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Measuring Engineering

Measurement in Engineering and especially in Software Engineering is based on the basic concept of what measurement is:

Measurement is the assignment of a number to a characteristic of an object or event, which can be compared with other objects or events.
Measurement is a cornerstone of trade, science, technology, and quantitative research in many disciplines. Historically, many measurement systems existed for the varied fields of human existence to facilitate comparisons in these fields. Often these were achieved by local agreements between trading partners or collaborators.

As we continue to explore the Measurement in Engineering process, we will look at what is a Software Engineer, first today it is a person as forward being an employee in a company.

Measuring an employee can be done by measuring the following things:

Online Presence: How often the employee is connected to the server/repository/or any other work connectivity related which is the platform and main “table” that he works with.

Work hours: The time the employee work at and how many hours does he work. If you take those and see the amount of work he has done, for example the number of bugs he fixed and so on, you can easily determine what hours were the most efficient, when did he make mistakes and as follow adjust the employee work hours to maximize his production.

Holidays: Measuring the amount of productivity of an employee before and after vacation is crucial because one of the most common things to happen to people is the “grinding” feeling that they have at job, vacation is one of many great tools to make the employee have a “rest” from the work, clear his mind and recharge himself with power that when he is back from the vacation, the “grinding” feeling would hopefully be gone.
When you measure holiday, you can also measure when is the best time to let each employee to vacation, first of all there is a company issue that at sometimes you cannot let an employee go because you need their job for maintained of a product or for example before a production launch, but let for now say that there is no issue with that.
So now all that left is to use a mechanism of learning and try for some time to let the employee off on different occasions and see how his performance change from time to time, then you can maximize the holiday tool to make your employee production much more efficient.

Personal Details: The details of your employee are crucial to measure his performance.
By know personal details about the employee, you can know for example what are the best times for him to work, if he has small children for example, he might be needed at home afternoon or at mornings to get them to school and so on, therefore the company might focus that employer work at nights or different hours.
As so, know the employee personal details as of aspirations to his life can help his managers to know how to push him in the right direction in his work so he can be productive by achieving his goals and feeling satisfied because a happy employee is in most cases a good employee.

Now as we continue at our employee measurement tools we will take a **deeper look in a software engineer work**:

Programs used through day: Most of the programs in the programs in the market today, especially those used in the software industry, have a lot of measuring tools that can be used by the managers of the employee to record and measure his work.
As so checking the kind of programs the employee use during the day we can check which one took his most effort and maybe get him an appropriate course or training in those specific programs to make performance in those works better.

Code Commits: Code commits to repository or a specific server are a great way to measure your employee because an employee commits is the way for the manager to inspect the code, see the difference between the version before the commit and how much productive been made between the two changes.
The commits are also a great way to measure the employee work rate, over the time you can see how many hours each employee need to efficiently finish a task and to evaluate them accordingly.
By time if the managers for example see that a specific employee commits are less than usual, they can investigate with him what are his difficulty's, and determine if it is a task difficulty or something related to the employee specifically.

Project Worked On: By measuring the project the employee worked on, you can measure his ability to solve a task by his experience in different jobs.
For example, if you see an employee that mainly worked on OS (operating systems) projects than you can task him with mainly operating system task that he will work more efficiently on. On the other hand, if you see that you have a task which an employee doesn't have any experience in the field of that task because he has not worked in that field, you can set him up with the appropriate training.

Email/Slack usage: By measuring the email/slack usage of an employee you can determine how socially he his and team working inside the company.
Team working in software engineering is very important, because usually developers work in teams. This tool can check that for example if an employee is not emailing a lot with his colleagues than maybe there is a social issue in the company that needs to be attended or an issue with the specific employee. Solving matters like this can increase team work and social communications between the team and company which greatly increase production of the overall tasks/products.

The second topic I will cover now is the **Environment of the software engineer** and different topics related to it:

An **office** is generally a room or other area where administrative work is done, but may also denote a position within an organization with specific duties attached to it.
The latter is in fact an earlier usage, office as place originally referring to the location of one's duty. When used as an adjective, the term "office" may refer to business-related tasks.
In legal writing, a company or organization has offices in any place that it has an official presence, even if that presence consists of, for example, a storage silo rather than an office. An office is an architectural and design phenomenon. whether it is a small office such as a bench in the corner of a small business of extremely small size, through entire floors of buildings, up to and including massive buildings dedicated entirely to one company. In modern terms an office usually refers to the location where white-collar workers are employed.
As per James Stephenson, "Office" is that part of business enterprise which is devoted to the direction and co-ordination of its various activities."

Office Space: Office space is a very important thing. each employee needs to be satisfied with the location that he works in and feeling as much comfortable as the company can allow. The employee comfort is a straight line to his successes. An employee that does not feel comfortable in his office space will also not work as efficient as comfortable one. Today a lot of big company as for example, trying to make the office space as comfortable and "homely" as they can.
There is a saying that called "Golden Cage" which a lot of offices today try to make the office so good, so the employees rarely go out of it and spend most of there time in the office.

Temperature and Lighting: Those have a big effect on the office as a whole, each employee need to feel comfortable in the office in the terms of temperature and be able to control it. If the engineer will feel too cold or hot, it will affect his work drastically therefore there should be an office rules and a way to measure what are the best temperature in the office for the maximize work by all the team. Lighting as well as temperature has a huge impact on workers, therefore the company should measure the lighting that will suit most workers and therefore be the most efficient for the office as a on part module.

Finding different data sources that currently are not in use:
In the modern era today, there are many tracking options and devices available. The most common one is a CCTV camera that by using computer vision programming can be used to measure the employees in a different and variant options.
For example: Grouping and location of people, can be used to know who the employee is most interacted with and therefore assign them in a team together. Also looking at the location that the employee usually spend time together can give some information about what do they like, what they do when they rest and so on, from all this information the company can change the office accordingly from design to schedule of work to make them as much fitting and comforting to the employee as possible.

The CCTV camera can also detect day to day jobs as for example using the copy machine, printing, going to coffee breaks, printing and so on, and see how much those small “tasks” interfere with the job, and if they are excessive or not.
Small example, if an employee takes too much time with a printer, might be a problematic printer and so the company should invest in a better printer that will make that small task fast. On the other hand, the company can check the rest of the employees work with the printer and measure the different between them, if it is big between all the employees or most of them than the employee in review, then it might be not a problem with the printer and with the employee himself, this is a small example of many uses that can be with day to day tools used in the office.

Monitoring influencers in a company: We can use tools as UEBA User Entity Behavioral Analysis to create a, Passive real-time monitoring of metadata, Monitor team communication channels, track file accesses and website history, detect threats and usage anomalies. All those help to determine the efficiency of the employee and the team and use it as to track the influencers people/parts of the company.
The whole idea is to try and monitor the part described above and then to have a simple and intuitive way to view the information about the people/parts of the company.
For example, having an employee badge tracker can measure things as: interaction between employees which then can be viewed and see the communication between the team and if there are any problems in the social interactions between them.
The measurement can be don’t by measuring the tone of voice, analyze conversations and so on.
The option to track employee location in the office, is an option to know how much time from the whole day the employee actually sit on a computer and work, how long does he spend in the different facilities and so on.

When comparing these information with historical base data, we can know a lot about the time the employees use in the different places in the job and so know how to change things to make them more efficient for all of them.
There is a big ethics issue with this matter because it interferes a lot with the privacy of the employee.
The privacy of the employee is an important thing, and if used badly can be criminal.
Some employees might object to use a tracker because then the manager can know exactly how much time they spend everywhere including for example toilet use, coffee breaks, conversation and so on, some things should stay private, so the employee would feel safe and not being offended by hurting his privacy.
So, there is a thin line between keeping the employee tracked to the limit, so he doesn't feel that the company hurt his privacy, the company should always keep track of that line and being carful not to pass it.
Personally, I think an employee not tracked is better than an employee being tracked to much that it feels that the company hurts his privacy, because besides the personal feeling of the employee that are very important, the employee will have a grudge towards his workplace, managers and that will greatly influence the efficiency that the employee works at.
Another example that is more to the employee side by himself and no to the employers is an **employee health monitor**.
This monitor can measure posture, sitting habits, stress level, heart rate, breathing and more.
All that information can be viewed easily on an iPad or a mobile phone, and the user can do various things by that information to help his physical and mental health, for example: improving his posture, getting to stretch and breath exercises, notify the user to take standing breaks and so on.
All those things that the user can do specified above, are not hurting the employee's privacy and helping him to stay healthy, this is a win-win situation for the company that does not intrude with the employee privacy, keeps him healthy which he probably feels glad that the company offer that for him. Keeping an

employee healthy means a more efficient employee, he will be more at work at a global scale because he would miss less work days and in general will use his time sitting in front a computer for example better because the risk of him being in pain would be lower.

Computational platforms: I will review some computational platforms to perform measuring in different areas of work.

Agile software development describes a set of values and principles for software development under which requirements and solutions evolve through the collaborative effort of self-organizing cross-functional teams.
It advocates adaptive planning, evolutionary development, early delivery, and continuous improvement, and it encourages rapid and flexible response to change.
These principles support the definition and continuing evolution of many software development methods

Sensor-based automated data collection:
To facilitate recording time, defects and software size, this provides a sensor-based automated data collection mechanism like Hackysts, PROM.
Time and defect data collected automatically are recorded in the time and defect log respectively which allows modification and insertion of data when necessary.
By monitoring software artifacts or tools, time spent on design, coding, review and testing can be collected automatically.
Hackystat: Hackystat is an open source framework for collection, analysis, visualization, interpretation, annotation, and dissemination of software development process and product data.
Hackystat users typically attach software ‘sensors’ to their development tools, which unobtrusively collect and send “raw” data about development to a web service called the Hackystat SensorBase for storage.

The SensorBase repository can be queried by other web services to form higher level abstractions of this raw data, and/or integrate it with other internet-based communication or coordination mechanisms, and/or generate visualizations of the raw data, abstractions, or annotations.
Criticism regard of agile development:

Agile methodologies can be inefficient in large organizations and certain types of developments.

Many organizations believe that agile software development methodologies are too extreme and adopt a hybrid approach that mixes elements of agile software development and plan-driven approaches.

Some methods, such as dynamic systems development method (DSDM) attempt this in a disciplined way, without sacrificing fundamental principles.

The term "Agile" has also been criticized as being a management fad that simply describes existing good practices under new jargon, promotes a "one size fits all" mindset towards development strategies, and wrongly emphasizes method over results.

Ethics:

Ethics surrounding this kind of analytics are a complicated thing, in my personal feeling the ethics should be mainly considered as to maximize the tools without hurting the employee.
In the end the employee is the one who needs to get the job done, if he will feel that his personal space or privacy being compromised, the job would not be finish in the right manner.
Also, there are laws and rules of what the company can or cannot do.
For example, in some countries it might be banned to put a tracker on a person without his consent, and let say for the situation explained that the company asks the employee about the tracker, what if he does not want to put it on but afraid to say no so he would not be fired, this is a conflicted situation that can hurt a lot of employees.

A trick the employers can use to make the employees feeling comfortable with the tracking devices or other methods of monitoring are showing it as not what is exactly is.

For example, Google develops a tracker and call it HumanProtector, which have a nice sound to it, can be explained as a prototype to help people in the case of emergency while meanwhile the tool is tracking them.

This was an example for a win-win situation, the employee is happy because he is taking part of a prototype testing which apparently has no actual affect on his daily basis job life, while the employers enjoy the data received by the employee and use it for the company beneficence.

To summarize, ethics are a big issue in those matter, the world today going toward a more technological monetarized world, from self-driving cars, fitbit's that track users health record, CCTV camera spreading and more, there should be people who monitor the use of the information and making sure the information is being used in the proper ethical right way.