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QUANTIFYING THE FUTURE

Using Function Points to Manage Agile Product Backlog: Fact vs. Fiction

Carol Dekkers, CFPS, PMP
Daniel B. French, CFPS, PMP, CSM

Principal Consultant
dfrench@cobec.com
www.cobec.com
https://www.facebook.com/Cobec-Consulting-168048156555810/

President
Dekkers@qualityplustech.com
www.qualityplustech.com

Agenda

- Background of Agile and the Agile Manifesto
- High level overview of the Agile process
- Benefits of Using Agile
- Critical Components of Agile Development
- Key Principals of Agile
- Key Agile Terms and Roles
- How Agile Projects are typically estimated and their challenges
- History of Function Points
- What are Function Points?
- Key FP terminology
- Why FP are better than typical Agile estimating tools/techniques
- Advantages of using FP vs. Story Points or SLOC
- Product Backlog and Counting Examples
- Product Backlog Management with Function Points
- How FP can be used to effectively manage Product Backlog
- Potential abuse of FP in Agile
- Applicability for various methods of Agile
- How to address nonfunctional user stories
- Conclusions
- Questions
- Additional Resources

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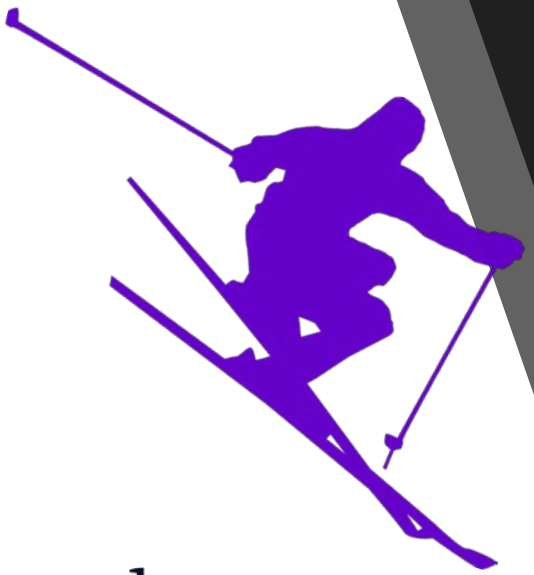
A Little About Us… Carol

- B.Sc. in Mechanical Engineering from University of Calgary
- 25 years in software measurement and FPA
- IFPUG CFPS (Fellow) → Over 20 years certified
- Author of 75 articles, co-authored 10+ textbooks (ASQ, PMI, ISBSG, IFPUG, CrossTalk and others)
- Member of U.S. delegation to ISO/IEC JTC1 SC7 since 1994
- Co-developed “northern Scope” certification (Finland) → € / FP
- IFPUG Past president, now Dir of Communications and Marketing
- Presented / instructed > 30 countries
- Project Management Institute (PMI) Project Management Professional (PMP)
- Agile Alliance Certified SCRUM Master (CSM)

A Little About Us… Dan

- B.S. in Economics from Virginia Tech
- Graduate of the Chubb Institute Top Gun Program
- Over 15 years experience in software cost estimation
- Counting function points for 19 years and been a Certified Function Point Specialist (CFPS) for 17 years
- Experience in a number of estimation techniques and tools including SEER-SEM, COCOMO, SLiM, Delphi, and Estimating by Analogy
- Chairman of the International Function Point Users Group (IFPUG) Functional Software Sizing Committee (FSSC)
- Former member of the IFPUG Conference Committee for 5 years
- GAO Cost Guide expert team member
- Project Management Institute (PMI) Project Management Professional (PMP)
- Agile Alliance Certified SCRUM Master (CSM)

History of Agile



- Representatives from Extreme Programming (XP), SCRUM, Dynamic Systems Development Method (DSDM), Adaptive Software Development, Crystal, Feature-Driven Development, Pragmatic Programming, and others (sympathetic to the need for an alternative to documentation driven, heavyweight software development processes) met at Snowbird Ski Resort in Utah in February, 2001
- Goal → to identify a better way to develop software in the new economy and eliminate unnecessary, bureaucratic tasks from software development
- Intention was not to be "anti-methodology", rather to bring back credibility to methodology

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The Agile Manifesto[1]

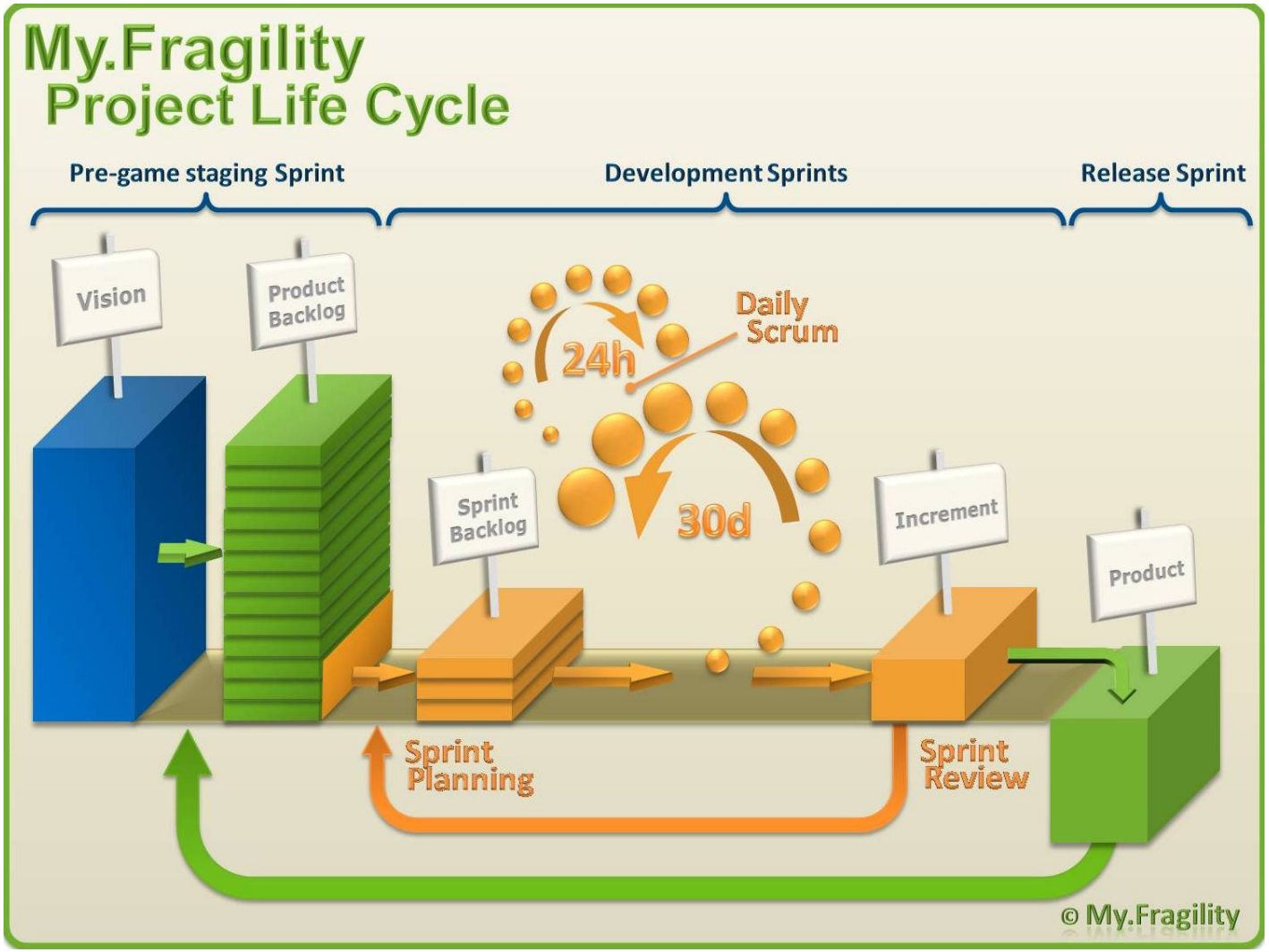
We are uncovering better ways of developing
software by doing it and helping others do it.
Through this work we have come to value:

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan

That is, while there is value in the items on
the right, we value the items on the left more[1].

[1] http://www.agilemanifesto.org/

Typical Agile Project Lifecycle[2]



[2]http://guntherverheyen.com/tag/my-fragility/

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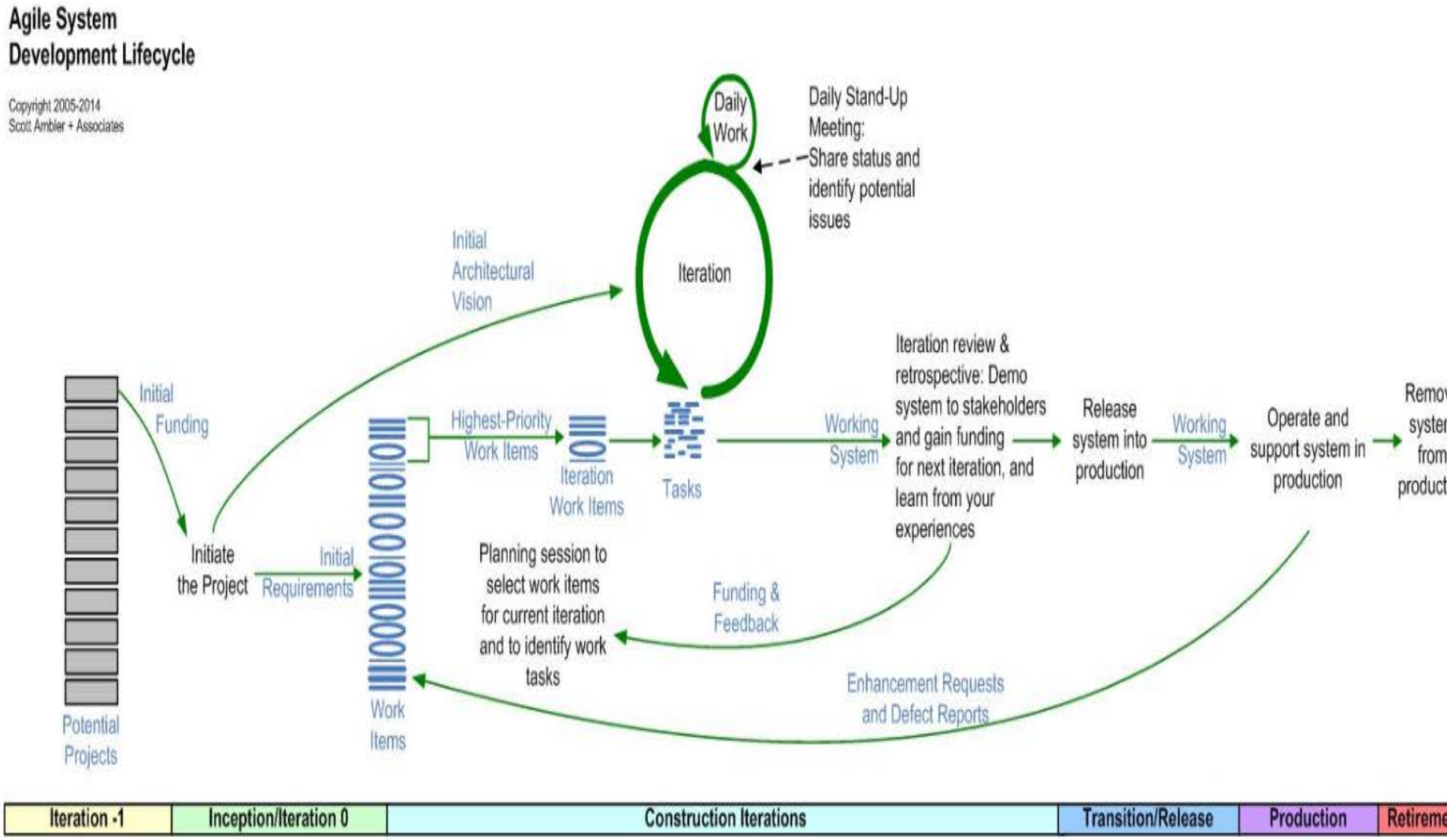
Agile Lifecycle Diagram[3]



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[3] http://www.ambysoft.com/essays/agileLifecycle.html

Benefits of Agile

- Quicker Time to Market
- Earlier ROI
- Customer-centric product development → higher satisfaction and acceptance
- Better communication (internal and external)
- Higher product quality
- Built in risk-reduction
- Better business goals/strategic alignment
- Increased predictability
- Prioritized delivery of critical/best value features

Critical Components of Agile

- Fixed sprints → 2 – 4 week duration
- Small team size (<20)
- Product owner → active team participant
- Daily stand up meetings & burndown charts
- Co-located team
- Active backlog grooming
- No overtime
- Working software delivered at end of sprints

Key Principles of Agile[6]

- The most efficient and effective method of conveying information to and within a development team is **face-to-face conversation**.
- **Working software is the primary measure of progress**. Agile processes promote sustainable development.
- The sponsors, developers, & users should be able to **maintain a constant pace indefinitely**.
- **Continuous attention to technical excellence and good design** enhances agility.
- **Simplicity--the art of maximizing the amount of work not done--is essential.**
- **The best** architectures, requirements, and designs **emerge from self-organizing teams**.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly **(post-sprint retrospectives).**

[4]http://agilemanifesto.org/principles.html

Key Principles of Agile[6]

- **Our highest priority is to satisfy the customer through early and continuous delivery** of valuable software.
- **Welcome changing requirements**, even late in development. Agile processes harness change for the customer's competitive advantage.
- **Deliver working software frequently**, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- **Business people and developers must work together daily throughout the project.**
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

Key Agile Terms and Roles[5]

- Product Owner
- SCRUM Master
- User Stories
- Velocity
- Backlog
- Backlog grooming

Typical Agile Project Estimation

Sprints → time-boxed at 2-4 weeks → estimate what can go into a sprint

Agile **Size Estimating** Methods typically include:

- T-Shirt Sizing (Sm, M, L, XL…)
- Story Points/Planning Poker (Fibonacci sequence)
- Use Case Points

Based on team / org velocity → sprint is assigned user stories/capabilities to be delivered (during sprint)

Agile does not = Adhoc… Estimates and Schedules important

The Challenges with These Estimating Methods

All are subjective and cannot be replicated, even within the same teams

Significant variation within and between teams

No rules on how to size

Inconsistent and unpredictable

Cannot be used to develop productivity, cost or quality metrics

Cannot be used to evaluate against industry data

Optimistic bias

Difficult to determine Velocity, especially when first implementing Agile

Using IFPUG function points can address most of these limitations

Function Point History

- 1979: Developed by Allan Albrecht (IBM) and released into public domain
- Alternative to Source Lines of Code (SLOC) to measure software size
- 1986: Counting Rules established by the International Function Point Users Group (IFPUG)
- 2010: Current IFPUG version 4.3.1 released in Jan.
- International Standards Organization - standard for software functional size (ISO/IEC 20926 Software Engineering – IFPUG Function Point Counting Practices Manual)

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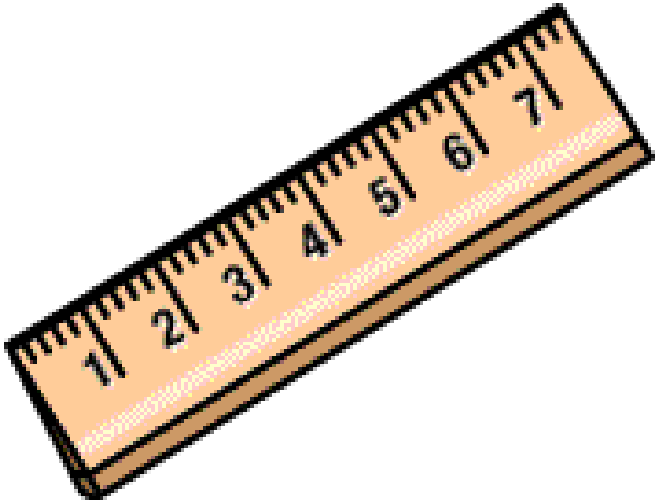
What are Function Points (FP)?



- Unit of measure for software size
- Measure the work product (output) of software development
- Measured functionality from user perspective
- Do not measure internal architecture, effort, or technological complexity of an application
- Language, platform and technology independent

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Types of Function Point Counts

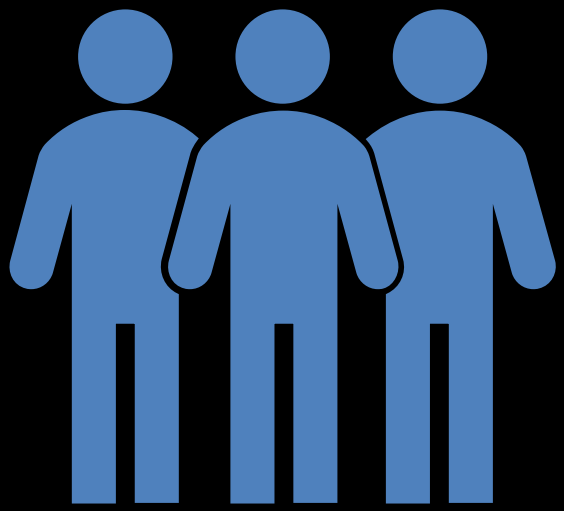
- Function points → used to count both projects and applications

- 3 types of function point counts:
  - Development Project (new software including conversion functionality)
  - Enhancement Project (new, modified, removed software functionality)
  - Application (count of an application in production)

Function Point Components

5 Functional Components: 3 Transactional + 2 Data:

- Transactional Functions
  - **External Inputs (EI)** – Batch transaction file, input screen, control information
  - **External Outputs (EO)** – Reports with calculations, output files with derived data
  - **External Inquiries (EQ)** – Data retrieval for on-line query screen, interface file with no calculations or derived data
- Data Functions
  - **Internal Logical Files (ILF)** – Application file, internal database
  - **External Interface File (EIF)** – Reference



Advantages of FP vs. SLOC or Story Points

- Uniform sizing
- Objective (not subjective) sizing
- Consistent measure regardless of team composition & experience
- Can better measure and predict Velocity
- Language, platform and technology independence
- More easily size, manage, and prioritize product backlog

The Product Backlog[6]

- A to-do list of all things to be done within the project
- Replaces (or supplements) traditional requirements specification artifacts
- May be technical or user-centric (user functionality) and presented as user stories
- Owned by Scrum Product Owner
- Scrum Master, Scrum Team and other Stakeholders all contribute to creating it (broad and complete list)
- Dynamic… exists as long as the product does
- Team can also use other artifacts

[6]http://www.scrum-institute.org/The_Scrum_Product_Backlog.php

Example Agile Product Backlog[7]

ToDo List

ID	Story	Estimation	Priority
7	As an unauthorized User I want to create a new account	3	1
1	As an unauthorized User I want to login	1	2
10	As an authorized User I want to logout	1	3
9	Create script to purge database	1	4
2	As an authorized User I want to see the list of items so that I can select one	2	5
4	As an authorized User I want to add a new item so that it appears in the list	5	6
3	As an authorized User I want to delete the selected item	2	7
5	As an authorized User I want to edit the selected item	5	8
6	As an authorized User I want to set a reminder for a selected item so that I am reminded when item is due	8	9
8	As an administrator I want to see the list of accounts on login	2	10
Total		**30**	

Example Scrum Product Backlog

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User Stories: FP Counting Examples

ToDo List

ID	Story	Estimation	Priority
7	As an unauthorized User I want to create a new account	3	1
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8	As an administrator I want to see the list of accounts on login	2	10
Total		**30**	

Example Scrum Product Backlog

#7 As an authorized user I want to create a new account:

- ILF Account Data (7-15FP)
- EI Create New Account (3-6FP)

  Total FP (10-21)

#1 As an unauthorized user I want to login:

- ILF User Data (5-15FP)
- EQ User Login (assume stored) (3-6FP)

  Total FP (8-21)

#10 As an authorized user I want to end my session:

- EI User Logout EI (3-6FP)

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Managing the Product Backlog with FP

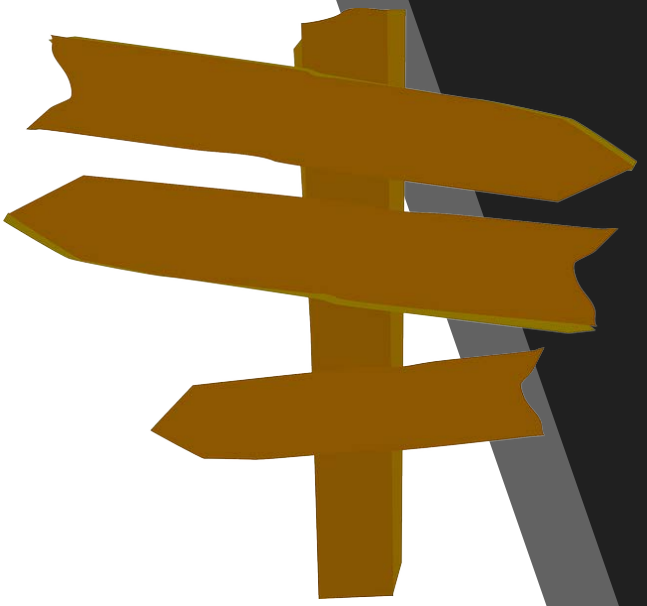
1. For each user story that describes user functionality → count FP
2. Determine Team Velocity (FP / sprint) … May have to estimate until enough local data collected
3. After FP sizing each countable user story, allocate highest priority user stories until the sprint is "full"

   E.g., If team velocity = 100FP / 2 week sprint, assign counted user stories (from the backlog) to equal 100 FP to the sprint
4. User stories that do not get implemented in their designated sprint are returned to the product backlog, reprioritized and, if needed, resized.

Potential Abuse of FP in Agile

- User stories that overlap or contain incomplete functions
- Certified counters can create consistency
- Focus on delivered functionality
- FP measure “what” of product, not “how”
- Bigger is not always better (or higher value)
- Cancelled, changed or refactored stories do not count double, triple, quadruple…

Applicability of Various Agile Methods



- Cross-project or cross-team comparisons → consistency important
- Appropriate measurement tools (FP, earned value, size of user stories, sprint level?)
- Goal – Question – Metric
- Measurement → signposts and guidance

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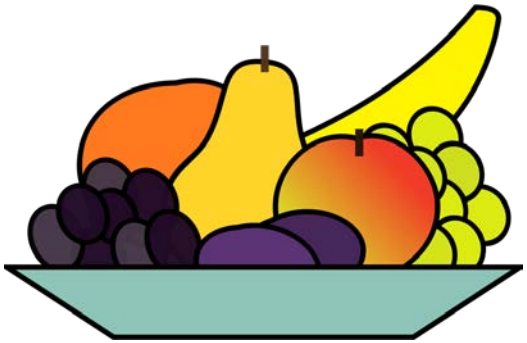
How to Address Non-functional User Stories

- User stories can be:
  - Functional (product - what) – size with FP
  - Non-functional (product - how) – size with SNAP
  - Technical (environmental or architectural)
  - Developer-centric (as a developer I want to add fields…)
  - Combination… (even operational)



- **Plan to use measurement as a tool to help (not hinder)**

Agile Conclusions

- **Agile is a powerful methodology**…if implemented correctly and effectively → produce high quality software quicker and cheaper than other SDLC
- **Use of Agile requires adherence to the framework**, organizational buy-in (top to bottom), trust, and cultural change
- Agile does not (imply or recommend that organizations) ignore estimating, metrics, processes, or schedules
- **FP are a powerful tool for teams** to more accurately estimate user stories and determine team and organizational velocity
- **The backlog can be estimated and** managed using function points to improve project delivery and team productivity
- **Care must be taken** to ensure that neither the developer nor the customer tries to "game" the system

Agile Certifications

- Scrum Alliance: Certified Scrum Master (CSM), Certified Scrum Product Owner (CSPO), Certified Scrum Developer (CSD), Certified Scrum Professional (CSP)
- Program Management Institute-Agile Certified Practitioner (PMI-ACP)
- Professional Scrum Master (PSM)
- International Consortium for Agile (ICAgile)
- Certified LeSS Practitioner
- SAFe Program Consultant (SPC4)

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Additional Sources of Information

ICEAA

SYSTEMS AND SOFTWARE CONSORTIUM

ISBSG Delivering IT Confidence | The global and independent source of data and analysis for the IT industry

Software Engineering Institute | Carnegie Mellon

Agile Alliance

These organizations can assist in establishing a metrics program or providing industry data for use until a metrics program is established:

- International Function Point Users Group (IFPUG) (www.ifpug.org)
- Agile Alliance (https://www.agilealliance.org/)
- International Software Benchmark Standards Group (www.isbsg.org)
- International Cost Estimating and Analysis Association (http://www.iceaaonline.com/)
- Systems and Software Consortium, Inc. (www.software.org)
- Software Engineering Institute (SEI) (www.sei.cmu.edu)

Questions

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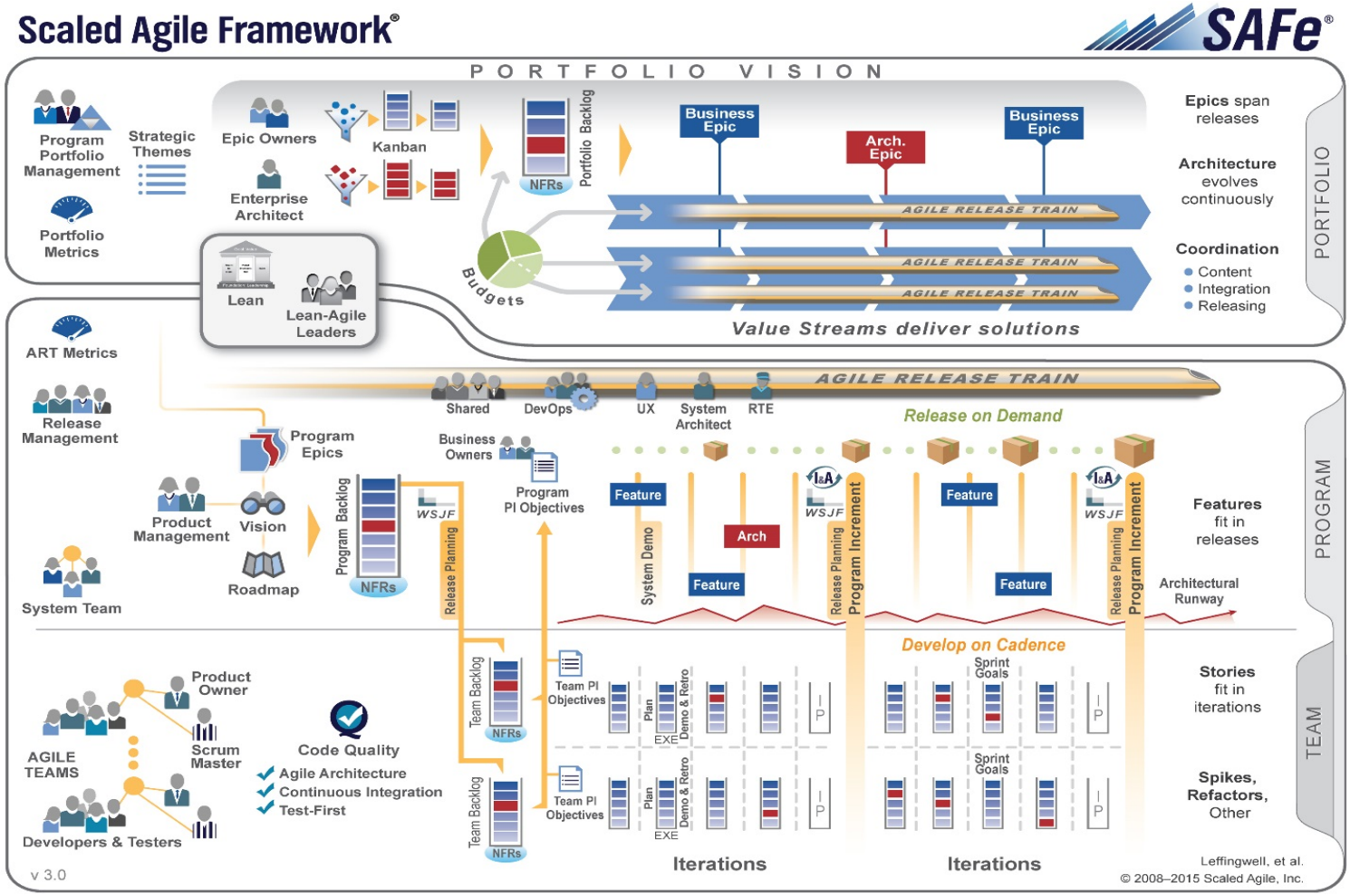
SAFe[8]



[8]http://torak.com/resources/agile/scaled-agile-framework-safe/

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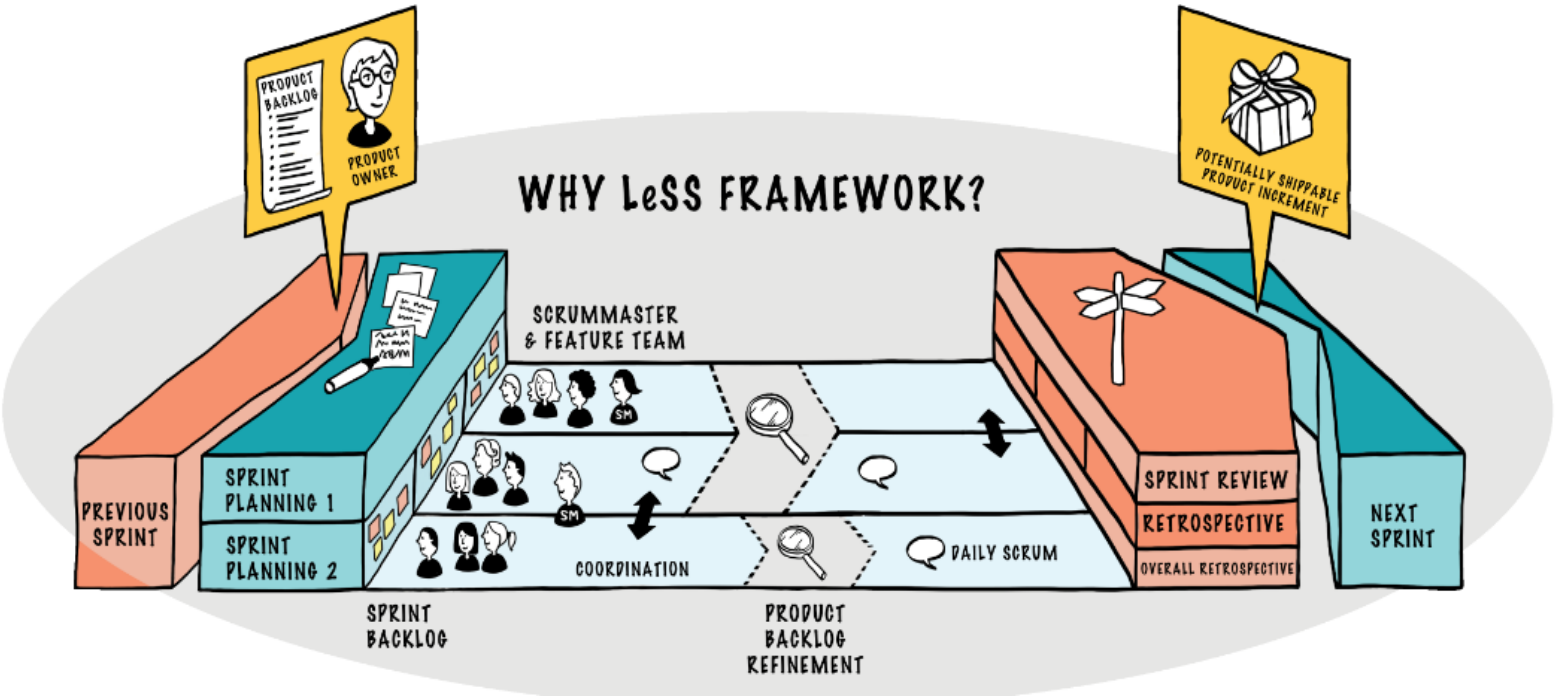
LeSS[9]

LeSS Framework



[9]https://less.works/less/framework/index.html

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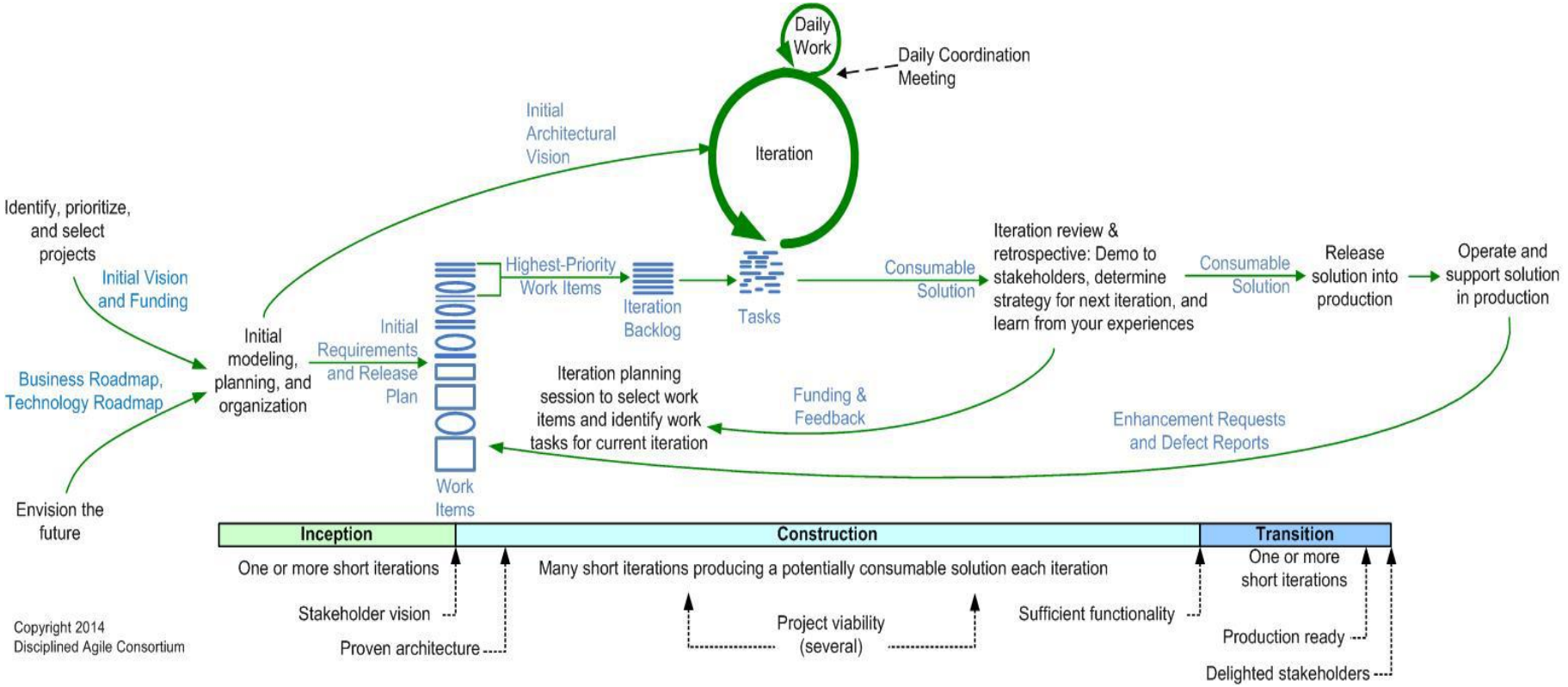

[10]https://i2.wp.com/www.disciplinedagiledelivery.com/wp-content/uploads/2014/05/disciplined-agile-lifecycle-basic1.jpg

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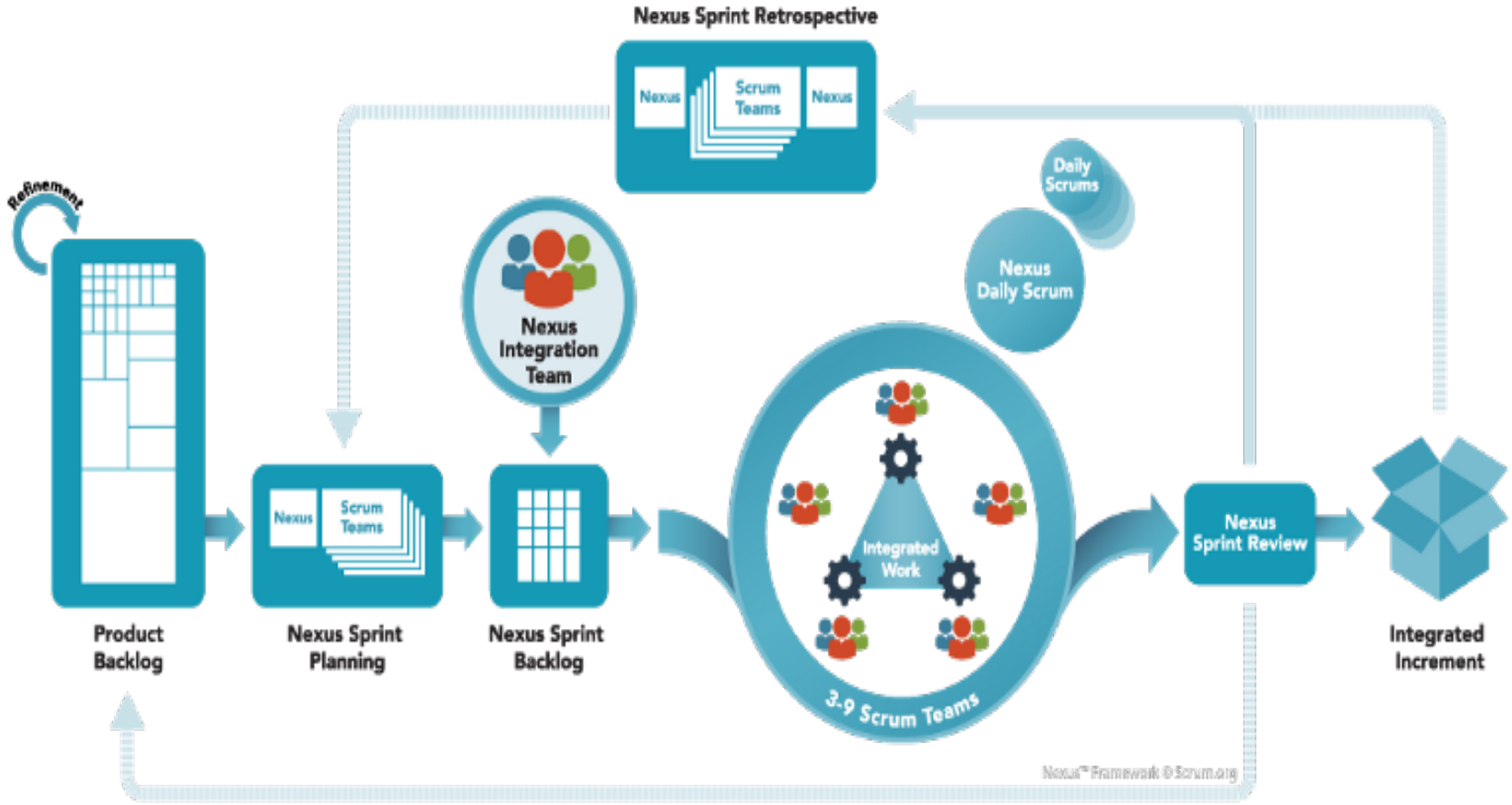
Nexus[11]



[11]https://dzone.com/articles/what-is-the-nexus-framework-scrum-at-scale

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