.

If a researcher's purpose is to classify objects by a set of independent variables into two or more mutually exclusive categories, discriminant analysis is being used. The prediction of a categorical variable is the purpose of discriminant analysis [17]. The researcher tries to determine which variables are associated with the probability of an object falling into one of several categories. In statistical sense, the problem of studying the direction of group differences is one of finding a linear combination of independent variables. Discriminant analysis is a statistical tool for determining such linear combinations.

The characteristics of the discriminant analysis are shown below.

TABLE IV.

	# OF DEPEN-DENT VARIABLES	# OF INDEPEN-DENT VARI-ABLES	DEPENDEN T VARIABLES	INDEPENDE NT VARIABLES
DISCRIMINANT ANALYSIS	1	2 or more	Nominal	Interval

The discriminant analysis in this paper uses project type (1=Design 2=R&D 3=Manufacturing) as a dependent variable. It can be classified as a nominal variable. The internal and external factors which influence the decision to terminate a failing project are the independent variables. Four discriminant analysis has been performed.

In the first one the independent variables are internal, technological, economical factors, market conditions and political factors. The dependent variable is the project type (Appendix-1). In the second discriminant analysis again the dependent variable is project type and the independent variables are external factors (technological factors, economical factors, market conditions and political factors) (Appendix-2).
In the third one the internal factors were split down to smaller sub-categories and the analysis has been performed(Appendix-3).
In the last one the factors which could make the decision to terminate a failing project difficult has been analyzed. The effect of project type on those factors was examined(Appendix-4).
In multiple discriminant analysis the goal is to find an axis with the property of maximizing the ratio of between groups variability of projections onto this axis [17]. However in our case there were three groups (project types) which needed k-1 axis for projection. Therefore 3-1=2 discriminant functions has been obtained.

Simplicity vs. response;
In the survey instrument three point scale ratings has been used for project factors. This gave a great deal of easiness to the respondents and the response rate was very high (31%). However in a sophisticated analysis like discriminant analysis the three point scale (high-mid-low) did not give high enough accuracy. Therefore the significance levels for the rejection of null hypotheses were in most of the cases not sufficient.
Taking this nature of the survey into consideration significance levels around 0.2 were accepted. However it was worth while to interpret those results. Most of the time they were consistent in literature.
The significance levels were acceptable only in the analysis which compared all the factors against the project type. The other ones were not found significant but they are still attached to the appendices.

Project type vs. factors;
Two functions has been found in the discriminant analysis with eigenvalues $lamda_1 = 0.25$ and $lambda_2 = 0.19$ (Appendix-1). The descriptive index of importance for the first function is 56.89%, which means that 56.89% of the variability is being explained by it. For the second function it is 43.11% and they add up to 100%. The functions were found significant enough with Wilks Lamda equal to 0.67 and 0.84, Chi-square equals 12.7 and 5.58. The null hypothesis which says that there is no significant difference among the groups is being rejected with significance levels of 0.23 for both functions.

Interpretation of discriminant function coefficients;
The coefficients are listed in the appendix-1. The first function can be interpreted as follows. The political factors have highest positive contribution to the decision to terminate a failing project. The others: technological, economical and internal factors have negative contribution. On the other hand the other one

suggests that market conditions are very important,then comes the economic considerations and all the other factors that have negative contribution to terminate a failing project.

Project types in the discriminant function 1 vs. 2 space;
The group centroids and graph of the discriminant function space is shown in appendix-1. R&D projects are very near to the function 1 which suggests that technological and political factors play a considerable role in project termination, and internal factors have negative contribution. The first part of this explanation is quite agreeable however we cannot say that the more unsuccessful the project is (time-performance-cost) the less probable it will be terminated. The other project types are somewhat nearer to the second axis which says that the market conditions and economical factors play an important role in termination. This is also consistent with the nature of those project types, however still the negative coefficients does not make sense. This is probably due to the significance levels which were used in the study.

One way Anova analysis of variance;
Since the nature of the survey was not very proper to discriminant analysis which looks to the forest from the above and was difficult to achieve statistically significant results, the researchers find it more proper to perform analysis of variance among each factor and the project types. Using this approach the trees were examined but it was possible to achieve statistically significant results. After making one-way anova test the F-coefficient and levels of significance is being contemplated and conclusions were drawn.

III.3 Interpretation of Results :

The distribution of the respondents are, 54.1% for R&D, 24.3% for design and 21.6% for manufacturing projects (Exhibit-1). Through all the available ones, seven have mentioned that termination is not used by their companies. This statement was mentioned to indicate that they do not face with failures, and the reasoning was based on the fact that project selection and evaluation process is performed carefully. The stated companies are foreign based (Japanese), which highlights the fact of different natures of nations. This affects the way of approach to the problem and in the degree of care and attention they pay while handling a problem or project.
The percentages of terminated projects can be observed from Exhibit-2.

It was also observed that most of the respondents have mentioned a rate of termination lower than 25%. This percentage is within the lowest interval provided by the question. It is not known whether the lower percentage is due to the biased approach of the respondents or the nature of the industry.

Analysis were also done to search for the relationship between the different project types and the percentage of the projects terminated. One-way analysis of variance results (Appendix-5.1) with an f-ratio of .374 and significance level of 0.6905. These results are not significant, therefore it can be concluded that survey and question types were not able to capture the possible relationships between these items.

The distribution of the stage of termination can be observed from Exhibit-3. The one-way analysis of variance (Appendix-5.2) resulted in f=.177 and a significance level of .8388. Here, significance level is again low to state a relationship between project types and the stage of termination, but a relationship is stated in different research articles [3]. It is known that the level of uncertainty in outcome of R&D projects are higher and thereby the success or failure are uncertain and usually are realized towards the final stage where the output of the R&D project is tried to be combined with market characteristics and demand. This type of behavior and uncertainty results in carrying the R&D projects towards the end, whereas in other types of projects where the outcome is certainly known (manufacturing/construction) continuous measurements and control processes are followed to compare the actual and the designed performance. This type of projects have also a faster response rate to external factors, which shortens their reaction time to the environmental factors. Consequently any negative interaction may result in the decision to terminate this projects. It can also be stated that R&D projects are relatively more closed till the end.

During the preparation of the survey it was believed that the type of the customer may affect the companies sensitivity on project performance, and ranking of different factors for the evaluation purposes. Generally the companies that work for governmental institutions are more sensitive to performance, cost and time and have solid specifications for the scope of the work. Due to the stated nature of such customers the evaluation of a project and importance of different factors may vary relative to other types. This hypothesis was searched by the survey but due to the nature of companies, having more than two or three types of customers, no classification was possible.
Since the effect of customer type can not be used the factors in the survey are related to project types and life cycle approach. Two questions (5 & 6) were prepared to look into the effectiveness of internal and external causes of termination.

Internal Factors :
The first question (5) was designed to mention the important internal factors like cost over-run, time over-run, lack of project champion and high level management support, and identify the importance of each with relation to the project types. One-way analysis is performed for each factor.
Cost over-run and the lack of high management support were the two factors found to be significant. The cost over-run was usually not important in R&D projects as expected [1],[15],[2].

High costs were usual as long as the R&D project is working and meeting the desired performance levels. Instead the cost over-run was really important for the manufacturing companies where the competition and demand are the driving forces and the companies have to meet the needs and adjust themselves for the changes in environment.
The lack of support from top management turns out to be important for the R&D projects. This dependence is also due to the nature of this projects. Since no certain outcome is defined, the continuity of the project is purely a function of the interest of people in high levels and the degree of success of the team in achieving the desired levels. Projects with lower levels of support are found to be terminated more frequently in R&D projects [5],[9],[7]. The design projects in the other hand are more operational in nature (similar to manufacturing), therefore are not highly dependent on the support from management. The ranking of significant factors with respect to design, R&D and manufacturing projects are stated at the table below :

Ranking	Design	R&D	Manufacturing
1	Cost Over-run	Lack of Project Champion	Cost Over-run
2	Time Over-run	Low level of Performance	Low Level of Performance
3	Low level of Performance	Lack of High Mgmt. Support	Lack of Project Champion
4	Lack of Project Champion	Time Over-run	Time Over-run
5	Lack of High Mgmt. Support	Cost Over-run	Lack of High Mgmt. Support

As observed from table, the operational nature of design and manufacturing projects creates some similarities in the ranking. The dissimilarities are due to the larger amount of uncertainty involved in the design projects relative to manufacturing.

External Factors :
The same type of analysis leads us to the fact that significance only occurs in case of two factors, political and economical. The economical factors are heavily considered in R&D projects and lesser in manufacturing projects. The criteria based on the economical factors to evaluate the projects are :profitability, rate of return and budget allocation.
The political factors instead, were found to be more important in design projects were the output is more specified than the R&D but not as certain as manufacturing. Therefore the design projects are effected by political factors like changes in international regulations or government regulations. The reason can be stated as the demand pull nature that tries to produce an outcome which is

felt to be needed by the potential customer. The needs of the customers are measured by different characteristics of the market and thereby the political factors. The other factors that do not show significance with project types are market conditions and technology [14].
The change in customer needs seems to be the highest ranked factor in market conditions which also is effective on R&D projects. Market potential also directs the R&D in attacking the possible customer needs.
The technological factors are not found to be significant. This behavior was also expected since the industry targeted is a "high-tech." one... One of the most significant issues in technology is the priority of other project and reevaluation of the ongoing one on the consistent basis. The lowest affect was observed from patent problems which was only significant in design companies.
The ranking of the factors under the project types can be observed from the table below :

Ranking	Design	R&D	Manufacturing
1	Economical	Economical	Internal
2	Technological	Market Condition	Economical
3	Internal	Internal	Technological
4	Market Condition	Technological	Market Condition
5	Political	Political	Political

In addition to the factors causing the failure, the survey looks into some of the factors that makes the termination of a project more difficult. Some of the factors can be stated as: risk of early termination, lack of sufficient information about project progress and acceptance of failure by project manager or the organization. The factors that show differences with respect to the project types are: acceptance of failure, risk of early termination and lack of sufficient information.

Ranking	Design	R&D	Manufacturing
1	Lack of information	Acceptance of Failure	Lack of information
2	Relation between PM and Top Management	Type of customer	Risk of early termination
3	Type of customer	Lack of information	Type of Customer
4	Acceptance of failure	Relation between PM and Top Management	Acceptance of failure
5	Risk of early termination	Risk of early termination	Relation between PM and Top Management

As observed from the table the risk of early termination and lack of information are ranking in the first places, where the acceptance of failure is the most important factor in R&D due to its top management power/personal interest nature.The lack of information is also significant to the design projects. Actually the lack of sufficient information is the embedded nature of all evaluation and control systems. The organization should consider the trade-off between the amount of information and cost, and must also point out the degree of uncertainty of the information.

IV. CONCLUSION :

The criteria defined as causes of failure are considered by the organization and proactive measures are applied by each in a different way. The fact is that the authority for project termination is gathered at the high level of management (EXHIBIT-4). The survey indicates that most of the time project manager is in a recommending position for termination of a failing project. Actually most of the respondents indicated that project evaluation teams are used, but only two of them stated that these teams have the authority for the decision making. Such a distribution indicates that the top level management is the origin of the decision making that uses other sources or levels of the organization for information and feedback purposes. These sources are the same as those used during the periodic review and reevaluation of the projects. Here, the importance of monitoring and control on the continuous bases are reinforced again.

Even in the cases that results in termination, it is the effective monitoring that provides the necessary signals to the organization. The organization evaluates the data by making use of different methods mentioned before. As a consequence the organization decides to take a corrective action (control). This corrective action can either be in the direction to close the gap between the actual and the planned stage or to completely terminate the project, to avoid further losses.

Here, the company should benefit from the advantages of previously defined termination processes, to reduce the undesirable affects of termination during the transition phase.

An appropriate planning for this stage will be helpful for the organization to maintain the same level of operation from the resources (human or non-human) obtained from the failed project, reducing the side effects of transition period.

The study performed here was suitable to analyze different parts of the subject, but it was not sufficient to perform a synthesis of the study and come out with a specific termination model. The reason can be tied to the fact that all the parts were not available, and any further attempts will lead to misconceptions in the process.

Consequently, it is advised for the readers or researchers who would like to use or continue on this subject to modify this paper for more in depth factors involved in each project type. Further modifications necessary to improve the results can be stated as : addressing each project type with a different survey instrument, better designed questions in the survey for each project type and to ease the statistical analysis, modify the survey with more in depth questions targeting the separate life stages of the projects and coming out with a failure control and termination mechanism for each project type relying on their specific characteristics.