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# Reducing Time to Market of Software with Time Duration Empirical Model

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**Abstract- Time to market is the length of time taken in product development from product idea to the finished product. Time to market is the essential aim of any new product introduction process. Performance measures are simple quantities that indicate the state of manufacturing organizations and are used as the basis of decision-making at this crucial early stage of the process. In this paper, analyses are performed on data to show the parameters which has maximum influence on the time factor. The model presented in this paper can be applied in any organization to calculate the influence of parameters on time factor.**

**Keywords: Development time, effort, productivity.**

## 1. Introduction

Time to market is the length of time taken in product development from product idea to the finished product. Time to market is the essential aim of any new product introduction process. Performance measures are simple quantities that indicate the state of manufacturing organizations and are used as the basis of decision-making at this crucial early stage of the process. The complexity and criticality of software within industry is high and continues to grow significantly every year as software becomes an increasingly important component in many consumer goods such as home appliances, cameras, cars and mobile phones the effective management of embedded software development in consumer goods poses difficult challenges for managers. Many factors contribute to this challenge: however, the driving force is cost[13]. The cost of hardware components, the cost of software development, and most importantly the cost of being late to market.

In efforts to meet time to market requirements, companies have succeeded in decreasing hardware development time through applying just in time and total quality management techniques, or simply by buying off the shelf solutions. However this means that software often lies on the critical path for product introduction[14]. In the telecommunications industry for example developing high quality software quicker is probably more important to a company than accurately estimating its cost or knowing its productivity.

## 2. Literature Review

Steven R. Rakitin [1] states Software Quality Consulting, Time-to-market and quality quality culture, and continuing support. Balancing quality and time to market is difficult, but it can be done. With a strong commitment from management, the organization can benefit from lower support costs, fewer bug-fix releases, and increased profits. Customers can benefit by not having to deal with defective software. This makes customers more productive, and as a result, more satisfied. And satisfied customers are more likely to buy more of the company's products.

Sin-Hoon Hum [2] described the evolution of competitive paradigms, highlighted the importance of time as a key source of competitive advantage, and then presented the nature of time-based manufacturing, sales and distribution, innovation and strategies. Time-based companies create more information and share it more spontaneously with as many employees as possible. Stalk and Hout argued that creating fast response among employees is necessary in order to provide fast response to external customers.

As per Morris A Cohen [3], introduce a multistage model of new product development process which captures tradeoff explicitly. It show that if product improvements are additive (over stages), it is optimal to allocate maximal time to the most productive development stage. it indicate how optimal time-to-market and its implied product performance targets vary with exogenous factors such as the size of the potential market, the presence of existing and new products, profit margins, the length of the window of opportunity, the firm's speed of product improvement, and competitor product performance. Finally, it shows that an improvement in the speed of product development does not necessarily lead to an earlier time-to-market, but always leads to enhanced products.

Paul K sabere [4], states that the study is an empirical examination of the relationship between pricing and optimal time on the market (TOM). First, estimates of optimal TOMs for our data set are generated using a linear programming model. Next, a workable measure of pricing is provided based on predicted listing prices and predicted sales prices. these are then able to measure directly the relationship between pricing and optimal TOM. The results of analysis indicate that both overpricing and under pricing would prevent the achievement of optimal TOM and result in suboptimal sales prices.

As per James D Herbsleb Audris [5] ,Global software development is rapidly becoming the norm for technology companies. Qualitative research suggests that multi-site development may increase development cycle time. Here data and data from the source code change management system to model the extent of delay in a multi-site software development organization, and explore several possible mechanisms for this delay. it measures differences in same-site and cross-site communication patterns, and analyze the relationship of these variables to delay. Our results show that compared to same-site work, cross-site work takes much longer, and requires more people for work of equal size and complexity.

## 3. DATA SET

The data set is taken from the book Applied Statistics for software managers by Katrina Maxwell. This data set is already used by author for another analysis. The data set is collected by bank to help to manage project portfolios. The project manager provided data at the end of each project. One person entered all project data into the database and validated it.

| Sr. No. | Variable Name | Description |
|---|---|---|
| 1 | id | identification number |
| 2 | size | application size |
| 3 | effort | effort |
| 4 | duration | Duration of project |
| 5 | start | exact start date |
| 6 | app | application type |
| 7 | har | hardware platform |
| 8 | dba | DBMS architecture |
| 9 | ifc | user interface |
| 10 | source | where developed |
| 11 | lan 1 | language used |
| 12 | t01 | Customer participation |
| 13 | t02 | Development environment adequacy |
| 14 | t03 | staff availability |
| 15 | t04 | standards use |
| 16 | t05 | methods use |
| 17 | t06 | Tools use |
| 18 | t07 | Software's logical complexity |
| 19 | t08 | Requirement volatility |
| 20 | t09 | Quality requirement |
| 21 | t10 | Efficiency requirements |
| 22 | t11 | Installation requirement |
| 23 | t12 | Staff analysis skills |
| 24 | t13 | Staff application knowledge |
| 25 | t14 | Staff tool skills |
| 26 | t15 | Staff team skills |

## 4. REGRESSION ANALYSIS

Regression analysis is a statistical process for estimating the relationships among variables. It is a statistical technique that allows us to predict impact on one variable on the basis of their scores on several other variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. Regression analysis helps to understand how the typical value of the dependent variable (criterion variable) changes when any one of the independent variables is varied, while the other independent variables are held fixed. A regression model shows *Y as* a function of X and β.

**Y = f (X, β)**

The β is denoted as unknown parameters, which may represent a scalar or a vector, X are independent variables and Y is the dependent variable.

**Coefficients Table**

| Model | B | T | Tolerance | VIF |
|---|---|---|---|---|
| (constant) | -1.741 | -3.047 | | |
| Lprod | -.512 | -6.994 | .661 | 1.513 |
| Leffort | .387 | 8.183 | .659 | 1.516 |
| T10 | -.379 | -4.916 | .900 | 1.111 |
| T13 | .176 | 3.041 | .908 | 1.101 |

The ***Coefficients*** table provides the details of the results. Both the raw and standardized regression coefficients are readjusted at each step to reflect the additional variables in the model. Ordinarily, although it is interesting to observe the dynamic changes taking place, we are usually interested in the final model. The Standardized Beta Coefficients give a measure of the contribution of each variable to the model. A large value indicates that a unit change in this predictor variable has a large effect on the criterion variable. The t and Sig (p) values give a rough indication of the impact of each predictor variable – a big absolute t value and small p value suggests that a predictor variable is having a large impact on the criterion variable.

The beta value is a measure of how strongly each predictor variable influences the criterion variable. The beta is measured in units of standard deviation. For example, a beta value of 2.5 indicates that a change of one standard deviation in the predictor variable will result in a change of 2.5 standard deviations in the criterion variable. Thus, the higher the beta value the greater the impact of the predictor variable on the criterion variable.

The t and Sig (p) values give a rough indication of the impact of each predictor variable – a big absolute t value and small p value suggests that a predictor variable is having a large impact on the criterion variable. The value of t in our model is effective to show the impact of predictor variable on criterion variable.

The tolerance values are a measure of the correlation between the predictor variables and can vary between 0 and 1. The closer to zero the tolerance value is for a variable, the stronger the relationship between this and the other predictor variables. You should worry about variables that have a very low tolerance. SPSS will not include a predictor variable in a model if it has a tolerance of less that 0.0001. However, you may want to set your own criteria rather higher – perhaps excluding any variable that has a tolerance level of less than 0.01. VIF is an alternative measure of collinearity (in fact it is the reciprocal of tolerance) in which a large value indicates a strong relationship between predictor variables. The value of tolerance and VIH in our model are effective which shows the strong relationship between predictor variables and criterion variable.

Y= -1.741-.512(lprod)+.387(leffort)-.379(t10)+1.76(t13)

Using this equation, given values for "lprod," "leffort," ,"t10"and "t13," you can come up with a prediction for the value of duration of the project.

**Model Summary**

| Model | R Square | Adjusted R Square |
|---|---|---|
| 1 | .719 | .691 |
| 2 | .884 | .858 |
| 3 | .946 | .926 |
| 4 | .977 | .963 |

R Square (R2) is the square of this measure of correlation and indicates the proportion of the variance in the criterion variable which is accounted for by our model. In essence, this is a measure of how good a prediction of the criterion variable we can make by knowing the predictor variables. However, R square tends to somewhat over-estimate the success of the model when applied to the real world, so an Adjusted R Square value is calculated which takes into account the number of variables in the model and the number of observations (participants) our model is based on. This Adjusted R Square value gives the most useful measure of the success of our model

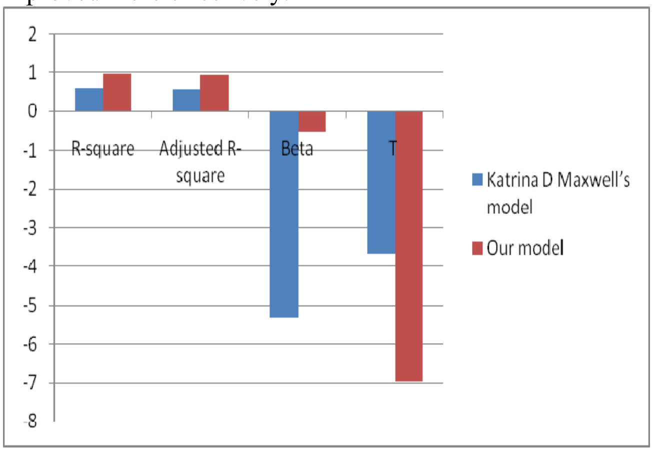
The Adjusted R Square value tells us that our model accounts for 96.3% of variance in the duration scores – a very good model!

## 5. Comparison

The model is compared with the model of Katrina D Maxwell's model.

| Parameter for comparison | Katrina D Maxwell's model | Our model |
|---|---|---|
| R-square | .617 | .977 |
| Adjusted R-square | .597 | .963 |
| Beta | -5.343 | -.512 |
| T | -3.666 | -6.994 |

Katrina D Maxwell's Time to Market model which accounts 61.7% of variance whereas our model accounts 96.3% variance. The variance shows that our model is describing the variables having more influence on the duration. The value of beta is also greater than maxwell's model which show that there is more impact on dependent variable. Even the values of t are also improved from Maxwell's model. So with this model duration can be improved more effectively.




The graphical representation of comparison between two models is shown in above graph. The above graph showing the improvement in the various values over the Katrina D maxwell's model.

## 6. Conclusion

Time to market is an important process quality attribute. The model presented is based on banking organization database. It has been shown how the model can be used to control the soft factors to optimize a particular project with respect to time to market. It has also been emphasized how the understanding and knowledge of the soft factors can be used to enable better planning and control of software projects.

## Refereneces


[1] Balancing time to market and quality by STEVEN R. RAKITIN Software Quality Consulting, ASQ Software Quality Professional, vol 1, no. 3, pp- 54-57, june 1999.

[2] Time-based competition:literature review and implications for modelling By Sin-Hoon Hum and Hoon-Hong Sim, International Journal of Operations & Production Management, Vol. 16 No. 1, 1996, pp. 75-90.

[3] Morris A. Cohen, Jehoshua Eliasberg and Teck-Hua Ho "New Product Development: The Performance and Time-to-Market Tradeoff", A journal of the Institute for Operation Research and Management Sciences, Feb 1996, Vol 42, no. 2, pp 173-186.

[4] Paul K. Asabere, Forrest E. Huffman, Seyed Mehdian "Mispricing and Optimal time to market", The Journal of Real Estate Research, vol 8, no.1, pages 149-155.

[5] James D. Herbsleb Audris Mockus Thomas A. Finholt Rebecca E. Grinter "An empirical study of global software development: distance and speed" ICSE '01 Proceedings of the 23rd International Conference on Software Engineering Pages 81-90

[6] Claes Wohlin Min Xie Magnus Ahlgren "Reducing Time to Market through Optimization with Respect to Soft Factors" , Proceedings IEEE Annual International Engineering Mangement Conference, pp. 116-121.

[7] REDUCING SOFTWARE PRODUCT DEVELOPMENT TIME by John Callahan Carleton University and Brian Moretton, Journal of Product Innovation management, 1995, 12, 110-123.

[8] K. Maxwell, L. Van Wassenhove, and S. Dutta, "Benchmarking: The Data Contribution Dilemma," *Proc. 1997 European Software Control and Metrics Conference*, The SCOM Conference, 30 Willow Tree Glade, Calcot, Reading RG31 7AZ, UK, 1997, pp 82–92.'

[9] Claes Wohlin, Magnus Ahlgren, " Soft factors and their impact on time to market", Software Quality Journal, September 1995, Volume 4, Issue 3, pp- 189-205.

[10] Rauscher, T.G. , " Time to market problems-the organization is the real cause", Engineering management conference, proceedings of the 1994 IEEE International, pages-338-345.

[11] Baygit A.C. ,Inman, " New product Introduction: Reducing time to market using Internet and Intranet technology, Portland International Conference on management and Technology, Pages: 454-459.

[12] Maxwell K.D., Applied statistics for Software Managers,Prentice-Hall, Upper Saddle river,2002.

[13] Sommerville, Software engineering, Addison-Wesley, Boston, Mass., (2004).

[14] J.r. Niels, Putting it all in the trunk: incremental software development in the FreeBSD open source project. Information Systems Journal, 11 (2001), 321-336.