IEEE-SEM, Volume 9, Issue 5, May-2021
ISSN 2320-9151

An extension and corrected means to consolidate difference in delivery rates in an agile environment

Anand Sunder, anand.sunder@gmail.com ,Capgemini

Abstract:

We here propose a mathematical model to depict the search for a common time function which represents rate of arrival of requests from the end consumer for implementation of a working software[1][2][3][4][5], to facilitate in time delivery of working software. The days of unidirectional communication are diminishing, therefore the search is for a unified model that suits the agile development model [5].

Introduction:

The need of a common mode of communication can be well deduced from the chain or flow chart below:

Let us assume the following functions for a unidirectional flow :

1) Accumulation of Consumer needs = $\int_{t1}^{t2} Cn(t)dt$
2) Accumulation of Prioritized requirements = $\int_{t3}^{t4} \Pr(t)\, dt = \int_{t3}^{t4} g(Cn(t))dt$
3) Accumulation of Technical Specifications= $\int_{t5}^{t6} \mathrm{Ts}(t)\, dt = \int_{t5}^{t6} f(Pr(t))dt = \int_{t5}^{t6} f\left(g(Cn(t))\right) dt$
4) Accumulation of Working Software's $=\int_{t7}^{t8} Ws(t)dt = \int_{t7}^{t8} h(Ts(t))dt = \int_{t7}^{t8} h(f(\Pr(t))dt = \int_{t7}^{t8} h(f\left(g\left(C(n(t))\right)\right) dt$

In an agile working environment this is even more enhanced given the chance of arrival of changes in requirements, closer to delivery deadlines, we need back and forth communication between

Managers, analysts and developers. We look for a function $h'f'g'(Cm(t))$ which realigns the delivery times between stages to match the expected delivery time, or maximizing overlap time

Z_{max} = Gdt

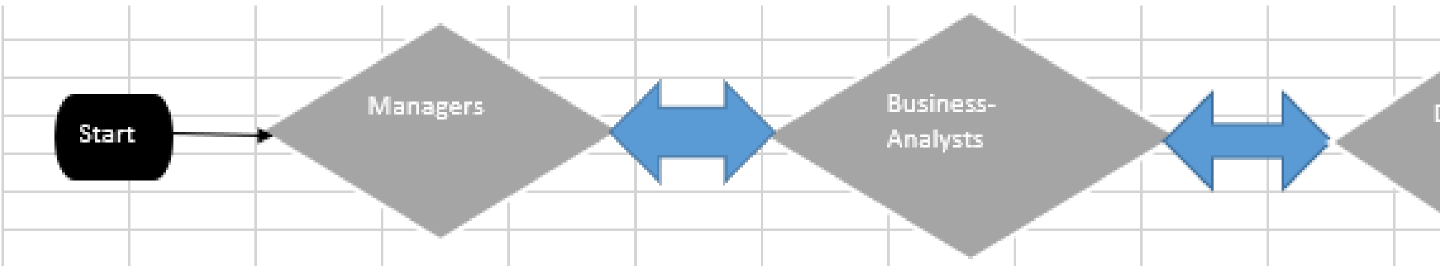
$\forall\ T = max\{t2 - t1, t4 - t3, t6 - t5, t8 - t7\}$

Where G>0 and is the cost coefficient.

$\forall\ t1, t2, t3, t4, t5, t6, t7, t8 > 0$

(P.S: The above maximization is a boundary valued case and subject to time constraints)

In the below schematic we assume a cyclic schematic dictating the flow towards a working software, the cyclicity is represented as a bidirectional arrow as shown:



For a bidirectional flow we would have a delta between stages:

1) Accumulation of Consumer needs = $\int_{t1}^{t2} Cn(t)dt$
2) Accumulation of Prioritized requirements = $\int_{t3}^{t4} \Pr(t)\,dt \pm \Delta J_1(t) = \int_{t3}^{t4} g(Cn(t))dt$
3) Accumulation of Technical Specifications=$\int_{t5}^{t6} \mathrm{Ts}(t)\,dt \pm \Delta J_2(t) = \int_{t5}^{t6} f(Pr(t))dt \pm \Delta J_3 t = \int_{t5}^{t6} f\left(g(Cn(t))\right)dt$
4) Accumulation of Working Software's =$\int_{t7}^{t8} Ws(t)dt \pm \Delta J_4(t) = \int_{t7}^{t8} h(Ts(t))dt \pm \Delta J_5(t) = \int_{t7}^{t8} h(f(\Pr(t))dt \pm \Delta J_6(t) = \int_{t7}^{t8} h(f\left(g\left(C(n(t))\right)\right)dt$

The delta functions are introduced by the bidirectionality possibility in flow, so as to time box all delivery cycles to the set deadline

$$\Delta J_1(t) = \pm \int_{t3}^{t4} g(Cn(t))dt - \int_{t3}^{t4} \Pr(t)\,dt$$

$$\Delta J_2(t) = \pm \int_{t5}^{t6} f\left(g(Cn(t))\right)dt - \int_{t5}^{t6} \mathrm{Ts}(t)\,dt$$

$\Delta J_3 t = \pm \int_{t5}^{t6} f\left(g(Cn(t))\right)dt$-$\int_{t5}^{t6} f(Pr(t))dt$

$$\Delta J_4(t) = \pm \int_{t7}^{t8} (h(f\left(g\left(C(n(t))\right)\right) - Ws(t))dt$$

$$\Delta J_5(t) = \pm \int_{t7}^{t8} (h(f\left(g\left(C\big(n(t)\big)\right)\right) - h\big(Ts(t)\big))dt$$

$$\Delta J_6(t) = \pm \int_{t7}^{t8} (h(f\left(g\left(C\big(n(t)\big)\right)\right) - h(f(\Pr(t)))dt$$

The function being searched must satisfy the below constraint per agile manifestos 10th principle, to minimize work not done [4], also abiding by work units [6], as given below:

$$W_T = \int_0^T h' f' g'\big(Cm(t)\big)dt$$

$$W_T = \int_0^T (\Delta J_1(t) + \Delta J_2(t) + \Delta J_3(t) + \Delta J_4(t) + \Delta J_5(t) + \Delta J_6(t))dt$$

S.T $\frac{\partial W_t}{\partial t} = 0 \, , \frac{\partial^2 W_t}{\partial t^2} > 0$

Conclusion:

Boundary value simulations and various optimization models must be run to arrive at the model of the function $h' f' g'\big(Cm(t)\big)$, which is to be evaluated. The number of cases or data points to be taken can vary and an optimum number must be selected to accommodate all variations possible in real project scenarios.

References:

1) Ralph Hughes, Chapter 5 - Recap of Agile DW/BI Coding Practices, Editor(s): Ralph Hughes, Agile Data Warehousing for the Enterprise, Pages 85-108, ISBN 9780123964649 https://doi.org/10.1016/B978-0-12-396464-9.00005-9

2) Ralph Hughes, Chapter 2 - Primer on Agile Development Methods, Editor(s): Ralph Hughes, Agile Data Warehousing for the Enterprise, Morgan Kaufmann,2016, Pages 13-29, ISBN 9780123964649, https://doi.org/10.1016/B978-0-12-396464-9.00002-3

3) Rational Unified Process : https://www.sciencedirect.com/topics/computer-science/rational-unified-process

4) Mark von Rosing, Joshua von Scheel, Asif Qumer Gill, Applying Agile Principles to BPM, Editor(s): Mark von Rosing, August-Wilhelm Scheer,

Henrik von Scheel, The Complete Business Process Handbook, Morgan Kaufmann,2015,Pages 557-581,ISBN 9780127999593,

https://doi.org/10.1016/B978-0-12-799959-3.00027-6

5) Agile Manifesto : https://www.scrumalliance.org/resources/agile-manifesto?utm_term=&utm_campaign=Live+Online+Courses&utm_source=adwords&utm_medium=ppc&hsa_acc=8637613312&hsa_cam=10054990704&hsa_grp=112186221774&hsa_ad=498878865721&hsa_src=g&hsa_tgt=dsa-1025284834960&hsa_kw=&hsa_mt=b&hsa_net=adwords&hsa_ver=3&gclid=EAIaIQobChMI1eOc3-SR8AIVLpZLBR0ScwLaEAAYASAAEgLZPPD_BwE

6) Camino's Ways: https://caminao.blog/system-engineering/project-management/work-units/