Universiteit Utrecht

Continuous Intelligence

Velocity Culture: *"If you think your users are idiots, only idiots will use it"*, Linus Torvalds 2005

nisi

Proceedings in Continuous Intelligence research

Jan Vlietland (standing on the shoulders of giants)

2018 version for Refsq

Key needs of the Software Industry

- The software market is evolving rapidly
- Requiring a continuous development of software professionals
- During BSc/MSc in Computer Science/Software Engineering: just 1 or 2 courses about Software Architecture, Requirements Engineering, Software Delivery, Software Development
- A need for additional continuous Post-Academic education and post-academic certification for software professionals

NISI mission

- Advancing the Dutch software industry by offering ways to continuously develop software professionals and migrating traditional workforce toward the software industry
- Actively stimulate social networking in the software industry and peer2peer knowledge sharing by face2face gathering
- Striving for a Dutch Software Industry that is among the best in the world
- Joint research programmes and post-graduate certification curricula

NISI spin-off Universiteit Utrecht

NISI agenda

- Cybersecurity & Continuous Intelligence
- Continuous Delivery 3.0
- Artificial Intelligence
- Software Product Management
- Software Business Development
- Blockchain Databases
- DevOps & Agile Scaling
- Agile Software Architectures & Eco-systems

NISI core members

Dr. Jan Vlietland, always passionate about software. Jan holds a PhD in Agile eco-systems, is business head of NISI and is working in the software industry for over 20 years.

Prof. Sjaak Brinkkemper is head of the faculty of Information and Computer Science and professor at Utrecht University, and NISI initiator.

Dr. Slinger Jansen is assistant professor at the faculty of Information and Computer Science of Utrecht University, and heads research at large software companies.

Agenda

1. **Introduction**
2. Continuous Intelligence concept
3. Demonstration
4. Continuous Intelligence process
5. Continuous Intelligence tooling
6. Closure

Continuous Intelligence defined

Continuous Intelligence is the automation of the software user tracking process, to enable software companies in developing software features that add the most value.

Example access www.**nisi.nl** for a little experiment

Interesting read: http://www.kde.cs.uni-kassel.de/hotho/pub/AWIC.pdf

Main Research Question

Premise: *"Companies want to deliver the most needed software for the lowest possible price. For that it needs to know what is most needed."*

Main research question: *"how to collect, analyze and present online information, to automatically identify the most needed software and prioritize software development activities"*

Interesting read: http://www.kde.cs.uni-kassel.de/hotho/pub/AWIC.pdf

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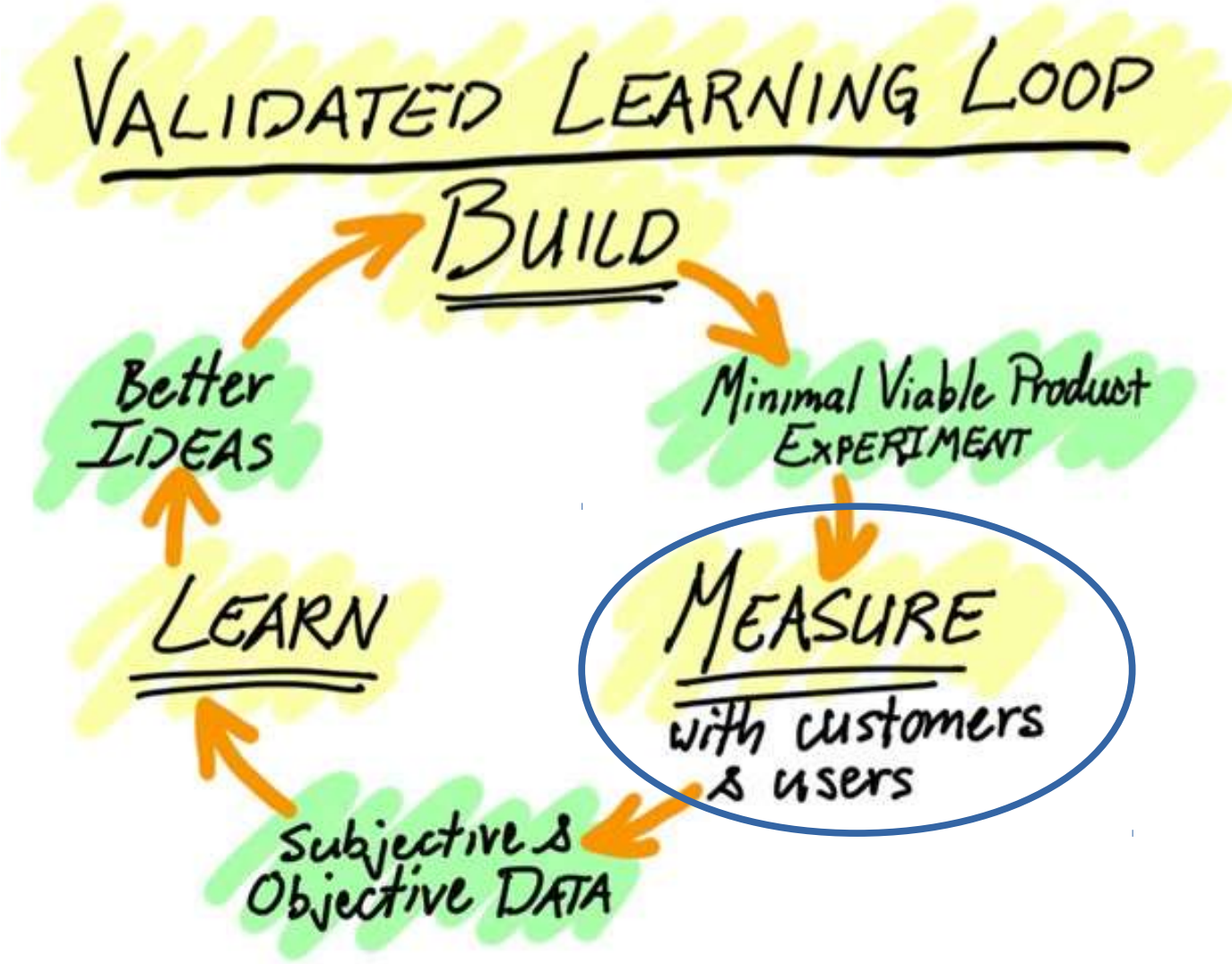
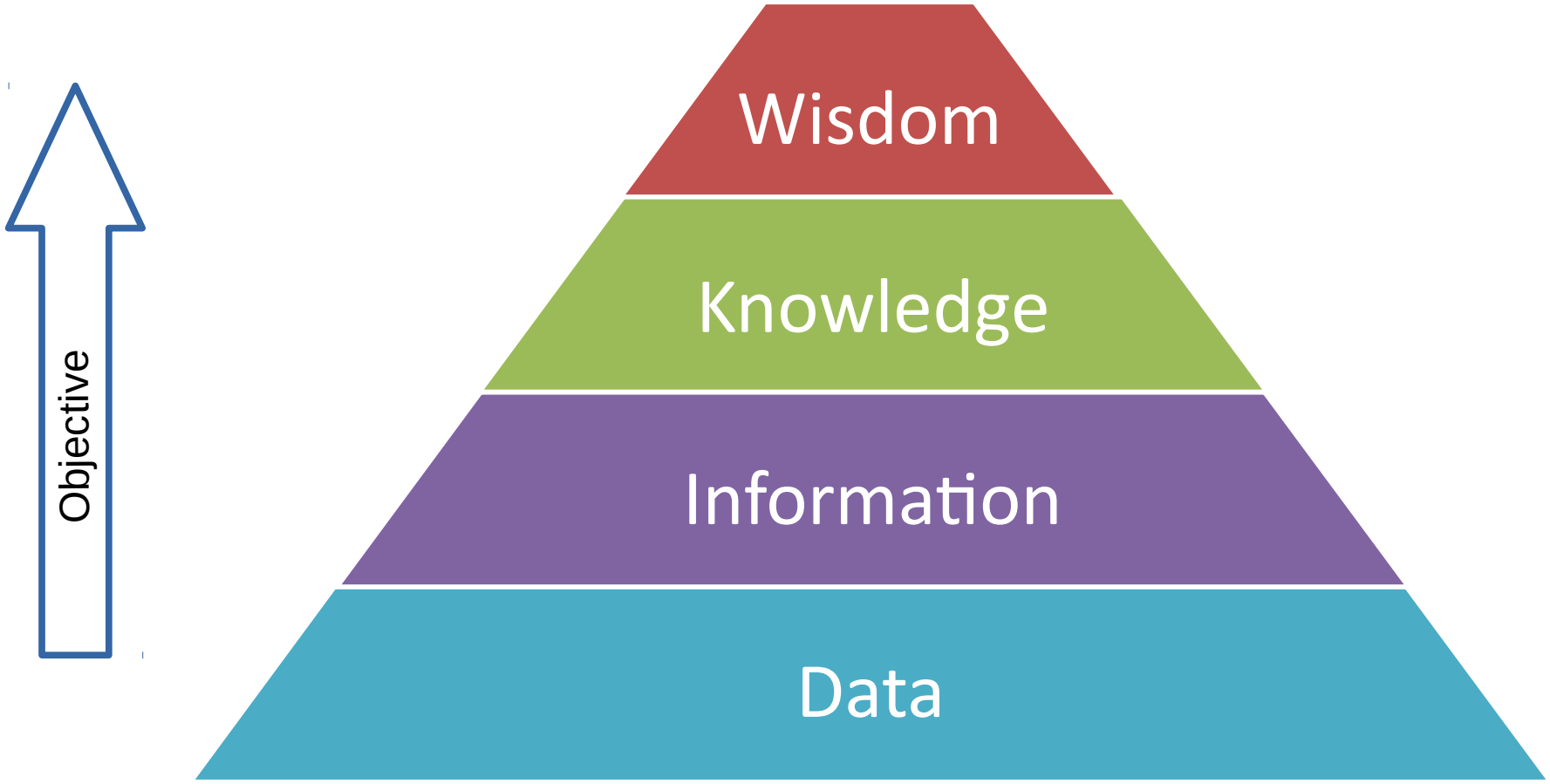
Fast discover by experimenting



Objective Continuous Intelligence



Source: Rowley (2007), The wisdom hierarchy - representations of the DIKW hierarchy

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Continuous Intelligence Demo 1

www.hotjar.com

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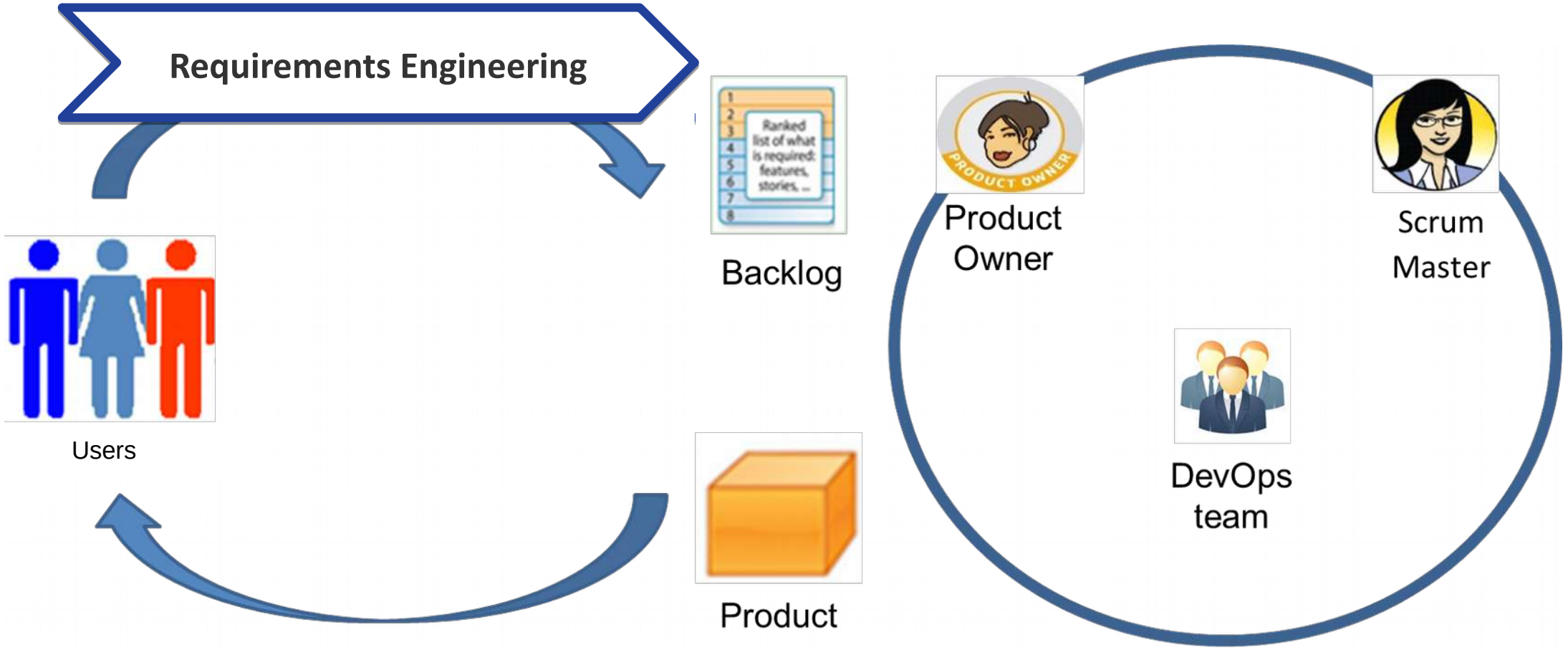
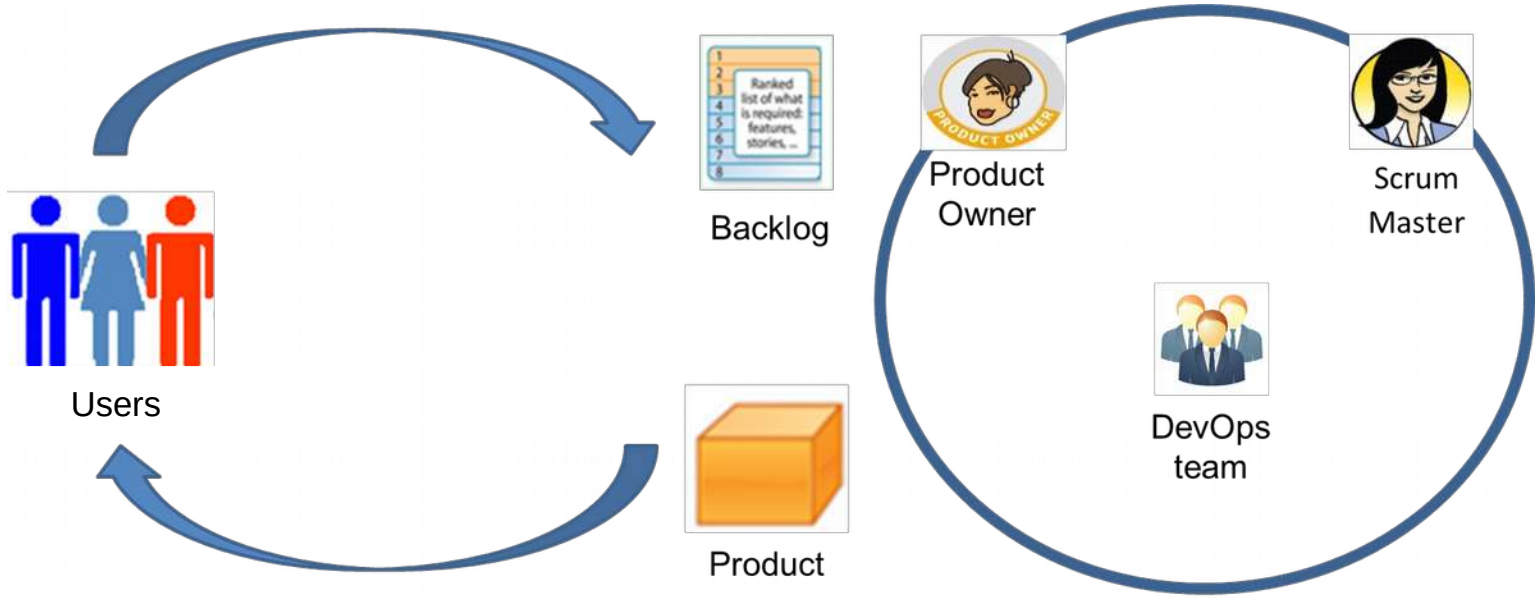
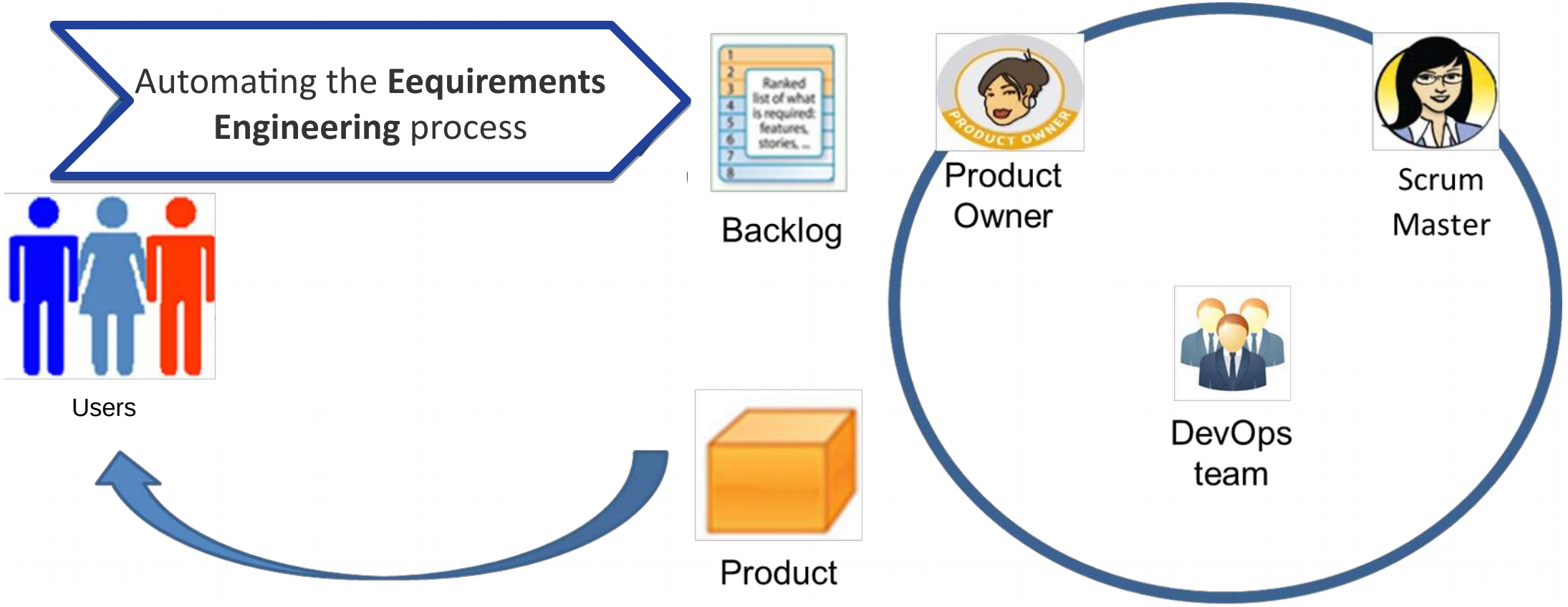
The Software Development Process...



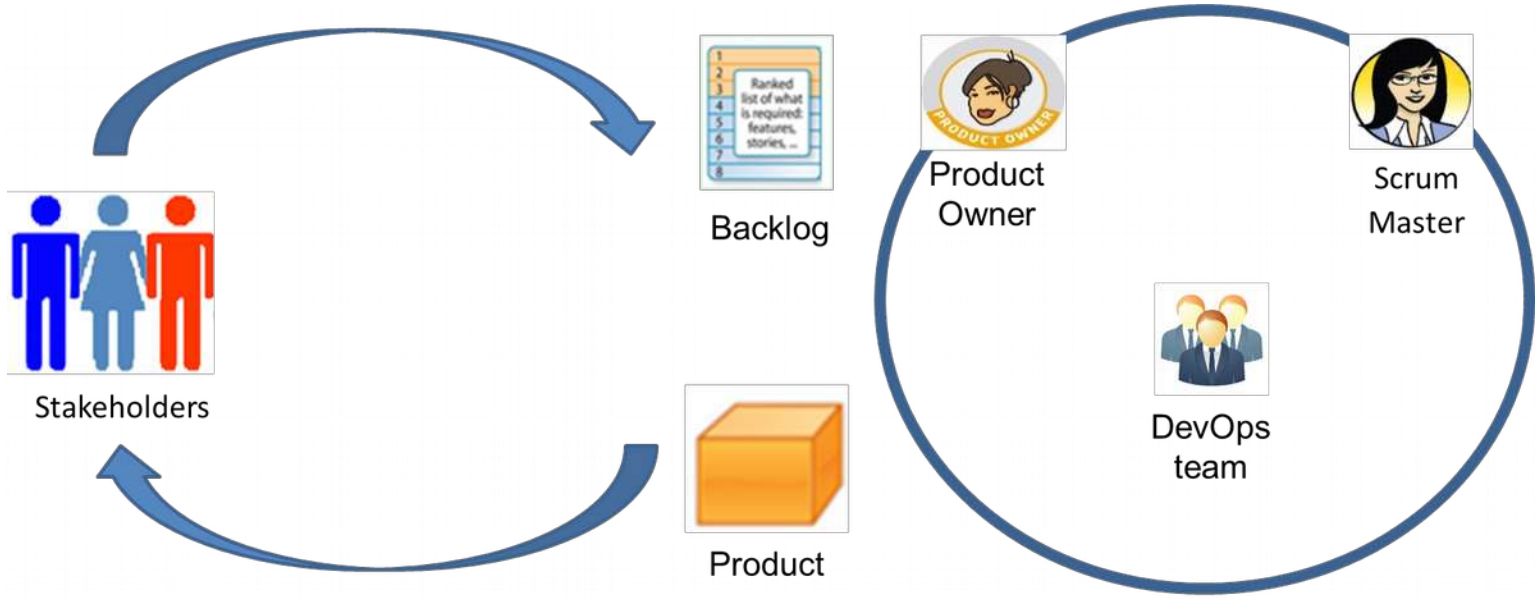
...supported with Continuous Delivery Platform



...expanding to...

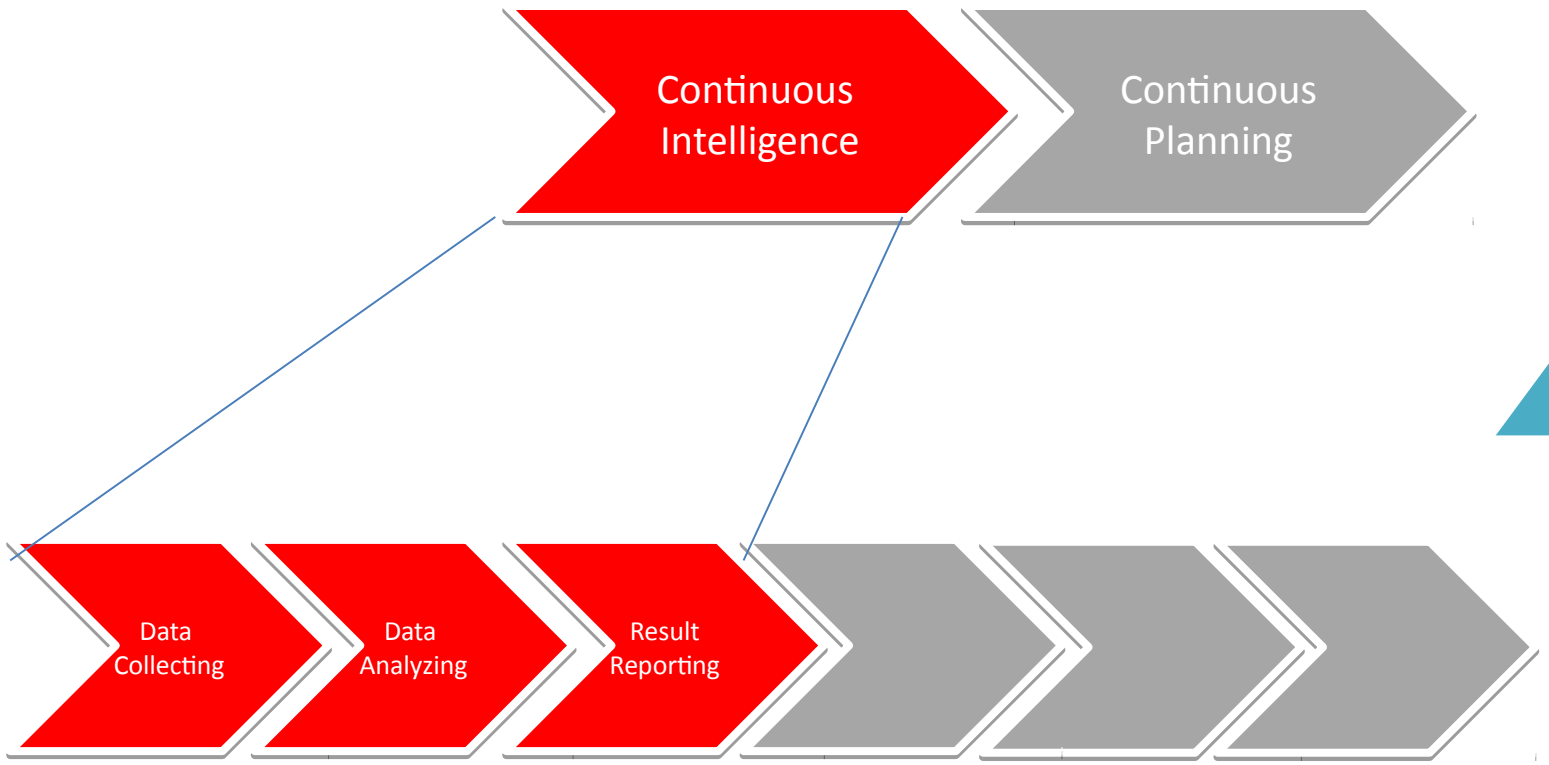


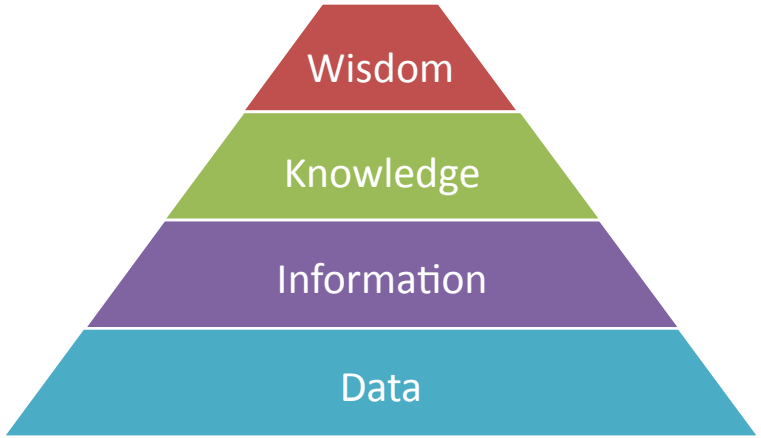
… Continuous Delivery 3.0



Continuous Intelligence | Continuous Planning | Continuous Integration | Continuous Testing | Continuous Deployment | Continuous Operation

Continuous Intelligence topics



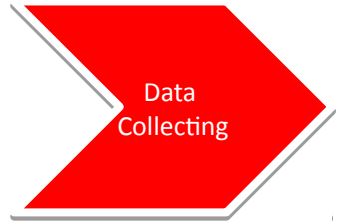


Typical Browser & App tracking

- URL extensions (e.g. Urchin Tracking Module)
- Mouse pointer or -touch data
- History records (e.g. Cookies, Flash cookies)
- Fingerprinting (IP address, Browser version, hardware info)
- Logging

Must read: http://spectrum.ieee.org/computing/software/browser-fingerprinting-and-the-onlinetracking-arms-race

Basic Browser information



- Cache-Control: max-age=0
- Connection: keep-alive
- Content-Length: 32
- Content-Type: application/x-www-form-urlencoded
- Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
- Accept-Language: en-US,en;q=0.8
- Cookie: tico=vw4rzlru0yryu; pico=vw4rzlru0yryu; tpag=puqnhaw31qrpr; ppag=puqnhaw31qrpr; tcss=3gv2mqiuakctq; pcss=3gv2mqiuakctq
- Host: www.grc.com Referer: https://www.grc.com/x/ne.dll?rh1dkyd2 User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/45.0.2454.99 Safari/537.36
- Origin: https://www.grc.com
- Upgrade-Insecure-Requests: 1
- FirstParty: https://www.grc.com
- ThirdParty: https://www.grctech.com
- Secure: https://www.grc.com
- Nonsecure: http://www.grc.com
- Session: i0yalbs05l4ld

Source : https://www.grc.com/x/ne.dll?rh1dkyd2

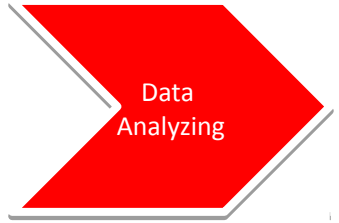
Basic App tracking

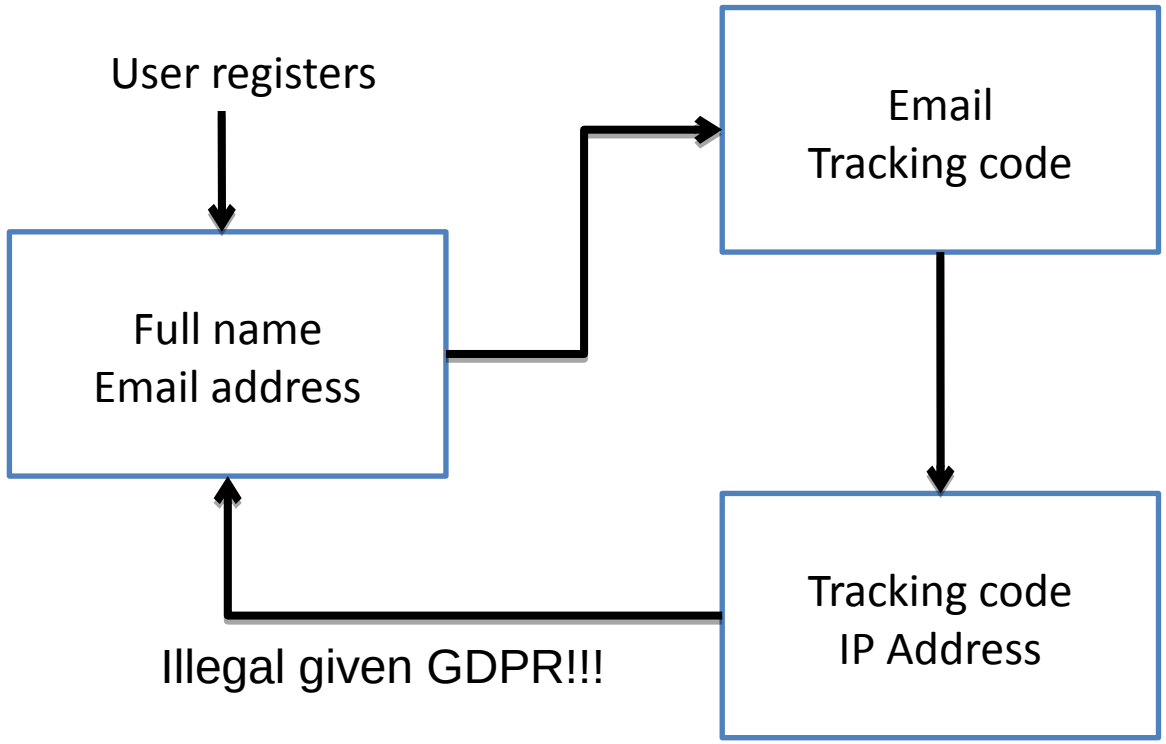
- Nearly endless possibilities, as the App is installed on the device potentially accessing many sources, such as:
  - Address Book, Calendar, Call history, Geographical location, Moving sensors, Clipboard, SMS records, Email, Microphone, Camera, File system, Bluetooth
- Availability of data depends on Device security settings, usually allow all by default

Source: http://www.computerworld.com/article/2509878/data-privacy/smartphone-apps--is-your-privacy-protected-.html

Source: http://www.appanalysis.org/

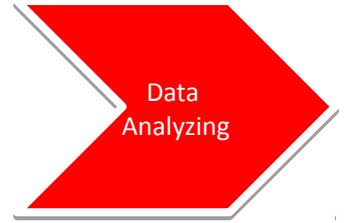
Data Analytics – Linking Data

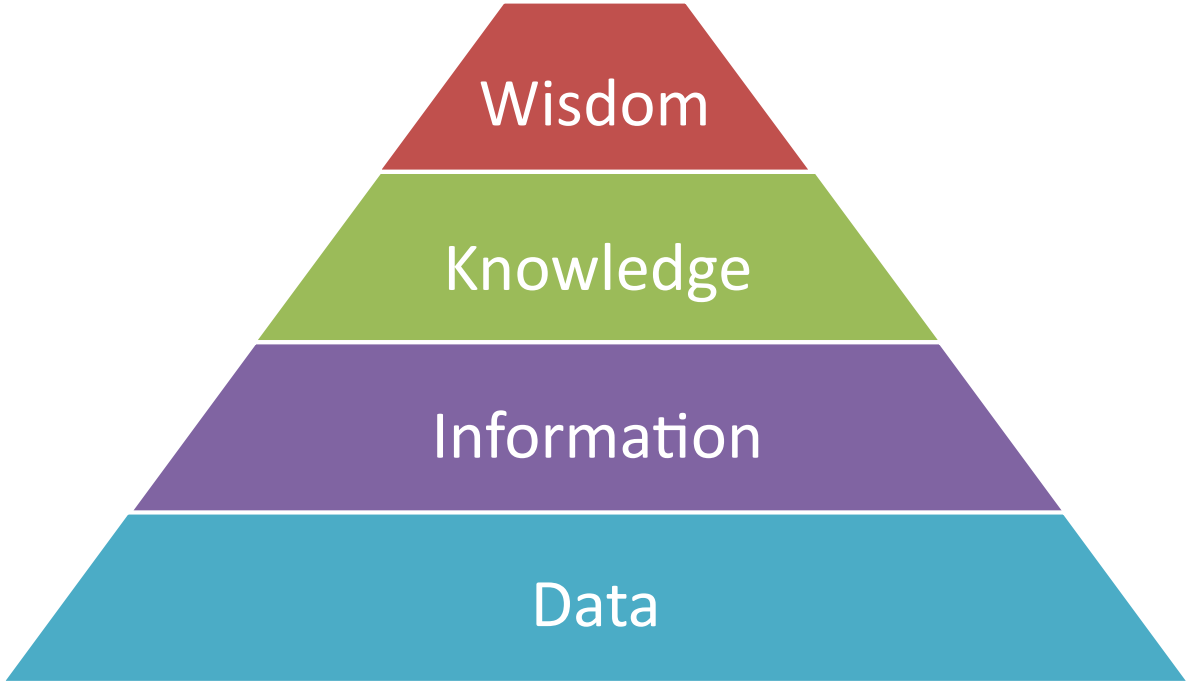




1. User enters Full Name and Email address
2. Newsletter is sent to users
3. User clicks the email
4. Web server records the Tracking code, IP address (and all other browser data that is sent)

Data Analysis – Machine Learning





Pong neural network: https://youtu.be/bPkWMlCq2tc
Artificial Mario player: https://www.youtube.com/watch?v=qv6UVOQ0F44
Theory: https://en.wikipedia.org/wiki/Bayesian_network#Inference_and_learning

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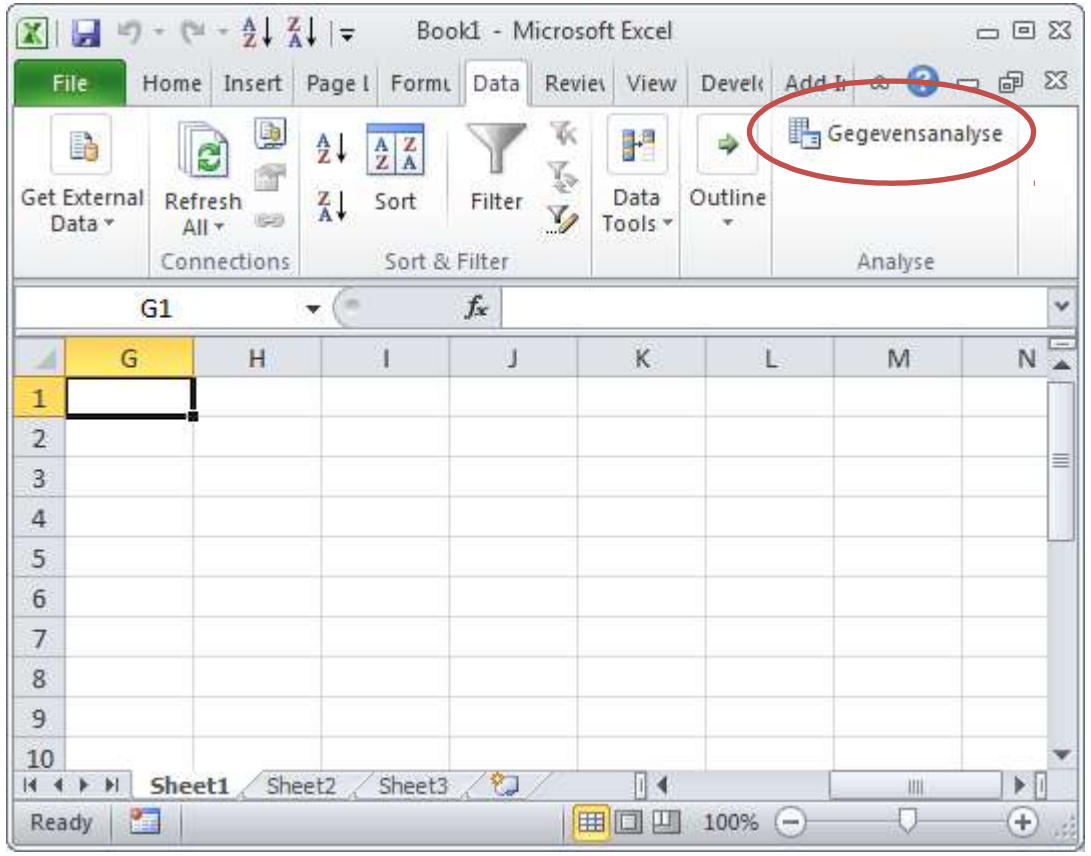
Excel


Book1 - Microsoft Excel
File
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Insert
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Formu
Data
Revie
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Devel
Add I
Get External Data
Refresh All
Connections
Sort
Filter
Sort & Filter
Data Tools
Outline
Gegevensanalyse
Analyse
G1
G
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Sheet1
Sheet2
Sheet3
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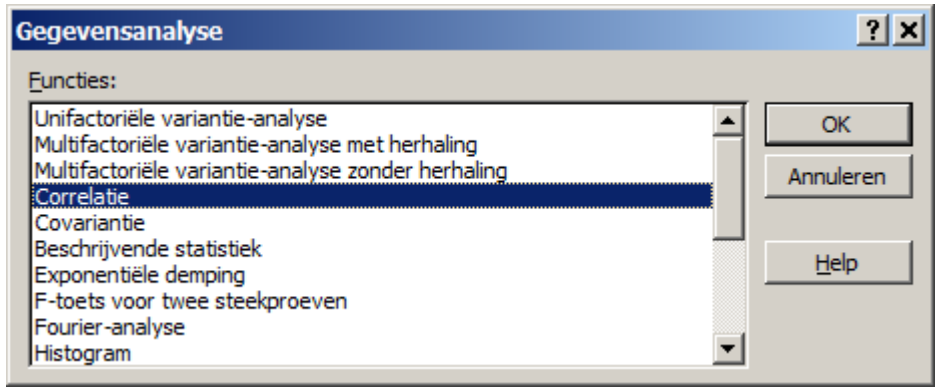
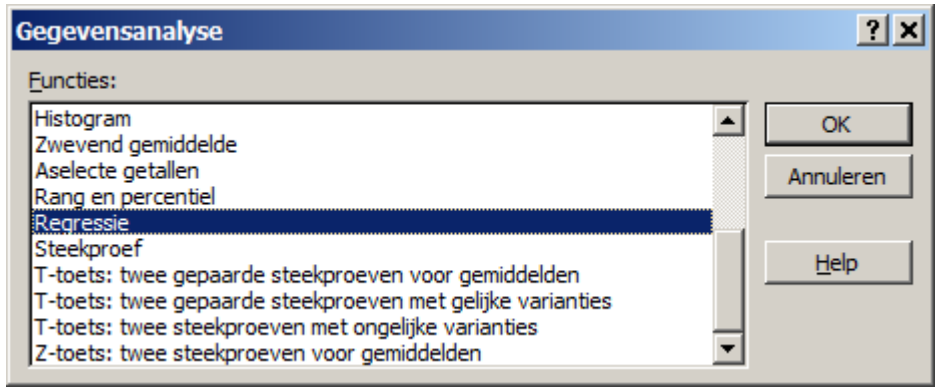
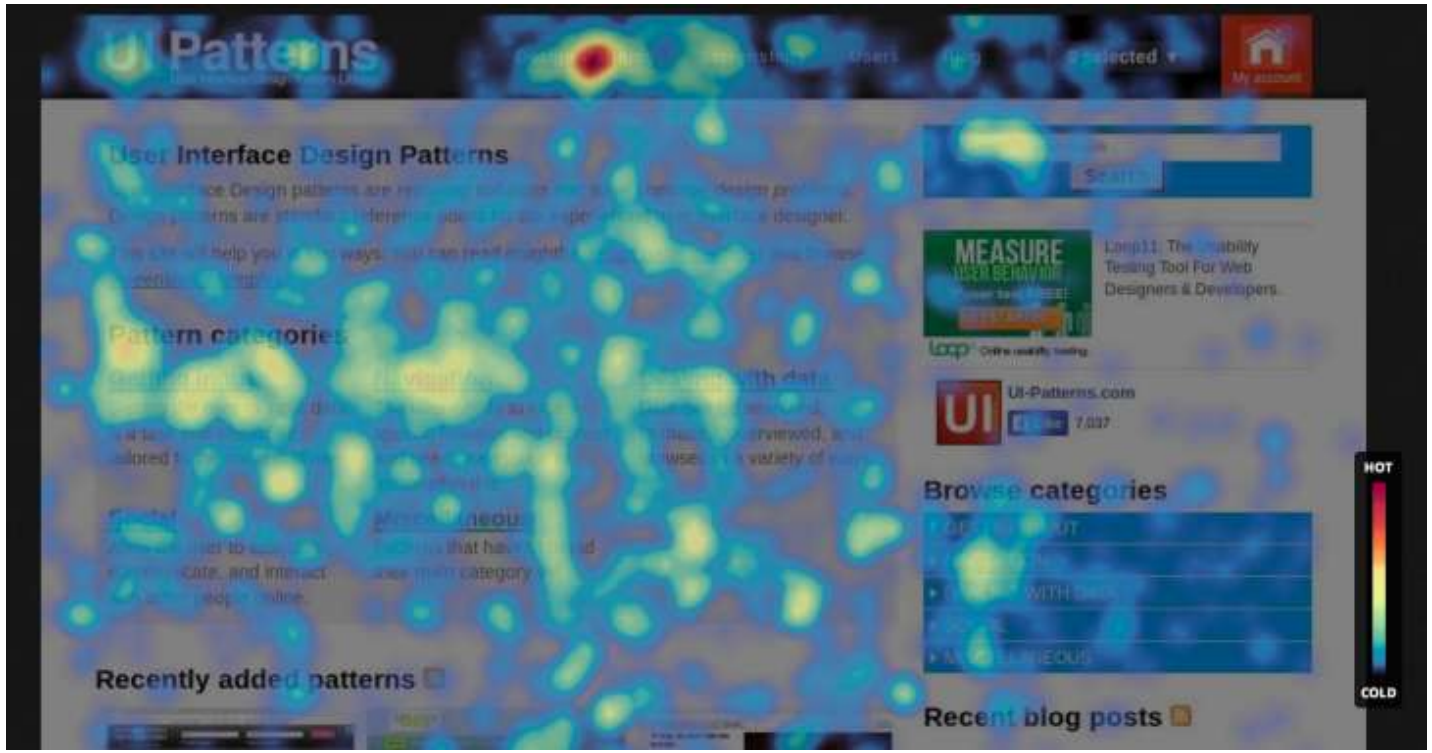
100%


Gegevensanalyse
Functies:
Unifactoriële variantie-analyse
Multifactoriële variantie-analyse met herhaling
Multifactoriële variantie-analyse zonder herhaling
Correlatie
Covariantie
Beschrijvende statistiek
Exponentiële demping
F-toets voor twee steekproeven
Fourier-analyse
Histogram
OK
Annuleren
Help


Gegevensanalyse
Functies:
Histogram
Zwevend gemiddelde
Aselecte getallen
Rang en percentiel
Regressie
Steekproef
T-toets: twee gepaarde steekproeven voor gemiddelden
T-toets: twee gepaarde steekproeven met gelijke varianties
T-toets: twee steekproeven met ongelijke varianties
Z-toets: twee steekproeven voor gemiddelden
OK
Annuleren
Help

Hotjar



Note: Cloud Analytics Services collect data at their premise, not yours!

Hotjar Tracking snippet

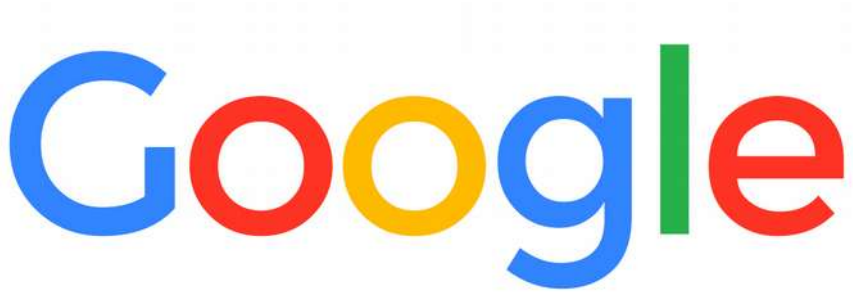
HTML

```
<script>
    (function(h,o,t,j,a,r){
        h.hj=h.hj||function(){(h.hj.q=h.hj.q||[]).push(arguments)};
        h._hjSettings={hjid:1,hjsv:5};
        a=o.getElementsByTagName('head')[0];
        r=o.createElement('script');r.async=1;
        r.src=t+h._hjSettings.hjid+j+h._hjSettings.hjsv;
        a.appendChild(r);
    })(window,document,'//static.hotjar.com/c/hotjar-','.js?sv=');
</script>
```

```
<script type="text/javascript">
  var _paq = _paq || [];
  _paq.push(['trackPageView']);
  _paq.push(['enableLinkTracking']);
  (function() {
    var u="//{$PIWIK_URL}/";
    _paq.push(['setTrackerUrl', u+'piwik.php']);
    _paq.push(['setSiteId', {$IDSITE}]);
    var d=document, g=d.createElement('script'), s=d.getElementsByTagName('script')[0];
    g.type='text/javascript'; g.async=true; g.defer=true; g.src=u+'piwik.js'; s.parentNode.insertBefore(g,s);
  })();
</script>
```

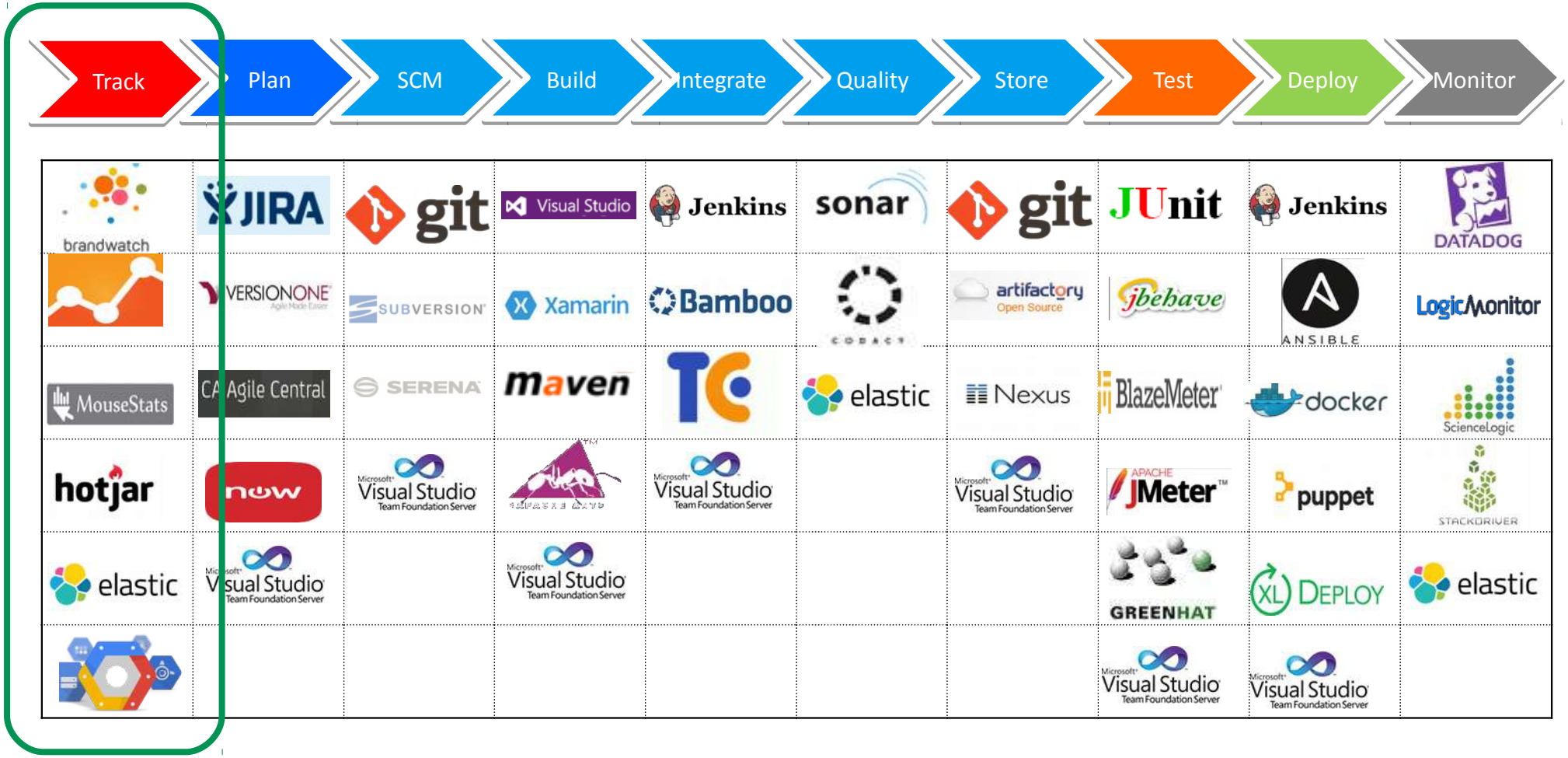
Source: http://developer.piwik.org/guides/tracking-javascript-guide

Google Cloud Products



- Adwords
- Analytics (basic visualization)
- Machine Learning (advanced analytics)
- Datastudio (visualization)
- Cloud Datalab (analytics)
- Big Query (collection)

Continuous Intelligence Tooling (and more)



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Research Avenues

Avenue 1: *"Use Machine Learning to improve the Continuous Intelligence process and Requirements Engineering Process"*

Avenue 2: *"Use Machine Learning to improve the Continuous Planning process by automatically prioritizing Software Development Activities"*

Interesting read: http://www.kde.cs.uni-kassel.de/hotho/pub/AWIC.pdf

Information

For more information about the course you can contact

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- j.vlietland@nisi.nl
- 06 – 2041 1834

Don’t forget to submit your homework!

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+31(0)30 - 268 5398

Thank you for your attention!