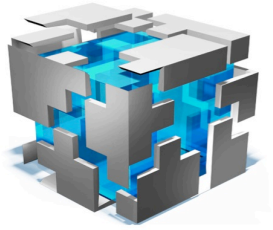
Onoly Analytics and Analytics 2 Insight

White Paper

Analytics at the Speed of Insight:

Simple, Fast and Actionable Tools to Improve Productivity



Analytics 2 Insight LLC

Onoly

Timely Actionable Insights

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Executive Summary

Analytics engenders competitive advantage

Technology and innovation drive productivity, but transaction costs arising from technology implementation limit gains. Analytics and decision science could provide the means to tame transaction costs and improve productivity. Transaction costs were defined by Ronald Coase in "The Nature of the Firm," published in 1937 and who earned a Nobel Memorial Prize in Economics in 1991.

Access to and sharing of information drives competitive advantage. Businesses often require global sourcing of physical and digital resources and collaborative workgroups often span several nations across the globe. Information flow is an integral aspect of collaborative workflows and global supply chains. Data serves as the foundation for business models where competencies are achieved through analytics. To achieve visibility and granularity into business processes, greater amounts of data are generated.

Complex and diverse datasets create bottlenecks that increase costs - - faster time to action generates value

By reducing transaction costs, advances in technology and innovation can translate into higher productivity; lower operating costs, and a greater supply curve shift. At the same time, the network effect, enhanced consumer utility found with increasing number of users, may push demand.

The takeaways are: 1) analytics provide a process to reduce costs and improve productivity; 2) a process to monitor, measure, and benchmark performance; and 3) enable a firm to assimilate new technologies and manage uncertainties.

Innovation and Productivity

Technology and innovation are directly linked to creating markets and wealth. When businesses are productive they can expand inputs to generate more sales. Perhaps hire more people or purchase capital equipment. That is until the payback falls below a desirable level. A business may incur more costs then anticipated because of externalities or transactions costs.

Transaction costs are costs originating from the activities of doing business. It is because of transaction costs that innovation causes pain for companies implementing new technologies. Training, proficiencies, and standards, these are the costs of innovation.

Our focus is innovation and productivity – how to minimize transaction costs

Analytics could provide the means to limit transaction costs while improving productivity. By integrating diverse datasets remote monitoring, measuring, and benchmarking can be accomplished automatically. Reporting by anomaly and exception could free resources and thereby reduce costs and improve productivity.

First public payphones in Los Angeles, CA, 1899

What were the costs to make the first phone call –

Innovation requires capital and labor investment –

Incurring transaction costs to build infrastructure and grow markets

What were the costs to make the first phone call? Innovation requires capital and labor investment incurring transaction costs to build infrastructure and grow the market.

Why Analytics Remedies Transaction Costs

Technology and innovation drive productivity, but transaction costs arising from technology implementation limit gains. Analytics could provide the means to tame transaction costs and improve productivity.

Transaction cost limit technology adoption

An analysis of US economic activity and changes in productivity suggests technology may initially slow and/or impede productivity. As a consequence of anemic productivity growth, business profitability suffers. However, new tools and innovative approaches to business processes may offer substantial improvements to productivity through data analytics. The use of analytics enables businesses to measure, benchmark, and align processes to improve productivity while adapting to new technologies.

Analytics enables measurement and monitoring to lower transaction costs

There is often a lag between productivity gains and technology adoption. Implementing technology often requires new software, training, and redesign of business processes. Productivity gains take time and depend on whether transaction costs exists. Transaction costs are costs associated with making an exchange of goods or services and include searching data, training, measuring inputs, compliance, policing other parties, supervising, and monitoring activities.

It's challenging for companies to sustain productivity with falling output as falling productivity erodes profit margins. In addition, businesses are more likely to add employees with rising productivity. So what steps are necessary to sustain productivity?

Analytics linked to measuring performance along the value chain can serve to optimize productivity and business value creation by focusing on business activities that contribute most to profitability. Measurement of inputs and outputs is itself a transaction cost so technology that automates and simplifies monitoring and measuring act to lower these transaction costs. As assets become more complex, labor more specialized, and more steps appear in the production process, the greater the cost of measurement. Therefore, steps to reduce transaction costs and tools that integrate business processes with analytics, act to drive performance by concentrating attention towards business activities that matter most to profits and productivity.

For instance, analytics applied to monitoring energy and environmental sensors was used to reduce energy costs by 17% via identifying an anomalies in building CO2 levels in conjunction with energy use for the NJ DOT main office complex. Propensity models were constructed from customer profile and behavior data to identify candidates with highest conversion rates. These are a couple of examples of applying analytics to reduce costs and improve operations.

Low cost cloud computing together with large, diverse, and growing datasets, from the web to internal sources, and available statistical visualization tools, have dramatically change the business intelligence, MRP and CRM markets. Computing costs are falling while data is rapidly increasing, forcing companies to embrace analytics to compete.

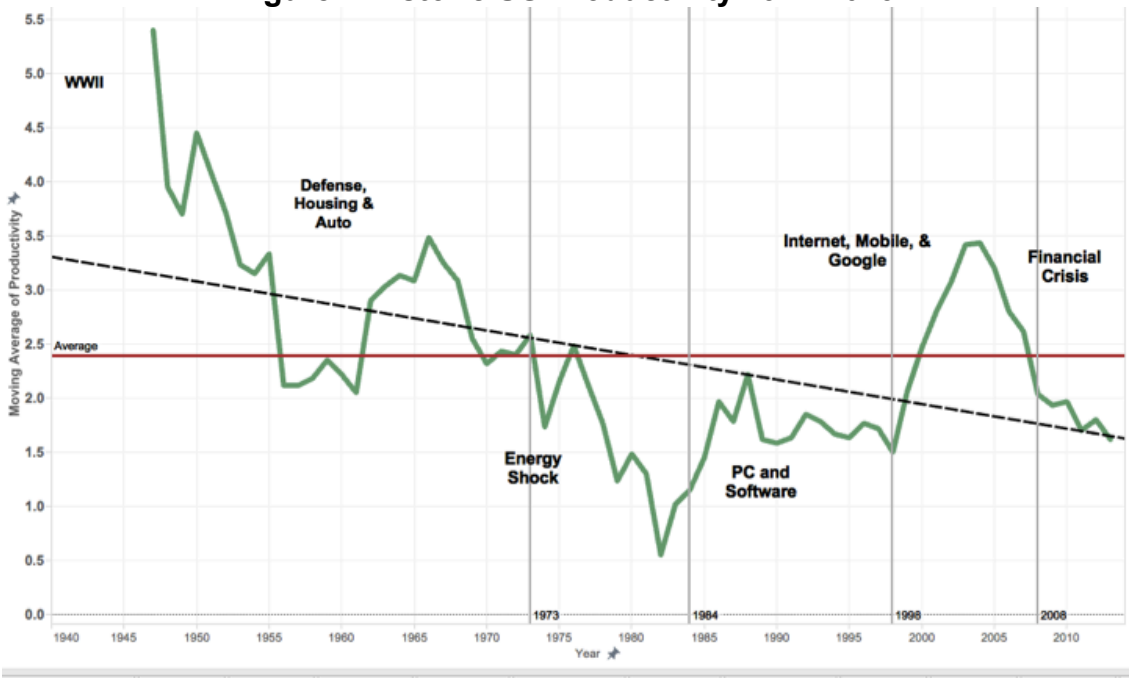
Legacy systems are capital and labor intensive. A plethora of online and desktop systems are available but often require a team of sophisticated business, statistical, and IT, and database experience. In essence, implementation of analytics might be a challenge in a market with highly specialized labor.

Analytics and cloud services reduce transactions costs and improve productivity

To demonstrate the challenges associated with technology adoption and business productivity, let's look at historical US productivity levels. From historic productivity data we find that periods of above average productivity are associated with strong economics growth. Technology and innovation play core role in driving productivity. After the oil shock in 1973, productivity fell below average for nearly 20 years. Not until the launch of the PC and related software did productivity begin to improve. Similarly, the emergence of the Internet, cell phones, and search engines like Google, are associated with improving productivity.

After a strong rebound in 1998, productivity has fallen again in the last decade. While the financial crisis after the collapse of Lehman Brothers is mostly to blame, productivity improvement may require that businesses change their approach to innovation and technology.

Figure 1 Historic US Productivity 1947-2013



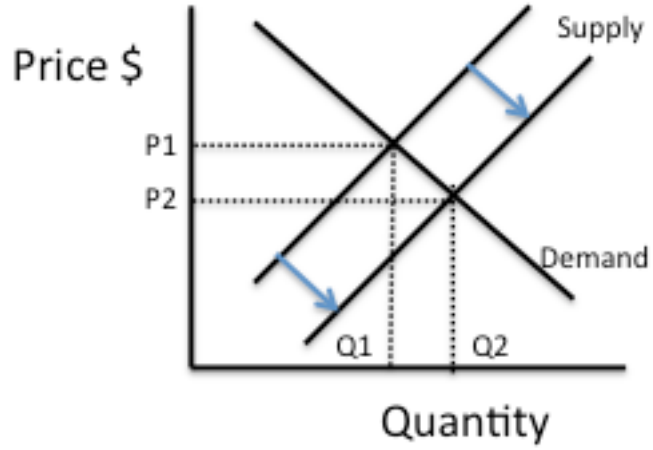
Source: Bureau of Labor Statistics

Innovation and externalities have a profound impact on productivity

Some technologies like Google search and cellular phones drove productivity much higher because of ease of use and their ability to lower transaction costs. Smartphones should have a positive impact on productivity, but the financial crisis and ensuing Great Recession was the driving factor.

Productivity is measured by the unit output per unit input and typically focuses on labor productivity. Improving productivity means firms produce more at lower costs thereby expanding operating margins. Transaction costs are costs associated with doing a deal. Transaction costs involve searching, monitoring, measuring, and managing activities from inputs to outputs. The reason technology and innovation involve new transaction costs are because of specialization of labor and asset specificity. Labor specialization means new ways to verify, manage, and measure performance. Asset specificity raises switching costs, heightens risk level, and may add to high fixed costs assets that turn to liabilities with obsolescence.

Figure 2 Technology and Innovation Shift the Supply Curve



Innovation can shift the supply curve and grow the market

To understand how technology changes economics let's illustrate using supply and demand charts. In theory, price times quantity sold equals revenue. By increasing sales while lowering costs, a firm should improve profits.

Technology and innovation are often associated with an outward shift in supply curves that in turn tend to expand the overall market because lower prices enables a large audience to purchase. The magnitude shift in the supply curve depends on marginal gains in productivity, as companies generate more output with the same inputs. If a firm can lower its transaction costs while improving productivity, the greater the benefit to the firm and market. In Figure 2 Technology and Innovation Shift Supply Curve, the shift in the supply curve results in both lower prices (P1 to P2) and quantity sold (Q1 to Q2). The size of the supply curve shift depends how disruptive technology in producing more output with the same inputs.

Transaction costs limit the benefit of new technologies to shift the supply curve because they inhibit the firms' ability to assimilate innovation. For example, the emergence of the PC and software incurred high transaction costs because of the learning, training, and managing involved in administering IT deployment in a business. The Internet, Google searches and mobile communications were more seamless and easier to use and therefore had significantly lower transaction costs. In fact the ability to gather information is a significant transaction costs mitigated through Internet search capabilities.

Today cloud computing is lowering capital expenses while smart phones and Internet mobile communications help to lower transaction costs. Transparency and granularity into activities in

the value chain enable insight into business performance and engender a platform to enhance productivity. Measurements into business process are required to align performance to corporate strategy. At the same time tools that enable faster, cheaper, and more effective measurement of inputs and outputs lower transaction costs. By combing the pervasive use of smart phones and tablets with analytics provides a more cohesive environment to lower costs and improve productivity.

Big data and analytics mitigate transaction costs

Big data and analytics improve productivity because they provide the architecture that enables insight into multiple dimensions of the business. Measurements and monitoring of business processes shorten the time to implement new technologies thereby allowing managers to allocate resources more efficiently. By including analytics into the business process further enhancements can be achieved by focusing on activities that generate more revenue, lower costs, and reduce risks.

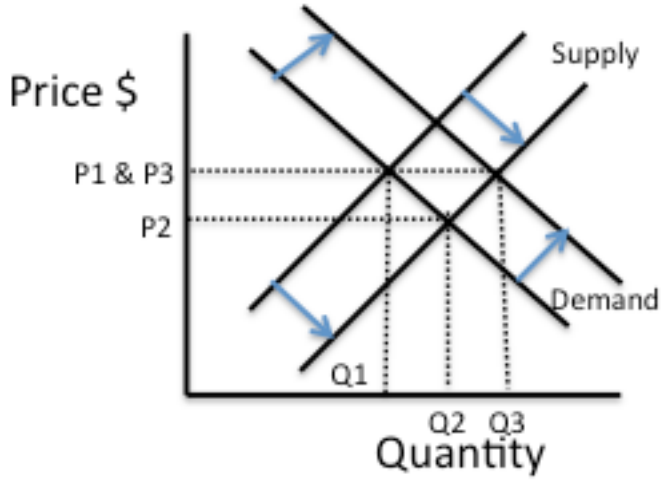
While technologies and innovations may create transaction costs, advances in analog sensors, remote wireless monitoring and cloud-based analytics can reduce transaction costs by extending the ability of the firm to measure further into the value chain. Wireless sensors extend monitoring and measuring further into the value chain from supplier to customer.

Wireless sensors and the Internet of Things will mitigate the impact of transaction costs, a byproduct of emerging technologies that result in costs such as searching, comparing, measuring, and managing the adoption of technology. The Internet, mobile communications, and sensor technologies reduce transaction costs by dramatically lowering the cost of searching, measuring, and monitoring. The ability to remotely monitor and measure inputs and outputs as well as activities and processes may have the most profound impact on productivity.

The Internet, mobile communications, and wireless sensor technologies can have a dramatic impact in productivity, because it enables companies to reduce transaction costs while facilitating faster adoption of innovation that in turn expand margins and value creation.

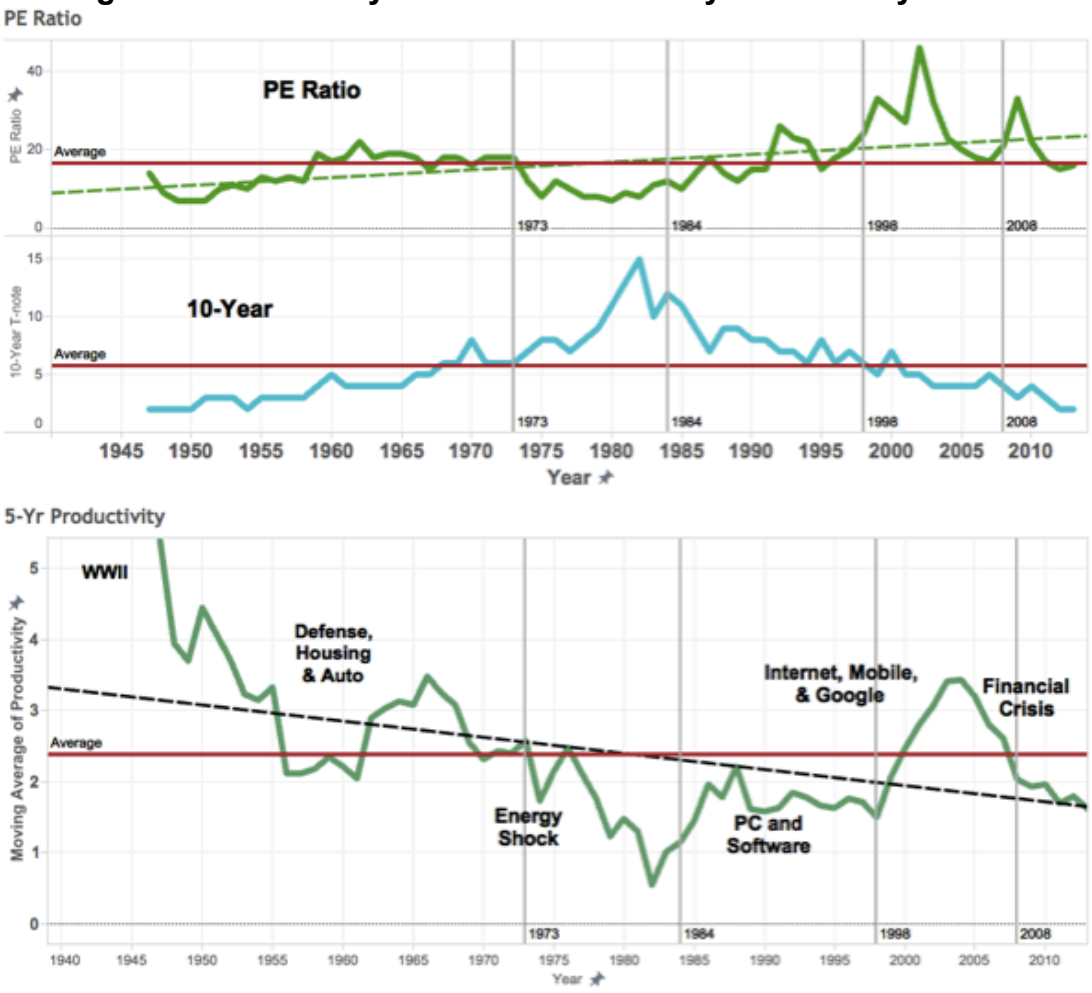
Innovation can shift the supply curve and network effect adds to market growth

Figure 3 Internet of Things and Network Effect



By reducing transaction costs, advances in technology and innovation can translate into higher productivity; lower operating costs, and a greater supply curve shift. At the same time, the network effect, enhanced consumer utility found with increasing number of users, may push demand. In Figure 3 Internet of Things and Network Effect, the demand curves shifts outward expanding the market because a larger number of users find greater value. The network effect arises from demand-side economies of scale that depends on the number of users. Greater utility is found among a larger user base. A good example is the cell phone network where if the cell phone could only call one number it would have little value in comparison to a phone that connects with billions of users.

Figure 4 Productivity to PE Ratios and 10-year Treasury Yields



Source: Gary Shiller, Bureau of Labor Statistics, Federal Reserve Bank

Productivity, because it enables companies to expand margins, tends to drive PE ratios. Similarly, interest rates determine the cost of capital and the willingness of a business to invest in technology. From Figure 4 Productivity to PE Ratios and 10-year Treasury Yields, we find periods of rising productivity tend to lift business value as measured by PE ratios.

Bottom line, reducing transaction costs, facilitates faster adoption of technology and innovation. Innovation provides the means for a company to lower costs. Innovation and technology can translate into higher productivity and greater business value. Analytics serves as the fabric to seamlessly bring data to actionable insight. By mitigating transaction costs analytics makes technology integration easier and more efficient. Tools that automatically provide analysis into business process and

escalate reporting in a proficient manner create an even deeper competitive advantage.

Analytics in Action

Analytics can detect anamolies in energy consumption

The following is an example of using remote wireless sensors to monitor energy consumption and environmental conditions such as carbon dioxide levels and tenperature reading across the building. Analytics was used to detect anamolous readings and escalate reporting to disignate personnel.

The New Jersey Department of Transportation (DOT) was able to demonstrate a 17% energy efficiency improvement and validate the use of demand-controlled ventilation as an energy strategy based on remote cloud-based sensor monitoring system.

To measure energy efficiency, the DOT installed the wireless energy and environmental sernsors to provide granular real-time monitoring. The energy monitoring system is equipped with current transformers (CTs) connected to lighting, Heating Ventilation and Air Conditioning (HVAC) equipment and receptacles tied to equipment and servers. The energy monitoring systems provide information on where and when energy was consumed. Energy consumption data is time stamped, logged and displayed through a web portal and dashboard. While the visual display of energy consumption data provides useful information, the system does not provide energy analysis...the “what and how.”

Figure 5 NJ DOT Environmental Dashboard

The NJ DOT has an 115,000 square foot main office facility. The building automation system (BAS) platform regulates airflow and temperature in the building. The DOT's main office shares one electric meter with another large building, so there is no granularity in the measurement of energy consumption. CO2 and temperature sensors were installed to track carbon dioxide levels. The demand-controlled ventilation test modulated the outside air intake based actual CO2 levels in building.

Employing visual statistical analysis on data generated from energy sensors, consumption patterns were easily identified and prescriptive remedies were suggested to improve in energy

efficiency. Environmental data provided insight into health and safety. The NJ DOT orchestrated energy and environmental monitoring system and a demand control ventilation test to demonstrate its efficacy in office building energy efficiency.

Analytics for Software Development

Software or Algorithm development processes are fairly consistent throughout the industry. The general equation for cost for each software release looks very simple

Release Cost = Fixed costs (cost of minimum release) + variable cost (Cost of new features and bug fixes)

More and more teams move towards agile sprints, which streamline and automate the Fixed Costs. Variable costs consist simply of new features you are looking to add and the number of bugs you are planning to fix during the release cycle.

Analytics used to improve productivity in software development

For development programs looking to build extremely reliable software (failure rate of <10-9) the fixed costs can be very high. The high fixed cost doesn't come from the design and code of software, rather from software testing costs. Take for example software for airplanes; such software has to be tested on a development platform in addition to systems testing once the software is loaded to flight computers. On the variable cost side, the numbers of lines of code per feature/bug and design complexity are the biggest drivers of cost. Additional drivers include cost of using technology such as JIRA or ClearCase to commit new software and document software development.

Process automation is established by introducing technology that maps and tracks the development of software. Tools like IBM's ClearCase and more recently JIRA are examples of such technology. These technologies add transactional costs to software development. The cost is incurred when designers, developers and testers have to engage in the additional activity of engaging in the use of this technology.

Analytics and data science can be used to minimize the total development cost. Software development programs using technology such as JIRA and ClearCase can extract the metadata out of those system to accurate determine and control the cost of software development. For each new feature and bug

that is fixed during the program data regarding feature/fix is stored in these systems. Data includes:

- Issue title and description
- Severity of Issue
- Need Date
- Affected Systems and Sub Systems

Additional metadata included in the system consists of timestamps of the any development events that software has to go through. This could include

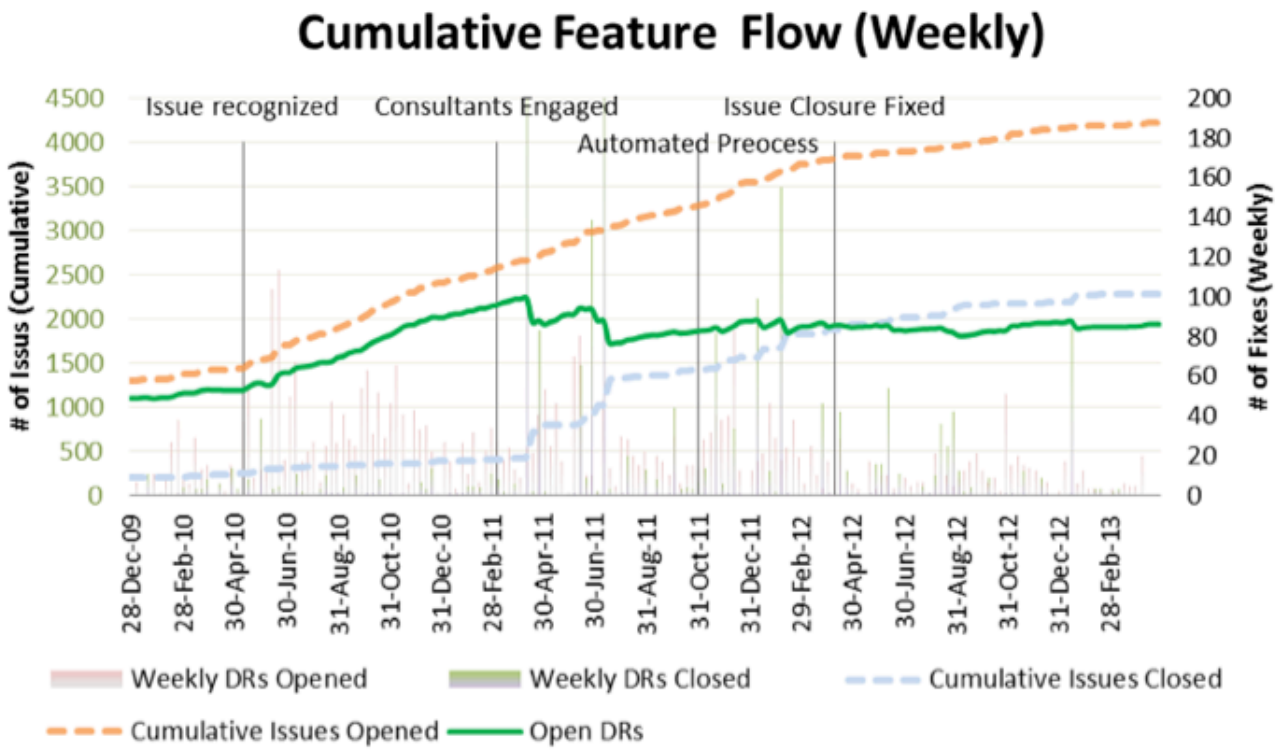
- Creation
- Initial review
- Assignment
- Design
- Develop
- Code
- Software Unit Test
- Software System test
- Integrated System test
- End-user test
- Feature/Fix Closure

Using this metadata of timestamps the first step is to determine how each feature/fix flows through the production system. This brings about transparency in the business process and clearly identifies bottlenecks in the system.

Next, it allows simple metrics and analytics to drive the process. In this case, the simplest metrics are Feature/Fix closure rate. The management team looks to keep this rate much higher than the Issue generation rate. See figure below on the charts that measure flow for sample software development process.

These analytics also allow the management to quantify fixed and variable costs of each release. This allows for batch size determination for how many fixes should be included in each release.

Figure 6 Productivity Improvements in Software Development



Analytics for Account Management

In the accounts receivables industry, small improvements in liquidation rates can greatly improve profitability. The goal is to identify what accounts are most likely to pay.

For The business methods and processes in place provided agent incentives based total dollars collected and therefore agent focus was on accounts with large account balances. Programs to gain improvements in liquidation performance were designed on call volume and targeted towards high balance accounts.

Analytics using just Pareto distribution and A/B testing

The use of analytics was based on a very simple approach. The first step was to develop a profile of accounts with high propensity to pay. The propensity model was then used to evaluate the account base and prioritize account selection for contact.

The initial account profile revealed some interesting insight. While the business model geared agents to focus on high balance accounts, over 30% of accounts had balances below $100. Typically, agents ignored accounts with balances below $100. In addition, A/B testing revealed that low balance accounts

had higher conversion rates. Someone with a $30 outstanding balance was more likely to pay versus someone owing $3,000.

The following chart illustrates the distribution of accounts by account balance and the results of A/B testing. With a large portion of accounts having low balances and the A/B indicating a higher propensity to pay with lower balances the business process change is required to address these low balance accounts.

Figure 6 Productivity Improvements for Account Management