Chapter 1 : ARTECH HOUSE USA : Systems Reliability and Failure Prevention

*Systems Reliability and Failure Prevention (Artech House Technology Management Library) [Herbert Hecht] on calendrierdelascience.com *FREE* shipping on qualifying offers. Offers a comprehensive treatment of the techniques and practices of systems reliability and failure prevention.*

But in the multiproject environment, the sheer number of interactions is not the only source of complex behavior; the feedback loops that exist among the principal management variables, and the fact that time is an independent variable, also play a role. The problem with systems exhibiting complex behavior is that they cannot be steered in the desired direction by applying any single action at any given time-in the case of a multiproject environment, increasing the head count in one project means delaying the start of another, increasing the use of overtime means diminishing the productivity of the whole organization, and not fixing some defects now means fixing them later at a higher cost. There is also an omnipresent risk of "oversteering" the system. Such variables tend to address the current situation, as long-term approaches such as process improvement and competence development are seldom a remedy in the case of late projects. The arrows in the diagram describe influence relationships among the management variables. For example, overtime hours lead to worker fatigue. When a project is delayed the project team shifts its focus from low-visibility tasks, such as inspections, reviews, and testing, to high-visibility tasks, such as coding and integration; this causes an immediate reduction in the project workload and some of the delay is recouped. As the schedule pressure continues to mount, the quality of the decisions made by the project team deteriorates, the number of errors increases, and the project falls even further behind. At some point, the project begins to attract special management attention, and the project staff is asked to work harder on "value-adding" activities. The team gets the message, and begins to put in longer hours while the focus on quality-oriented activities continues to drift away. The extra hours soon pay off in the form of boosted output, but as people become fatigued, The multiproject challenge their productivity drops and the number of mistakes made increases, creating another vicious circle. The next weapon in the conventional management arsenal is to increase the project head count. This measure could help or damage the project, depending on the circumstances. We know for a fact that some effort is associated with taking the newcomers through the learning curve, and this implies an increase in project workload for the original, already overloaded, staff. Furthermore, if the work was not planned from the beginning to accommodate the extra head count, a significant effort might be needed to partition and later integrate the new interfaces. Also, as the team grows larger, its productivity diminishes as a result of an increase in the communications overhead and process losses [5]. Finally, after the above approaches fail to produce the desired result, the project scope is reduced. This, which effectively cuts the workload, also comes with a price tag: Interfaces must be reworked and adaptations made. In the end, this may result in less product functionality and no real savings. Outside the sphere of the offending project, other otherwise unrelated projects begin to experience delays, as the resources they need are not made available on time. Projects waiting for deliverables are also affected. As the number of projects in the queue increases, resources are multitasked across several projects in order to keep the project sponsors happy. Such ad hoc multitasking further hinders the overall productivity of the organization. To add to the mayhem, limiting the scope of the offending project has resulted in a number of Band-Aid projects intended to pacify customers who were promised now defunct features. This adds to the organizational workload, further reducing the resource availability and increasing the multitasking, which further reduces the productivity, which further delays the projects, which adds to the workload, which further reduces the productivity. Breaking the circle calls for something truly dramatic. Any intervention is likely to affect something somewhere else. The results of an intervention take time to materialize and when they do, they do not materialize at a constant rate of progress. The true state of the system is unknowable: The current state of the system can only be inferred, its most likely evolution only guessed at. The presence of many actors, each with his or her own agenda and opinion about what should be done and when, and whose behavior is conditioned by the behavior of others, contributes to the fact that the system resists reductionistic analyses. Thus, the multiproject system is inherently unstable; the best advice one can give on how to manage it is to avoid getting into trouble in the first place, because once one gets trapped in the vicious circle it is very difficult to get out. Repenning, Goncalves, and Black [6] argue that every organization has a tipping point, a threshold that determines how much development and how much problem fixing an organization can handle, which once crossed causes fire fighting to spread rapidly from a few isolated projects to the entire organization. The cornerstone of their theory is that the more upfront work done in a project, the less difficulties encountered downstream see Figure 2. Based on this model, Repenning, Goncalves, and Black produced the chart shown in Figure 2. So other things being equal, in a fire-fighting situation desperate interventions lead to more desperate measures, which justify bringing in more firefighters, which leads to more fire fighting, which leads to more extreme measures. Much of the data used has not been drawn from the project environment-such data is either nonexistent or difficult to access. However, to jump from the original fields of research where the data was collected to project work is not too much of a stretch. If psychological The multiproject challenge Figure 2. In general, people in situations in which they must achieve multiple goals, such as meeting a deadline and achieving a certain level of quality, tend to sacrifice the least visible goal when they perceive that satisfying both would be difficult. In a study conducted by Gilliland and Landis [7] which attempted to evaluate the tradeoffs between quality and quantity when both goals were perceived as being difficult to attain simultaneously, participants gave up the less visible quality goal see Figure 2. This is the vicious cycle. If the trend conIinLes,s w n ailthe o r g d t i o n is operating in firefighting mode. Weinberg and Schulman [8] came to a similar conclusion see Table 2. In their experiments, five teams were given the same programming assignment but different goals to achieve. The experiment showed two remarkable results: Four of the five teams excelled with respect to the objective they were given. None of the teams performed consistently well with respect to all of the objectives. So if the organization, explicitly or implicitly, favors one goal over another, when something has to give, rest assured it will be the less favored, less visible goal. 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Multidisciplinary feasible method was used to decouple the multidisciplinary analysis and the fourth moment method for reliability analysis was recommended systematically. The case study shows that optimization efforts could improve obviously the performance of centrifugal compressor under the requirements of reliability. This framework could make the design reach the best performance with a good reliability. It indicates that the proposed optimization method is available and feasible for the engineering application. A new approach to synthesize the different methods of reliability allocation based on D-S theory is presented in order to obtain a reasonable result in the reliability design of a system. Firstly, introduced the background of the question and D-S theory; secondly, summarized the main methods available of reliability allocation; thirdly, presented our approach of reliability allocation, and gave an example applied the approach; and finally, reached the conclusion that the approach is effective for reliability allocation. Wen Hui Mo Abstract: Reliability optimization design of the gear box is proposed. It includes an objective function, 30 design variables and 52 constraints. It is important to note that material properties, geometry parameters and applied loads of the structure are assumed to be normal random variables. Reliability calculation adopts the HL-RF method. The comparison of design parameters demonstrates the proposed method. Structure optimization seeks to achieve the best performance for a structure while satisfying various constrains such as a given probability. In the traditional mathematical model of structure optimization, the goal and the restraint functions are given without considering the randomness of the structural system. In this paper, the random loads and strength are described by probability method, the structure reliability is considered as objective function. Using the genetic algorithm, the mega-sub controlled structural systems is multi-objective optimization designed based on the structure reliability under random excitation, combined with the probability density evolution method for evaluation of extreme value distribution. A low-cost and high-performance structure is getting. A new approach was proposed to estimate the reliability of a machine component when the probability density functions of stress and strength can not be exactly determined or only finite experiment data of stress and strength are available. The conventional universal generating function was introduced and then it was extended to represent the discrete interval-valued random variable. The experimental data of stress and strength were formulated as two discrete interval-valued random variables. Based on the extended universal generating function, a discrete interval-valued stress-strength interference model was proposed. An approach was proposed to solve the proposed stress-strength interference model and it can be used to calculate the upper and lower bounds of the component reliability. An example was given to demonstrate the proposed approach. It is showed that the proposed approach is suitable to the reliability estimation of a machine component when only finite experimental data of stress and strength can be obtained.

Chapter 3 : Appraisal of a Novel Reliability Optimisation Model Using Hypothetical Problems

But in the multiproject environment, the sheer number of interactions is not the only source of complex behavior; the feedback loops that exist among the principal management variables, and the fact that time is an independent variable, also play a role. The problem with systems exhibiting complex behavior is that they cannot be steered in the desired direction by applying any single action at any given timeâ€"in the case of a multiproject environment, increasing the head count in one project means delaying the start of another, increasing the use of overtime means diminishing the productivity of the whole organization, and not fixing some defects now means fixing them later at a higher cost. Such variables tend to address the current situation, as long-term approaches such as process improvement and competence development are seldom a remedy in the case of late projects. The arrows in the diagram describe influence relationships among the management variables. For example, overtime hours lead to worker fatigue, and fatigue affects productivity, leading to project delay. When a project is delayed the project team shifts its focus from low-visibility tasks, such as inspections, reviews, and testing, to high-visibility tasks, such as coding and integration; this causes an immediate reduction in the project workload and some of the delay is recouped. As the schedule pressure continues to mount, the quality of the decisions made by the project team deteriorates, the number of errors increases, and the project falls even further behind. The team gets the message, and begins to put in longer hours while the focus on quality-oriented activities continues to drift away. The extra hours soon pay off in the form of boosted output, but as people become fatigued, 22 The multiproject challenge their productivity drops and the number of mistakes made increases, creating another vicious circle. 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In the end, this may result in less product functionality and no real savings. Outside the sphere of the offending project, other otherwise unrelated projects begin to experience delays, as the resources they need are not made available on time. Projects waiting for deliverables are also affected. As the number of projects in the queue increases, resources are multitasked across several projects in order to keep the project sponsors happy. Such ad hoc multitasking further hinders the overall productivity of the organization. To add to the mayhem, limiting the scope of the offending project has resulted in a number of Band-Aid projects intended to pacify customers who were promised now defunct features. This adds to the organizational workload, further reducing the resource availability and increasing the multitasking, which further reduces the productivity, which further delays the projects, which adds to the workload, which further reduces the productivity. 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Its location depends on the utilization ratio of the resources. The tipping point represents the equilibrium point. The arrows show the direction in which the system will evolve when in disequilibrium. The dashed lines show how to read the diagram. This is the virtuous cycle. This is the vicious cycle. If the trend continues, soon all the organization is operating in firefighting mode. Weinberg and Schulman [8] came to a similar conclusion see Table 2. In their experiments, five teams were given the same programming assignment but different goals to achieve. The experiment showed two remarkable results: Four of the five teams excelled with respect to the objective they were given. None of the teams performed consistently well with respect to all of the objectives. So if the organization, explicitly or implicitly, favors one goal over another, when something has to give, rest assured it will be the less favored, less visible goal.

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As the measures of success and the problems that the PO and the individual projects tackle are different, the metrics for the project-based organization must reflect this duality. While for the individual projects, the objective is to complete their work while meeting cost, schedule, quality, functionality, and technical performance requirements, for the PO the objective is to maximize the benefit for the organization across all the projects and in the long run. To this effect, the PO needs to collect data not only to manage the project portfolio, but for estimation and process improvement purposes, none of which is an immediate concern for the individual projects. The following sections describe some of the metrics commonly used in the project and the portfolio management environment. The list is necessarily incomplete and the reader is directed to additional resources; excellent material is available in [9] and [10]. The assumption behind all the progress metrics is that the future will look more or less like the past. In other words, progress is gradual, and although breakthroughs do occur, if you have not reached what you were set to achieve by a certain time it is unlikely that you will beat all the odds and be able to finish your work in the planned time. Typical Progress Metrics Category Description Work progress The progress of a specific task could be measured in terms of its main output i. Requirements activity Number of new requirements specified during the reporting period. Source code activity Number of lines of code added, changed, or deleted during the reporting period. The technical parameter to be measured depends on the type of deliverable being developed, so here we limit ourselves to cite a few examples. A TPM should be a significant qualifier of the total system, and reflect a characteristic that contributes to system success. Transactions per second TPM attribute. Probably the best-known exponent of this type of measurements is earned value. Typical Performance Metrics Category Description Earned value At the most basic level metrics in this category compare the actual cost of the work performed to the budgeted or planned cost of that same work and to the budgeted cost of the work that was scheduled to derive the four measures described below. Cost variance Measures the difference positive or negative between the actual and the budgeted cost of the work performed. Schedule variance Measures the difference positive or negative between the budgeted cost of the work performed and the budgeted cost of the work scheduled. Cost performance index Is the ratio of the budgeted cost of the work performed to the actual cost of the same work. An index value of 1 indicates that the project spending is proceeding according to the plan. An index below 1 indicates overspending. An index over 1 indicates that work is progressing at a lesser cost than planned. Schedule performance index This is the ratio of the budgeted cost of the work performed to the budget cost of the work scheduled. An index value of 1 indicates that the project is progressing according to the plan. An index below 1 indicates delays. An index over 1 indicates that work is progressing at a faster pace than planned. Productivity Productivity is the ratio of the amount of product or output of the organization relative to the resources consumed to produce it. There are several options for measuring output. It can be measured in terms of number of products fielded, number of features delivered in the products, or some measure of the size of the products such as lines of code LOC or function points FP. Resources consumed will most likely be represented by effort expended, measured in terms of hours or hours per month. Usually is compared to past performance. Multifactor productivity data envelopment analysis In the case of multifactor productivity, instead of a single input like man-months, the resource consumed is a composite of labor, capital investment, and other resources used in the process. Ratios A ratio is simply a number expressed in terms of another, and is used to restate the relative magnitude of the dividend to the divisor using a single number. Rework ratio The rework ratio measures the amount of work effort expended to fix defects in relation to the total work. Rework may be expended to fix any product. This measure identifies the quality of the initial project effort, products that need the most rework, and processes that need improvement. Financial ratios Ratios such as profit margin and return on investment ROI relate the benefits generated by a project to the amounts invested to obtain them. Performance measurements do not tell what is happening with the project, only that things are not going according to plan whether for good or bad and should be looked at. Interpreting cost and schedule performance indexes. Typical People Metrics Category Description Staffing Measures in this category are used to evaluate the adequacy in terms of number and experience of personnel assigned to a project and the level of stress or morale of the staff. Staffing variance Shows the difference between the staff required by the current plan and the allocated head count. Slack index This index measures the degree of freedom available for innovation, for knowledge sharing, and for personal and organizational development. Indirectly it measures the margin of maneuver the organization has to respond to a surge in work or an emergency condition. Although the need for some "slack" is acknowledged in planning constants, which allocate less than the totality of the available work hours to direct tasks, this measure is seldom tracked. Overtime index Overtime is not only expensive, but it is unproductive and harmful if abused. Overtime is a leading indicator of unsound working conditions. Calculated by dividing the overtime hours by the base working hours for all project staff in this reporting period, it is expressed as a percentage. Voluntary turnover Each project member who leaves the team causes a productivity drop and schedule disruption. A high turnover rate could be indicative of a morale problem, excessive pressure, etc. While the reasons for tracking the actual staffing levels against the planned ones are obvious, the motivation behind some of the other metrics needs to be analyzed. In Chapter 2 we saw the negative consequences of overtime and fatigue on quality and productivity; furthermore, if key people leave in the middle of the project, or if half the staff is alienated, the damage could be insurmountable for the project and far-reaching for the organization see Figure 7. This level of detail is necessary because the aggregated curve could mask surplus in one area with shortfalls in another, which are not interchangeable. Long overtime hours and the lack of any "slack" in the employee work-week are leading indicators of trouble ahead. If a project can only meet its commitment by resorting to continuous overtime and the postponement or abandoning of training and other activities, the sustainability of such a pace shall be brought into question not only from an employee morale point of view but also from a cost perspective. The employee turnover rate for the project should also be compared with that of the entire organization and other projects for signs of trouble. A project that a large number of people are trying to leave is not a healthy project. To prevent overreacting to an increase in overtime or employee turnover, it is important to distinguish between random variations in weekly reports and institutional trends. The best way to do this is to use control charts similar to those used in statistical process control SPC see Figure 7. Control chart assessing project morale. Project 1 seems to be experiencing a larger-than-expected turnover. This might be indicative of morale problems within the project. This set of measurements see Table 7. Typical Product Metrics Category.

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Whether it be an aircraft, a missile defense system, an electrical power plant, or services like telecommunications or computer banking, reliability of high-tech systems is of great importance to today's professionals.

Chapter 6 : Systems reliability and failure prevention (Book,) [calendrierdelascience.com]

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Chapter 7 : Herbert Hecht (Author of Systems Reliability And Failure Prevention)

This timely resource offers you a comprehensive, unified treatment of the techniques and practice of systems reliability *and failure prevention, without the use of advanced mathematics. Featuring numerous, in-depth real-world examples, the book distills the author's many years of practical experience in designing and testing critical systems.*

Chapter 8 : Artech House - books from this publisher (ISBNs begin with) (3 of 3)

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