

METRICS - The Management Mantra

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Abstract

This article critically gazes into every aspect of Metrics and how to manage projects using Metrics precisely. Metrics of any kind is interesting to watch but when that is being tied to organizational goals, results would be fruitful to reap more than expected outcome. Metrics shows the journey path and whether organizational needs can be met to not. This would help to take decisions at right time the right decisions, to bring the schedule back on track instead of allowing unknowingly in the wrong path. Any Metrics that's defined should be married to the goals and vision of the organization and the department where the analysis and changes are implemented. What makes interesting is the analysis of data reveals insights, genuine facts and unveils the black box. The key reason why any organization grows and produces great results YoY [year on year] is because the Metrics is the basis for decisions. Measure of metrics may end up producing decisions directing in the wrong pathway if metrics are irrelevant to the business. Historical data, previous project data, organization-level data and industry data are the best sources to predict the future. Industry experts and consulting bodies rely more on large volume of data of different verticals to recommend suggestions to get away from the rut, but also defines the track for prospect (Wohlin et al., 2000).

Keywords: Productivity, Metrics, SMART Goals, Benchmarks, Data Accuracy, Decision Making

Introduction

“If you don't collect any metrics, you're flying blind. If you collect and focus on too many, they may be obstructing your field of view.”

- Scott M. Graffius

What are the Pitfalls and Why Metrics doesn't Matter?

It's truly interesting to touch upon the other side of the Metrics as well before choosing the metrics that exactly fits the business goals. While we strongly believe the requisite for metrics, it's equally important to discuss the business needs, best practices in industry and benchmarks and the fruitfulness of use of metrics in large corporations for better decision making. The five points given below are likely causes for failure.

- Too many Metrics
- Metrics untied with goals
- Metrics not understood by the team
- Irregular cadence of reviews
- No accountability

In software development, anything that's produced is a snowflake, unique, incomparable and unequal. If so, how the metrics can be used to cognate other metrics, benchmarks and industry standards. Is no single Golden Rule to Recommend a Particular Metric to adopt for a given Scenario. Each member or team is a snowflake with 'N' number of unique characteristics [ex: skills, capability, performance, potential, background, motivation, environment and support structure], which influences highly on the teams or individuals.

So it becomes meaningless to associate metrics of other projects or industry against our projects. Maybe appropriate to compare data [ex: productivity] of an individual with his own data of previous years, but surely not with others data. The opinion of experts and researchers doesn't support this approach, still the researchers are deliberating more on this. The key

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performance indicators [KPIs] can be used for relative comparisons and planning for improvements on a continuous basis for growth. But the argument still remains unanswered why decisions are being taken in organizations on comparative mode. It's quite a thought-provoking study for researchers to provide a solution going forward.

It would be more important to study the metrics on quality aspects also equally important to act based on voice of customers [VOC]. At the end, the satisfaction level of the customer influences critical decisions more than metrics on various occasions. That's why it makes more sense to study the metrics along with VOC all the time for better and right decisions.

The metrics chosen should be done using SMART goals which are Specific, Measurable, Attainable, Relevant and Time-based. A disciplined approach by software professionals using these principles will ensure the purpose and essential need to manage and grow any organizations (Brahm et al., 2018).

“This thrilled Zuckerberg, whose primary measure of the service's success was how often users returned.” - David Kirkpatrick

Data and its Significance

Data quality and accuracy are two most crucial ingredients to ensure higher success rate as the decisions are taken based on facts only and not with gut feelings.

To achieve Data Quality for Project Metrics:

- Continuously coach the team to enhance their knowledge and understand the importance.
- Continue to baseline the metrics and benchmark for continuous improvements.
- Data cannot be used in its raw state but needs translation into presentable format in a way that is readable at appropriate levels so that it can be subjected for analysis.

As the data is being gathered from different departments, teams working in various geographies, it's important to translate the data into a specific format for processing. It would help if the teams are trained to be uniform in data gathering processes to avoid errors. In most of the real-time scenarios, the flavor of the data is homogeneous

within specific territories or segments. In such cases, it's recommended not to merge non homogeneous data together for decision making. Using accurate data, measurements and decisions will be with high precision (Loshin, 2006).

Significance of Data Accuracy

Data accuracy can be improved by using tools and automated recorders than gathering it via manual process. The cricket statisticians are the best example to mention here. With the help of real-time data that gets recorded over a period of time, various cricket coaches use them to take appropriate decisions for team selection, batting order or various combinations. If the data is inaccurate, the teams end up taking wrong decisions which may result in a disaster. Data related to batsman includes (a) number of balls attended, (b) number of sixes, (c) number of fours, (d) overall run rate and so on. Similarly, data pertaining to bowler is (a) number of wickets, (b) the economy rate per over and so on. Using different permutation and combination, coach will be able to make decisions like who all can be selected for a game in specific venues or countries. This example aptly suits to any organization as well (Loshin, 2006).

“The more data you have, the more you know, data will speak at its best.”

Research Methodology

Approach adopted in this study is direct/real-time data gathered from projects executed over a period of time [6 to 8 months of data] subjected for statistical analysis to examine the pattern and behavior on various aspects in a systematic way. As the data is directly taken from projects, the inferences and recommendations are candid and help to implement recommendations with ease. As the data-gathering approaches and measurements are based on a scientific nature, tools like SPSS or Mini Tab are best research tools to speed up the entire activity.

Empirical Study

An empirical study on introduction of Metrics Program in real-time projects attracted the attention of many in the organization as the outcome and findings started showing the right path and started revealing a lot, which

were hidden for long. A sample of the same is given in the Table 1 for a better understanding. These are basics in any software projects but important findings, motivated to continue the journey with metrics to look at more improvements. The key metrics include variance in effort and schedule, density of defects, defect removal efficiency, project size in story points, efficiency of review process, metrics on documentation coverage and above all the measure of productivity. Even though these are at high-level measures at first look, to derive these various parameters, characteristics and behavior of projects, and a lot of real-time data need to be gathered to see the results. In the process of implementing the data-gathering activity itself, a lot of discipline got embedded in the team and the way the work is being delivered. Team members realized the importance and a self-discipline has been in-built at a steady phase. This change itself has been a confidence booster to take many more steps in the journey of measurements.

Table 1 contains few initial measures that were tracked to monitor the progress and gaps in the process and execution methodology (Brahm et al., 2018).

Table 1: Measures and Definition

Measures	Definition
Overall Defect Density	DD = Number of Defects/Size of the Project
Defect Removal Efficiency	DRE = Defects in a particular phase/Total Defects including reported post production defects
Schedule Variance	Earned Value (EV) minus the Planned Value (PV)
Effort Variance	Difference between the planned effort and Actual Effort
Project Size [Story Point for Agile Projects]	Size in story Point for Agile Projects
Review Effectiveness [Efficiency]	Review Efficiency = (Total Number of Review defects)/(Total number of review defects + Total number of testing defects) * 100
Documentation Checklist	Checklist Measures Coverage
Productivity	Development Productivity = Development Project Size/Development Effort

Earned Value [EVM] in terms of effort and schedule returns enormous amount of savings if the task is done in advance, otherwise it provides a warning signal to trigger required actions to get back on track. Like a GPS, this tool

helps managers to monitor and control the project. At the end, the cost benefits and business benefits attained are innumerable. This is a MUST have TOOL for managers.

The measurement of project size in terms of function point or feature point or story point helps to estimate the effort and cost more closely or within a small tolerance limit. Project sizing helps to measure the productivity and at a later point, the same can be compared against the industry standards. This gives an opportunity for the manager to know exactly where the project stands and what specific actions have to be initiated to plan for improvements.

One of these metrics relates to documentation, is a very good measure helps to meet ISO 9001 or CMMI level or any other audit requirements. Artifacts produced during SDLC process and the deliverables are too critical for any future reference. The processes mandate the review of any deliverable at every stage of the project; but how that can be measured is the question. Is the review good enough or not? The measure of review effectiveness and defect density is an evidence for any actions that the team takes to improve the process. Ultimate need from the customer is to have a working product with high quality. To achieve a high-quality product, it is paramount important for the manager to have real focus on process, product and people. The metrics produced during the SDLC phases should be specific and directly relating to goals of the organization.

Metrics Inferences Reveal More than it Hides

- Metrics demonstrate value such as Project Metrics related to cost, on-time delivery rate demonstrate the value of a team.
- Metrics increases the performance, productivity, refine and improvise.
- Helps to identify the weak spots in the delivery process.
- Enables the team to communicate with all stakeholders the importance of requirements engineering.
- Guides to know the effectiveness of the review process and gaps.
- Removes all the post production defects.
- Ultimately the customer satisfaction improves significantly.
- Reporting to senior management has become effective with metrics.
- Team's morale improves and productivity.

Importance of Review Process

The defect review process delineated below is a recommended process for any delivery across development lifecycle. Gathering data about this review process and deriving metrics would help making appropriate decisions to improve the entire process on a continuous manner.

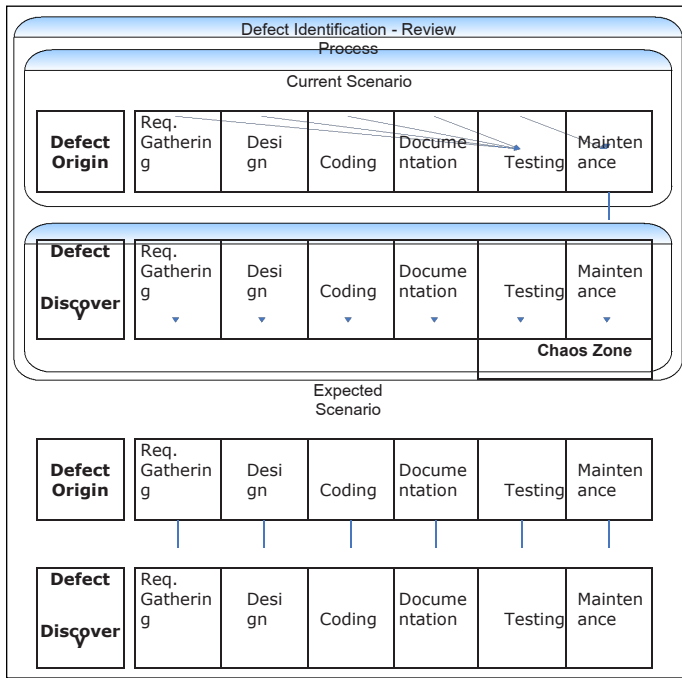


Fig. 1

The following are the key aspects one should follow to achieve defect free software.

- Believe Defect-Free Software is Possible.
- Think Defect-Free Software is Important.
- Commit to Delivering Defect-Free Software.
- Design Your Code for Simplicity and Reliability.
- Trace Every Line of Code When Written.
- Review Code by Programmer Peers.
- Build Automated QA into Your Code.
- Build and Test Daily.
- Use Automated Checking Wherever Possible.

Applying these defect-free methods to an existing project will be worthwhile. Although it is harder to achieve a totally defect-free result with existing code (usually due to the design and volume), applying these steps will result in a significant reduction in an existing project’s defect rates. One can deliver defect-free software by following these steps and working constantly towards the defect-free goal, one will see more and more software become defect-free. (Source: Tenberry Software, Inc)

Inference from Outcomes

- Data gathering practice helped the team to support significantly over a period.
- Key measures like productivity, DRE, review effectiveness and coverage, turnaround time to fix the defect, documentation scores, and defects arrested before prod helped the team to learn where they stand.

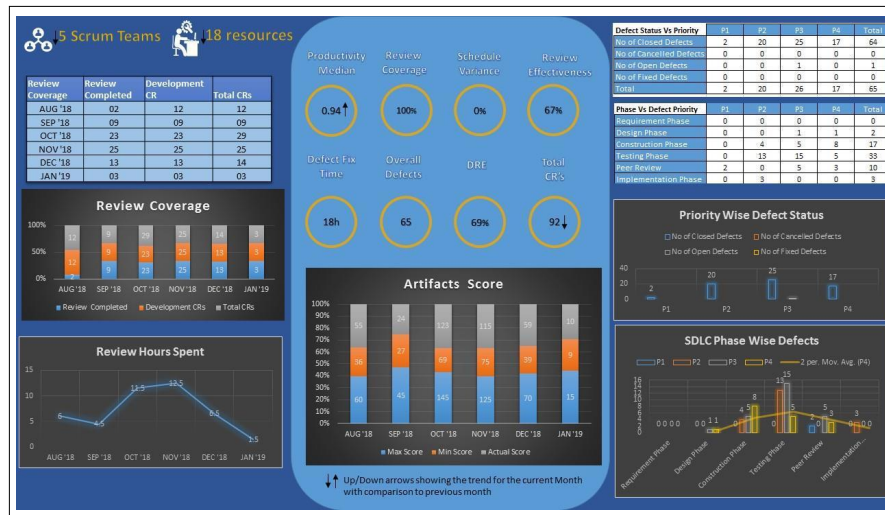


Fig. 2: Key Parameters Derived from Metrics

- Helps to learn lessons from wrong doings and mistakes which eventually improves efficiency.
- The defects identified belong to what categories during SDLC phase helps to have more focus on defect prone areas.
- Overall helps to make better management reporting and to decide focus areas for future.

Benchmarking

Is benchmarking going to help organizations? Obviously 'YES'; to survive in today's red ocean competitive environment, building internal baselines on various key performance indicators [KPIs] would guide the organizations to prepare for the journey and to beat the competition. Mere survival is not good enough as the competition is always watching to beat and overcome. So need for a metrics is paramount activity and regular comparison against their own previous standards, against industry across the globe. As the competition is across the globe and any organization from any corner can become a challenger at any point of time. So building benchmarks and comparing against competitors is always healthy. Various international quality standards exist [like ISO 9001, CMMI] today for the companies to adopt and practice, which has become a qualification to stay in the market. Interestingly, benchmarks around innovation, value addition, cost savings, re-engineering, artificial intelligence and automation have started coming up as a challenge for all sectors. The need for measuring such new metrics is vital for growth and survival.

Recommendations

- Strongly support projects to start adopting to metrics which are relevant to them.
- Imbed the culture of decision making using data instead of making decisions just with experience and intuitions.
- Use metrics relating to organization goals, mission and vision only.
- As metrics reveals more than what it hides, ensure the

data capturing process robust and stable for best results.

- Introduce automation to produce results and inferences free from manual errors.

Conclusion

Various researchers proved in the past the power of metrics and the benefits it reaps to the organizations over a period of time. This article supports the argument of many researchers why should we adopt the best practices and manage projects using metrics to accomplish the organizational goals and vision. Even though the studies support the use of metrics, they equally caution the right choice of metrics and ability to infer appropriately. Tools like VOC, feedback and expert opinion are extremely influential that organizations should adopt at regular intervals to keeping mind the vision, mission and specific goals in making apt decisions to elite metrics for the organizations. The metrics program can be engorged over a period of time based on results of initial period. Use of statistical tools like SPSS or Excel in-built macros will surely enable the researcher to get more insights from the available data.

"The Six Steps to Success by Ken Poirot are 1) Define Success, 2) Devise a Plan, 3) Execute and Overcome Adversity, 4) Measure Results with Key Metrics, 5) Revise the Plan and 6) Work Hard."

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