Robotic Intelligence - Subsumption Architecture

Revolutionizing Agile Scaling

Enterprise Agile Global Community Meetup

Sue Ryu

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August 15, 2023

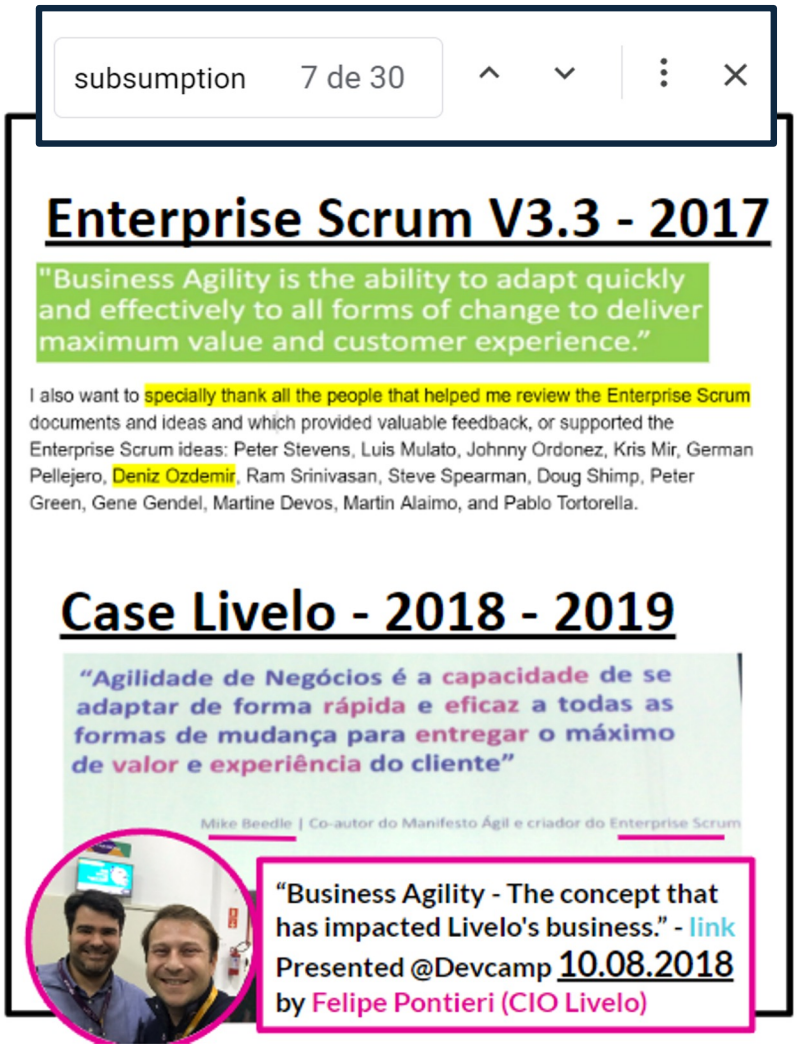
Global Enterprise Scrum for Business Agility Conference 2017 in Chicago

My search for how best to scale Scrum ended with encounter with Mike Beedle.

Met him in 2016 at Meetup in NYC – Improved ES for Biz Agility

How I met **Mike Beedle**

https://www.facebook.com/groups/EnterpriseScrum
https://www.facebook.com/agilefiction (~2015)



Why?

Autonomy, Autonomy, Autonomy

All at Once Management

Decentralized Decision Making

Faster Time to Market

Synergy & Alignment throughout the whole organization

Happy teams, customers, stakeholders

Survival & Profits!

Let’s talk about the types of Scaling

No Scaling –

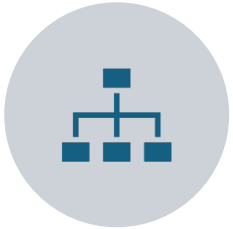
One team - one product

Scaling on ONE product –

Many teams working on one product

Scaling on a portfolio level –

A Portfolio of Products – each product – many teams



Scaling at Enterprise Level -

Portfolio of Products, HR, Governance, other organizational needs

The BIGGEST Challenge with Scaling is managing

Interdependencies

Dependencies

EAT

Autonomy

Lack of autonomy leads to

- Poor Empowerment
- Poor Commitment
- Poor Accountability
- Poor Morale

All these create

- Bottlenecks

Lead to

- Delays!

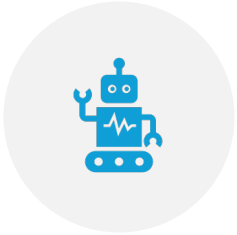
Scrum just BREAKS DOWN!

Managing Dependencies via Subsumption Architecture

- Problem
  - Many Scaling Frameworks (SAFe, LeSS, Scrum at Scale) manage the dependencies through roles & meetings
- Solution (Subsumption Architecture)
  - Enable
    - Autonomy on the team levels
    - Collaboration across the entire organization

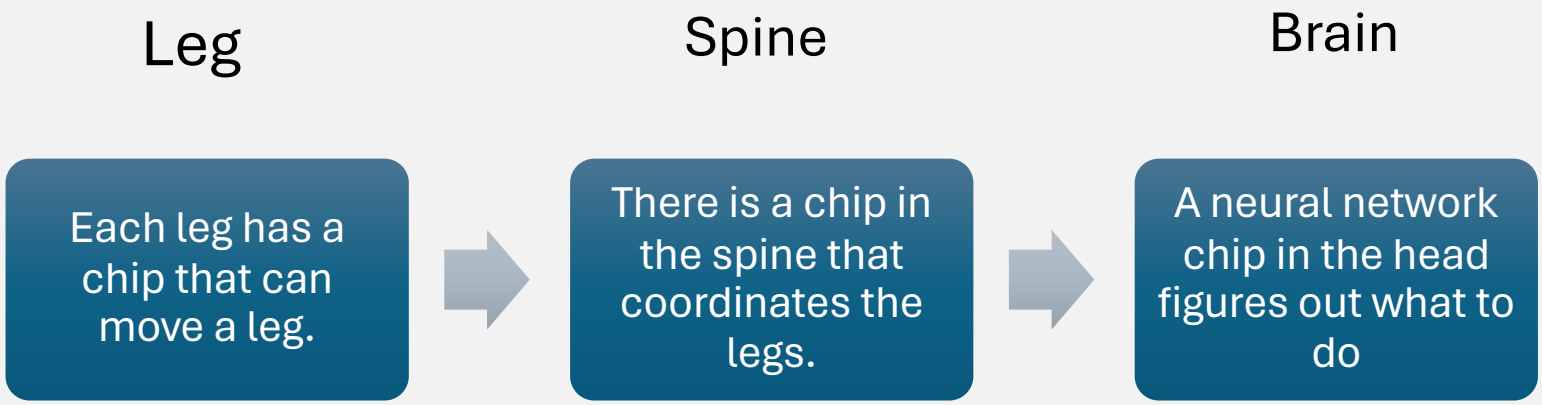
How Jeff learned about Subsumption Architecture?

Rodney Brooks and Jeff Sutherland Interaction in early 1990 – Jeff rented an office space to iRobotics - use of the subsumption architecture for robots



Rodney Brooks – A Radical discovery after 30 years of trying to build a robot using an intelligent system. The best they had been able to do was a smart chess program. Then he and his team discovered the Subsumption architecture. Game Changer

How does a robot walk using the subsumption architecture?



"Before you turn the robot on the chip is blank. The chip collects data as each level's sensor sends its own to the chip as it wonders around. **There is no database. The world is the data and all data is created by sensors." –** Prof. Rodney Brooks

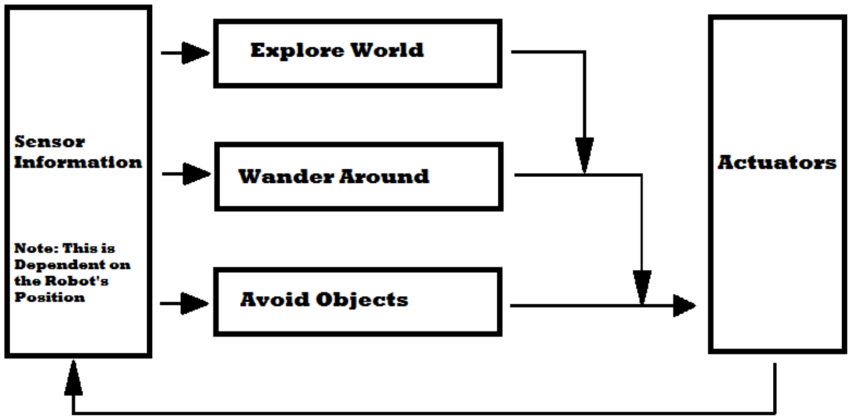
How does a Robot use the Subsumption Architecture?

- 3 Main roles – Layers, Sensors, Actuators
- Sensors – sends signals to all the layers as it roams
- Actuators
  - Enable the subsumption layers to interact with the physical world
  - Enable the robot to ACT appropriately and accordingly to the most recent and relevant information it received from the sensors.

Actuators, Sensors, layers all work together replacing the role of a central processor.

No Central Processor

A robot must be able to know how to avoid an object before it can wander around. Once it can wander around, it can explore the world.

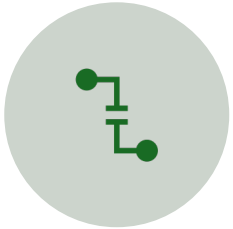


it is layered so that the higher layers subsume the lower layers. The higher layer consumes what the lower layer produced and does its own thing while listening to the sensors.

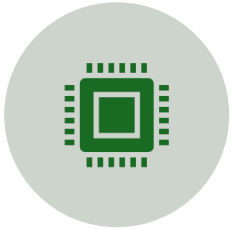
Keys to the Robotics' Subsumption Architecture

Hierarchical Subsumption Layers **Autonomy on its own layer**

Learning from past behaviors



Controlled by sensors & Acted by Actuator



No Central Processor

Created By Sue Ryu & Changer Ozdemir

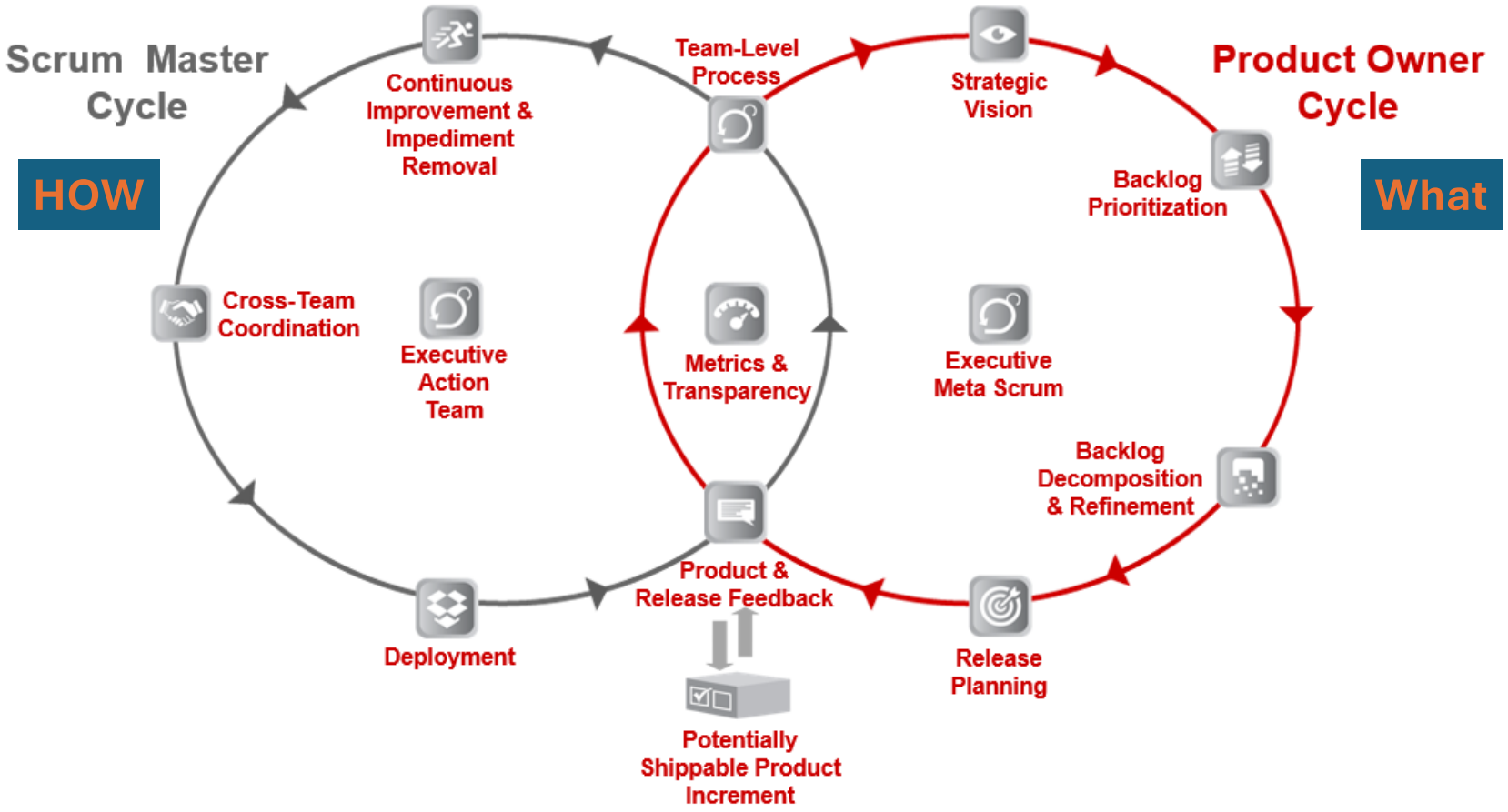
August 2023

Jeff applied the Subsumption only to the team level!

He liked the idea of how a robot can learn from itself and become better and better. He wanted his Slow programmers becoming better.

The real beauty of the subsumption architecture comes when and where a higher layer subsumes the lower layer till all the parts work like a whole.

Scrum@Scale Cycles



Scrum@Scale doesn't utilize the beauty and essence of the subsumption architecture instead it divides Scrum into two How and What.

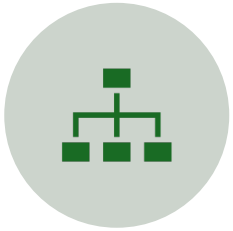
Mike's approach is using the subsumption all the way ….
Apply it n-level to the whole organization as well as sensors & actuator functions

Of the Subsumption Architecture.

“Ideally, all hierarchy is in SUBSUMPTION.”

- Mike Beedle

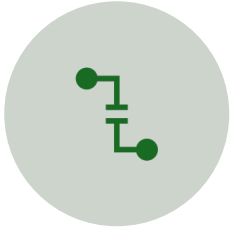
Now, let’s take a look at how you can apply the subsumption architecture for an organization



Subsumption Layers – What kind of subsumption hierarchy would make sense

Autonomy on its own layer

Learning from past behaviors – Insert a blank chip and it records its behaviors and learn from them



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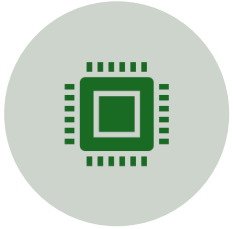
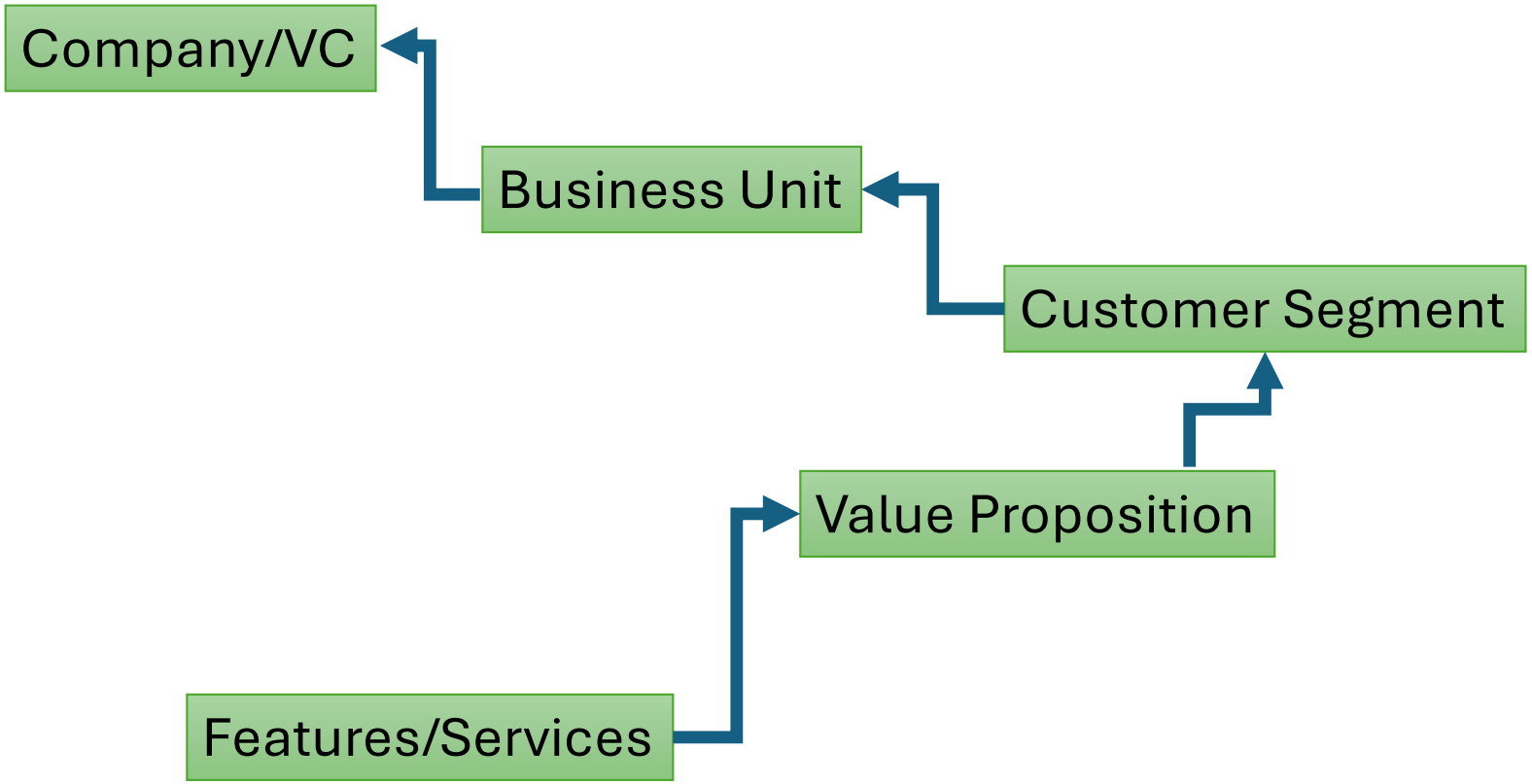
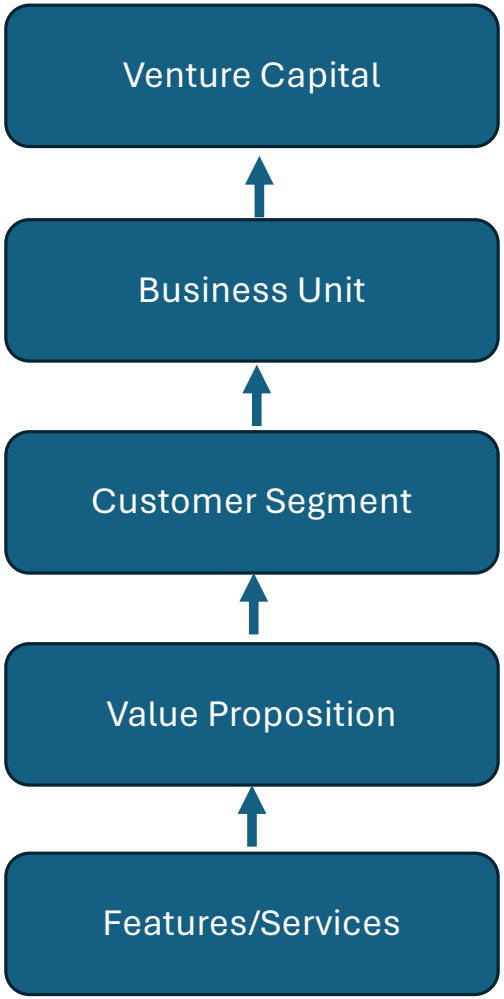


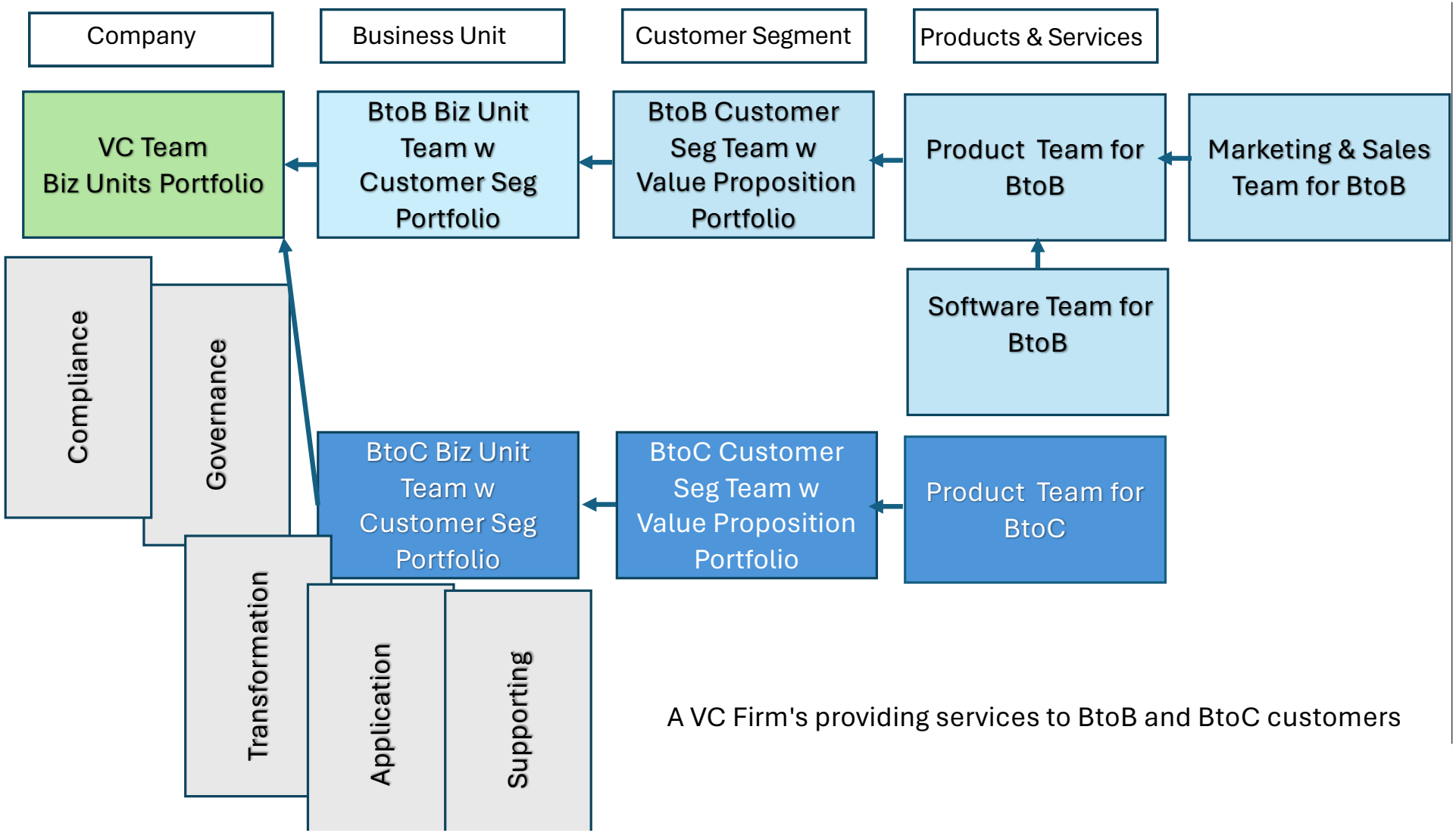
No Central Processor – Instead Actuator control the lower layer based on the signals received from sensors

Bottom up approach - Subsumption Layers



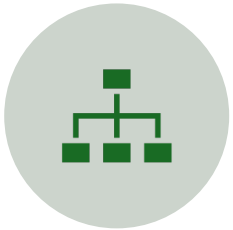
Subsumption Layers





A VC Firm's providing services to BtoB and BtoC customers

Why use customer segment?



How to divide into subgroups so that the higher layers subsume the lower layer **Autonomy on its own layer; Hierarchy of Layers**

In ES - By Customer Segment

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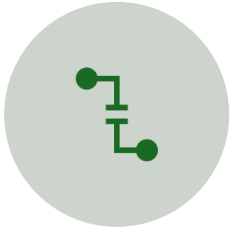

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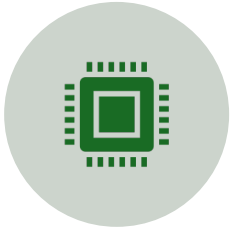

No Central Processor – Instead Actuator control the lower layer based on the signals received from sensors

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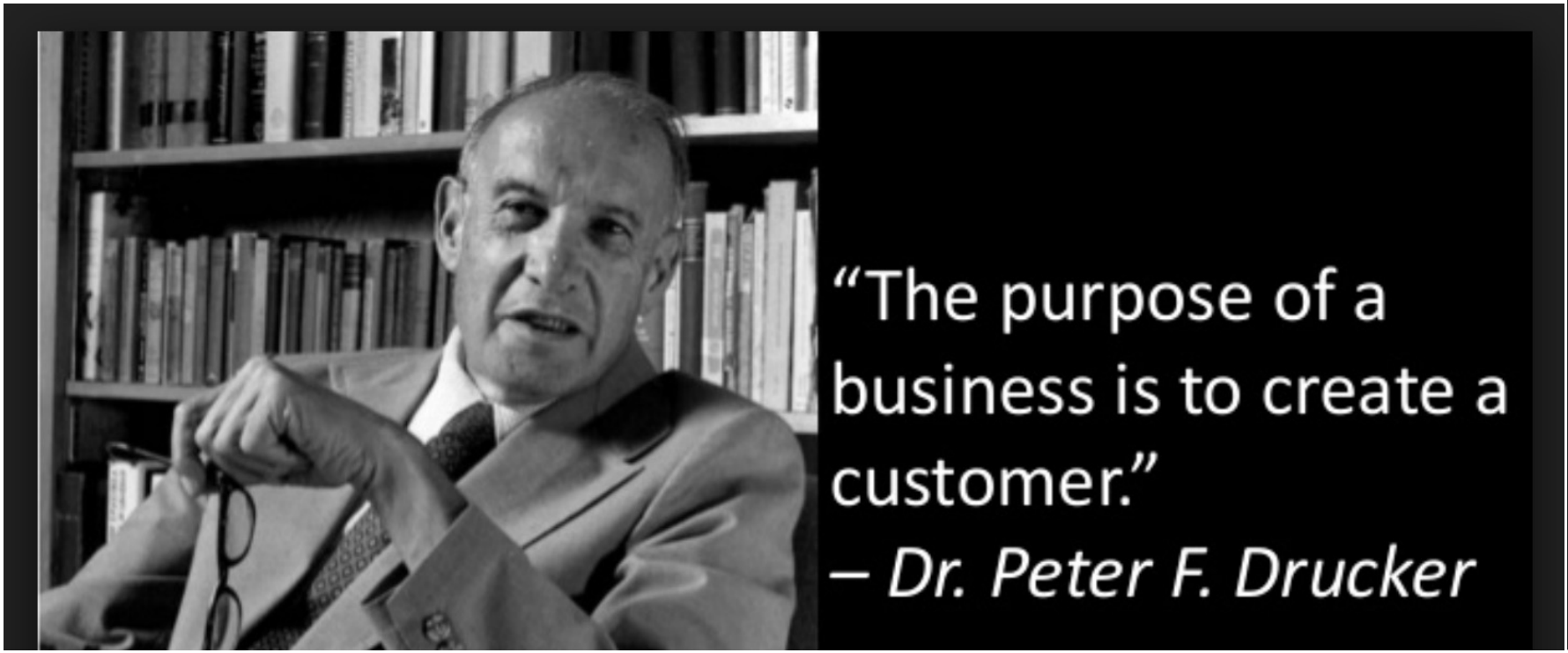
Why? Answers can be found from two very **influential management thinkers**

Peter Drucker

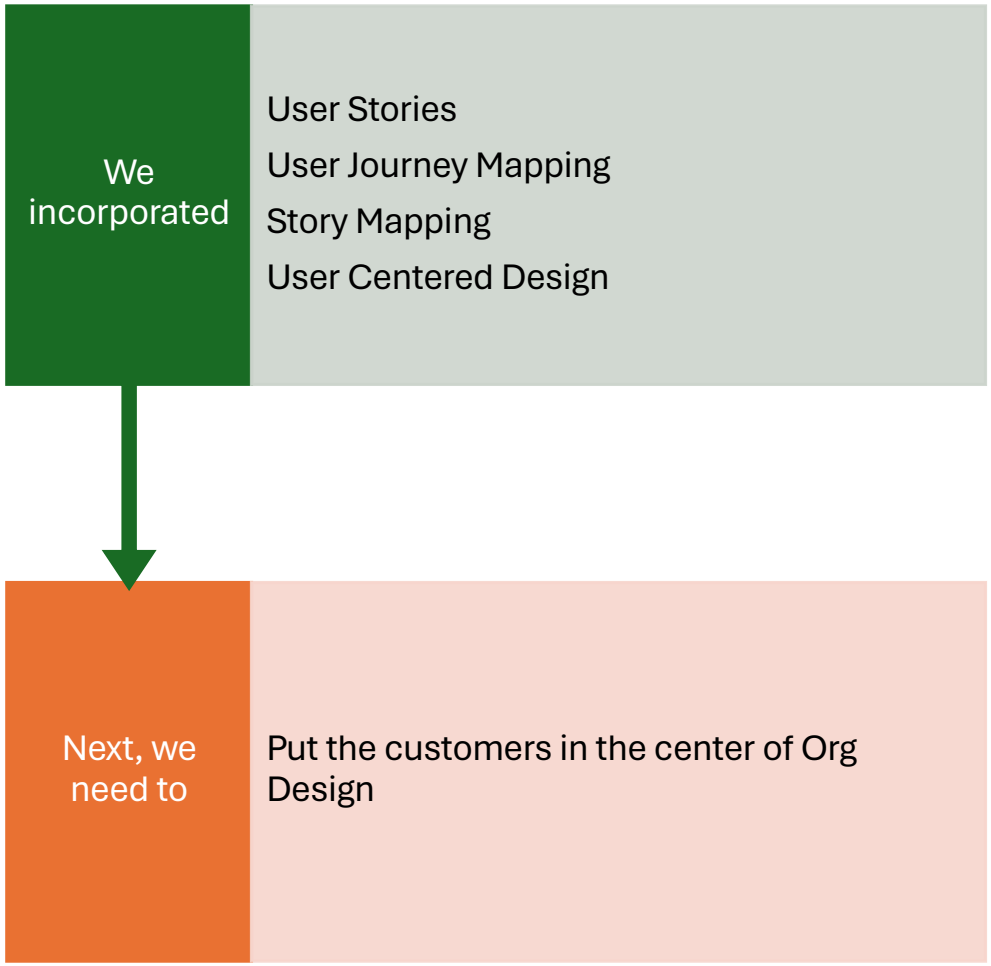
Clayton Christensen

Peter Drucker

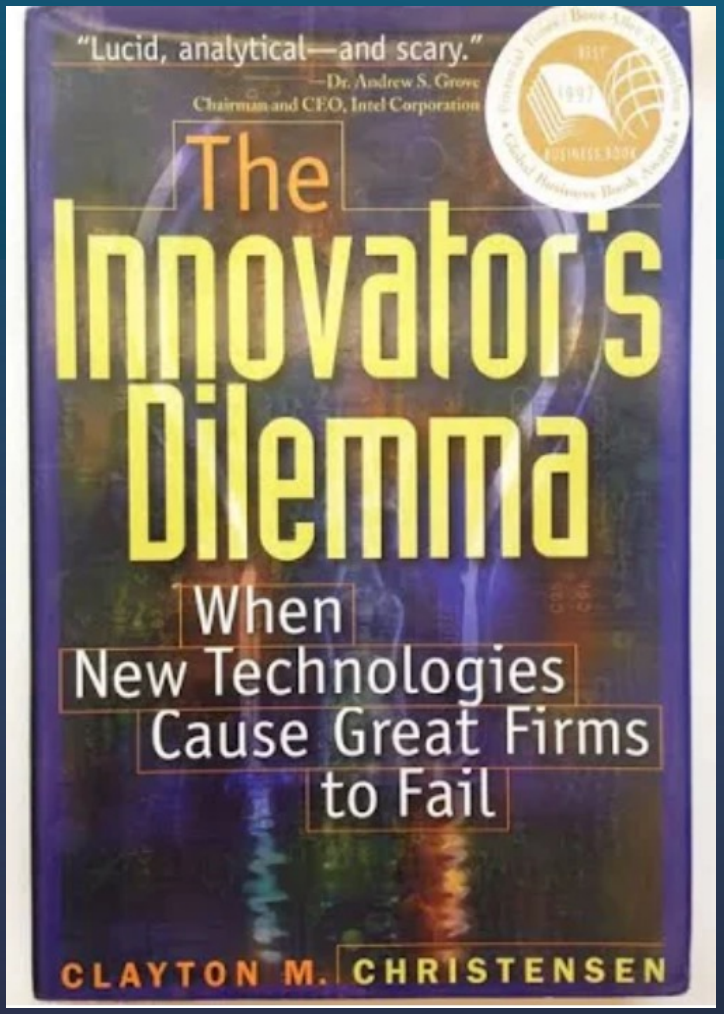


Not a User but a Paying Customer!

We still haven't put the customers - paying customers in the center of organization design.



In his book, he talks about value networks and Not following value networks often leads to best firms failing in the face of disruptive innovation..



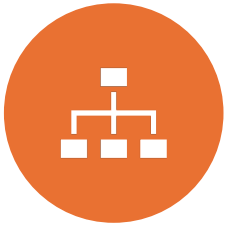
Hard disk drive industry to study why best firms fail in the face of disruptive innovation. Published the book in 1997

Clayton chose Hard Disk Drive after a sage advise from a friend.

"Those who study genetics avoid studying humans. Because new generations come along only every 30 years or so, it takes a long time to understand the cause and effect of any changes. Instead, they study fruit flies, because they are **conceived, born, mature, and die all within a 1 day**. If you want to understand why something happens in business, study the disk drive industry. Those companies are the closest things to fruit flies that the business world will ever see."

Why Established Firms Fail in the Face of Disruptive Innovation?

Clayton says in his book, common explanations from innovators, scholars, consultants are either:



ON MANAGERIAL, ORGANIZATIONAL, AND CULTURAL RESPONSES TO TECHNOLOGICAL CHANGE

THE ABILITY TO DEAL WITH RADICALLY NEW TECHNOLOGY

Clayton - The history of disk drive industry tells us a different story:

"As we saw, the nature of the technology involved (components versus architecture and incremental versus radical), the magnitude of the risk, and the time horizon over which the risks needed to be taken had little relationship to the patterns of leadership and followership observed. Rather, if their **customers needed an innovation**, the leading firms somehow mustered the resources and wherewithal to develop and adopt it. Conversely, if their customers did not want or need an innovation, these firms found it impossible to commercialize even technologically simple innovations."

Christensen, Clayton M.. The Innovator's Dilemma (Management of Innovation and Change) (p. 85). Harvard Business Review Press. Kindle Edition.

Established firms failed not because they didn’t develop the technology first.

In fact, they were the first to develop the prototypes. His finding consistently showed that they failed because: They were caught in between two different value networks.

Value Network

"The concept of the value network—the context within which a firm identifies and responds to customers' needs, solves problems, procures input, reacts to competitors, and strives for profit—is central to this synthesis."

Christensen, Clayton M.. The Innovator's Dilemma (Management of Innovation and Change) (p. 85). Harvard Business Review Press. Kindle Edition.

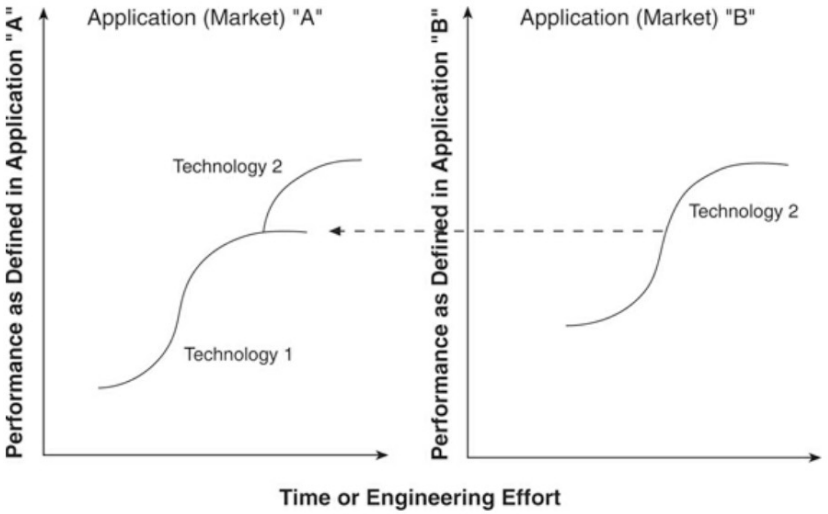
Needs for Desktop Customers vs Laptop Customers

- Desktop customers - More storage and faster speed vs the size of a disk
- Laptop customers - Small size over more storage and faster speed. In fact, they are willing to pay more for a small disk.

They failed because of competing for resources – they often put their current customers needs first rather than the new market's customers needs.

This is the reason that they need to be completely separately from each other.

Figure 2.6 Disruptive Technology S-Curve



Source: Clayton M. Christensen, "Exploring the Limits of the Technology S-Curve. Part I: Component Technologies," *Production and Operations Management* 1, no. 4 (Fall 1992): 361. Reprinted by permission.

Why Established Firms Fail in the Face of Disruptive Innovation?

Held Captive by their current customers

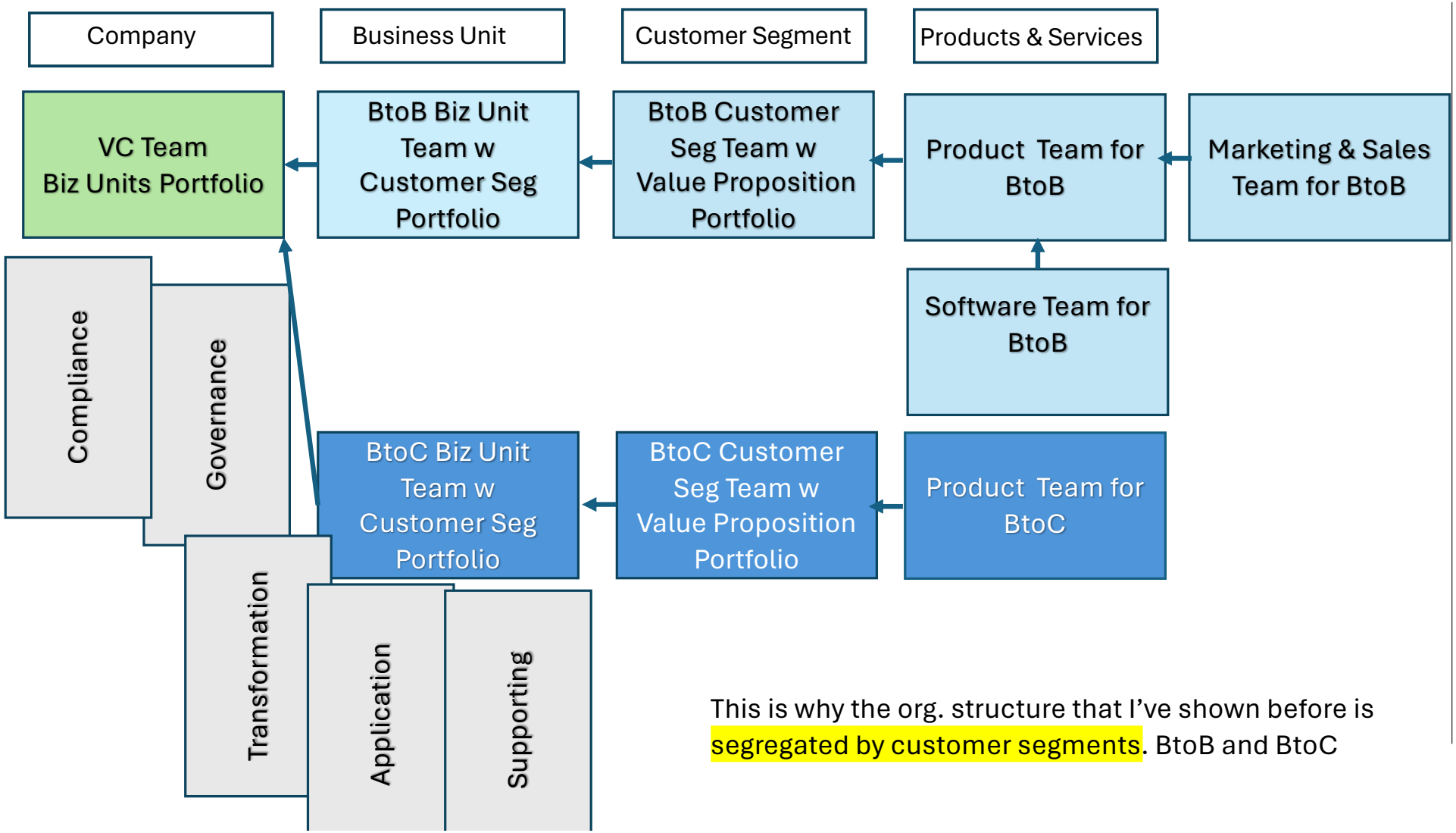
Listening to their CURRENT customers often leads them to enter the disruptive industry late.

Not a rational financial decision for the firms to make investment and put resources into the emerging market

they usually have **lower margins and lower profits**

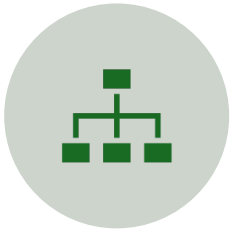
disruptive technologies typically are first commercialized **in emerging or NEW market**

By the time they make the strategic commitment to enter the emerging market, it is too late!



This is why the org. structure that I've shown before is segregated by customer segments. BtoB and BtoC

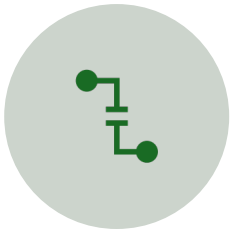
Robotic/Subsumption Architecture - Learning from past behavior



How to divide into subgroups so that the higher layers subsume the lower layer **Autonomy on its own layer; Hierarchy of Layers**

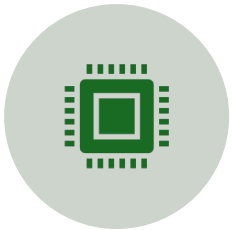
Learning from past behaviors – Enterprise Scrum is based on Scrum; Transparency, Inspect & Adapt.

Transparency – Scrum Board and Canvases



Sensors & Actuator

ES – Canvases - Value Network, Surfers



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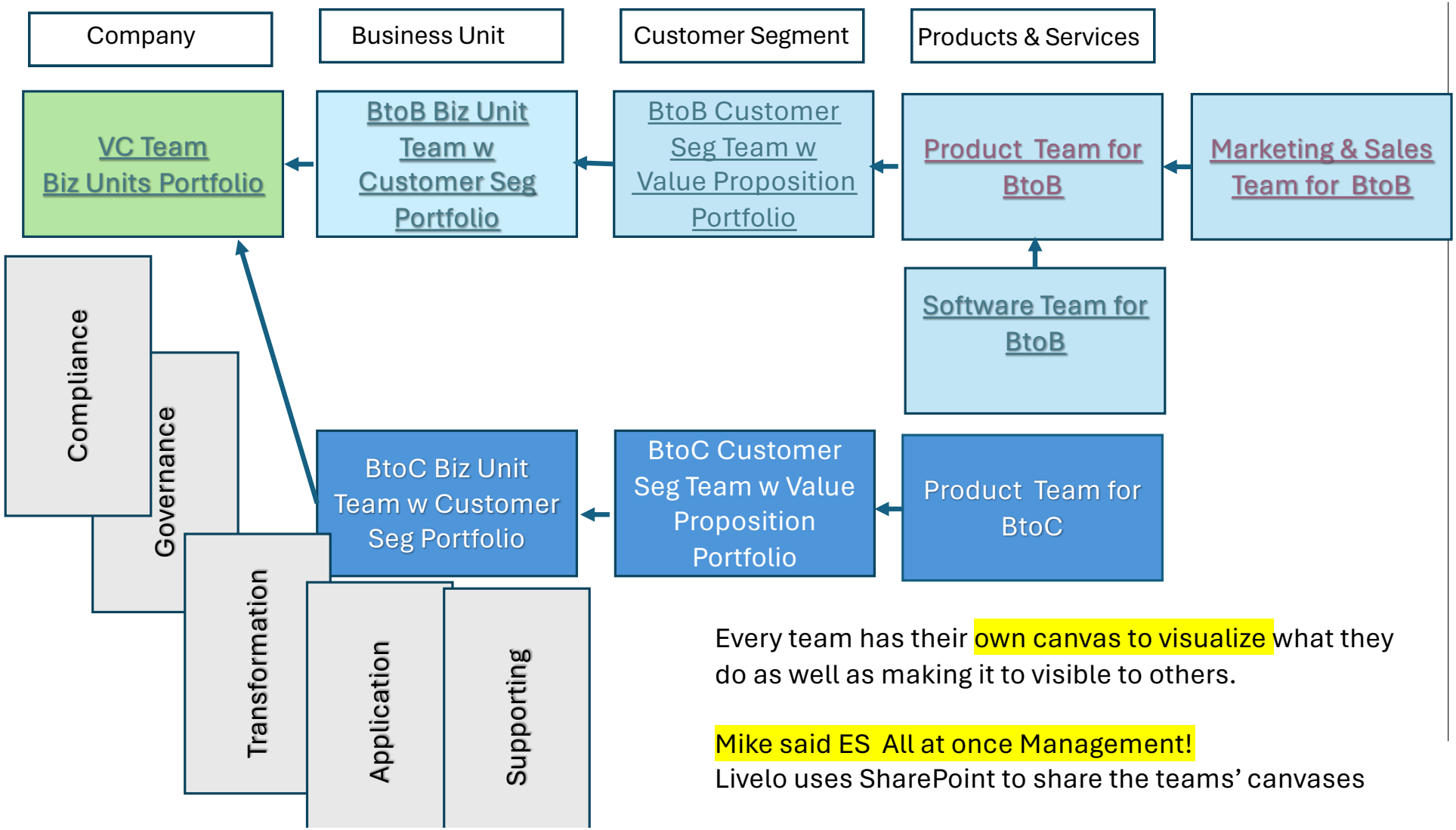
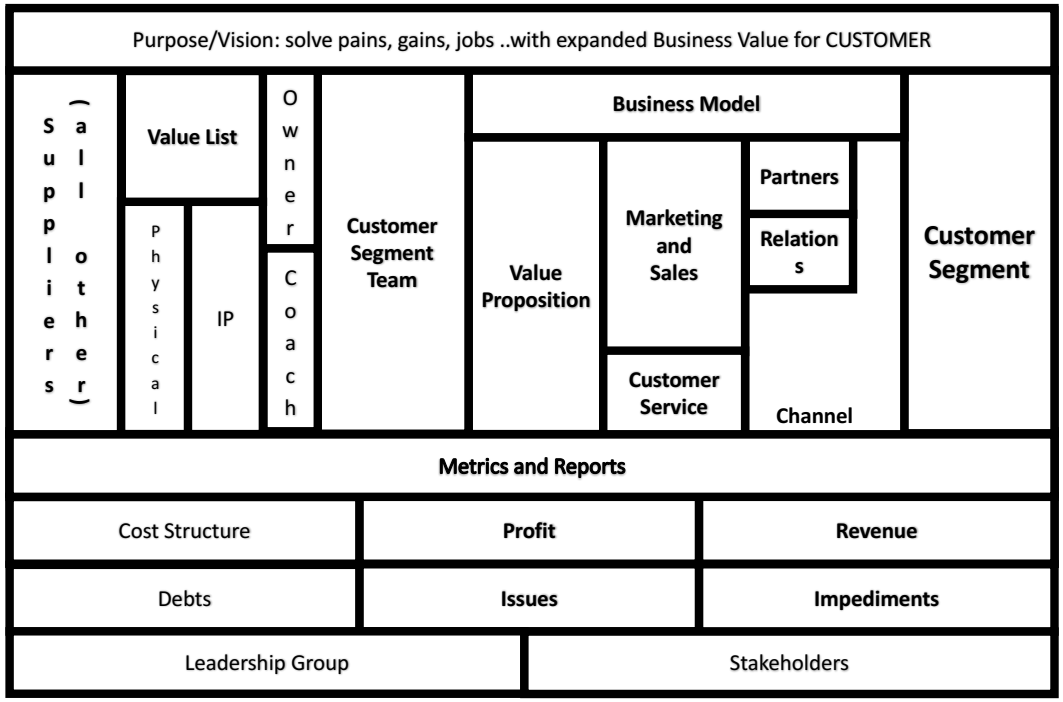


Every team has their own canvas to visualize what they do as well as making it to visible to others.

Mike said ES All at once Management!
Livelo uses SharePoint to share the teams' canvases

Products & Services Business Model Canvas

ES – Business Model Canvas



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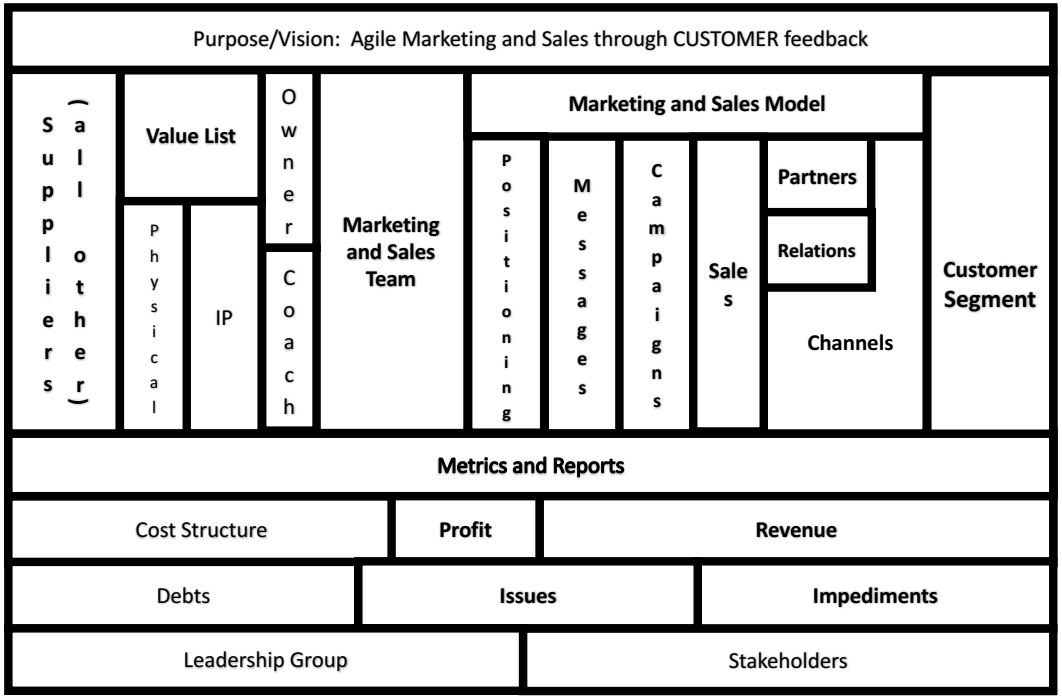
Marketing and Sales

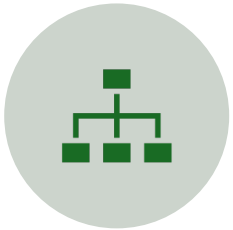
ES – Marketing and Sales



February 10, 2018

Back

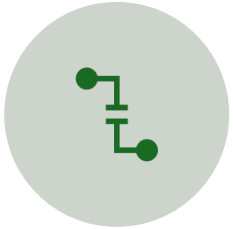
Robotic/Subsumption Architecture in ES – Sensors & Actuators – Surfers & Andon



How to divide into subgroups so that the higher layers subsume the lower layer **Autonomy on its own layer; Hierarchy of Layers**

ES – By Customer Segment

Learning from past behaviors – ES is based on Scrum; Transparency through Canvases, Inspect & Adapt –. Just Scrum Board but canvases on every level



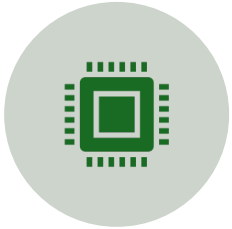
Controlled by Sensors & Actuators

In ES - Canvases, Surfers

All at once Mgmt.

Surfers & Andon - Examples from Cihangir;

More work is needed this area



No Central Processor

Not one person on the top making all the decisions

Teams work together making the appropriate decisions and actions on their level while listening and responding to the conditions all at once.

All at once mgmt. through the subsumption architecture

Created By Sue Ryu & Changer Ozdemir

August, 2023

Benefits

- Autonomy, Autonomy, Autonomy – Foundation of Agile
- All at Once Management via Canvases & Surfers
- Decentralized Decision Making
- Faster Time to Market
- Synergy & Alignment throughout the whole organization
- Happy teams, customers, stakeholders
- Survival & Profits!

Let’s see
How Livelo Implemented it!

Timeline Livelo

"3rd most profitable & 13th company which most grew, between the 1000 biggest in companies in Brazil" - 2018

Livelo Brasil
79.745 seguidores
2 h

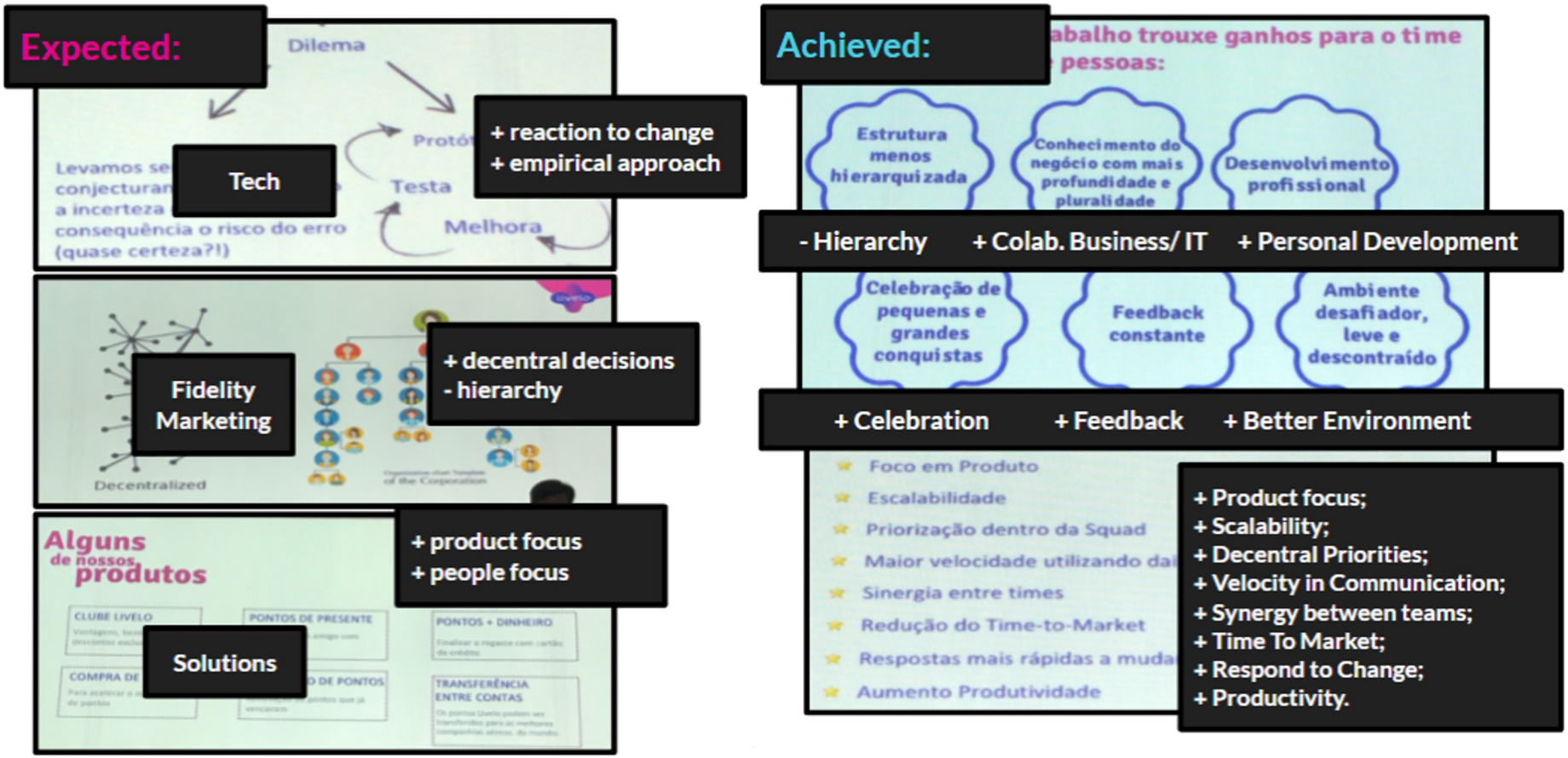
Todos os dias, escrevemos um pedacinho novo da nossa história. E hoje, temos ainda mais motivos para celebrar!
Já está nas bancas a edição especial da revista EXAME, que traz o ranking das 1.000 maiores empresas do Brasil, o Melhores & Maiores. A análise de dados definiu a Livelo como a 3ª empresa mais rentável em 2018, a 13ª que mais cresceu e a 442ª maior do Brasil! Subimos 173 posições em relação ao ano anterior.

..."one of the biggest Loyalty/ Reward Programs in Brazil" - 2023

Felipe Pontieri (CIO Livelo) 10.08.2018 @Devcamp - link

"Business Agility - The concept that has impacted Livelo's business." - link - Presented @Devcamp 10.08.2018 - by Felipe Pontieri (CIO Livelo)

Challenges / Expectations vs. Gains



"Business Agility - The concept that has impacted Livelo's business." - link - Presented @Devcamp 10.08.2018 - by Felipe Pontieri (CIO Livelo)

Subsumption Architecture @Livelo

Subsumption Architecture for a different type of management

Mike Beedle
Think of subsumption of "collaboration with a different knowledge layer".

Enterprise Scrum is a subsumption based framework // V3.3 18.05.17

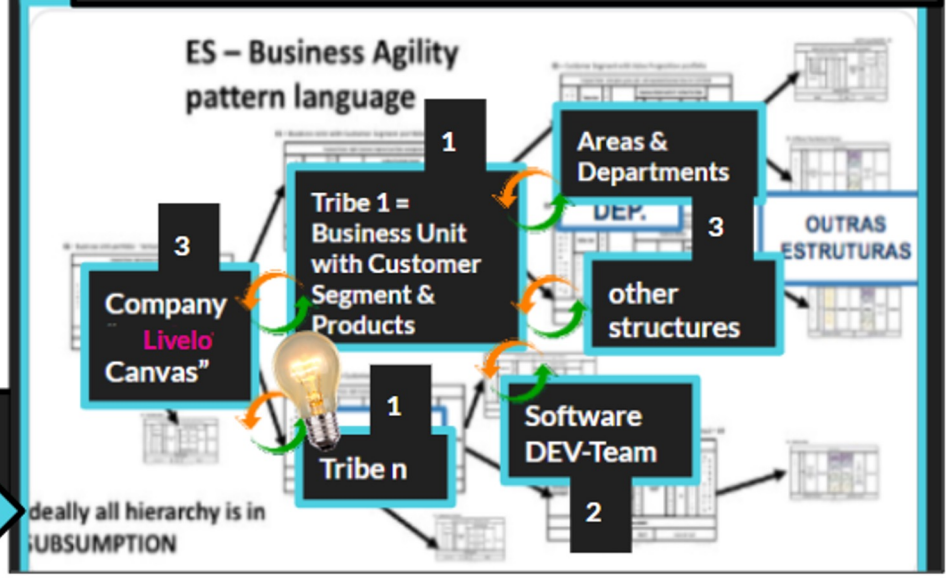
In Enterprise Scrum, we generalize the 2-level subsumption architecture behavior of Scrum into an n-level, n-things in subsumption generalized subsumption behavior for any domain. Subsumption means "checking with the reality of that domain" and adapting as needed by changing behavior.

subsumption 7 de 30

N different knowledge layers collaborating for more experience.

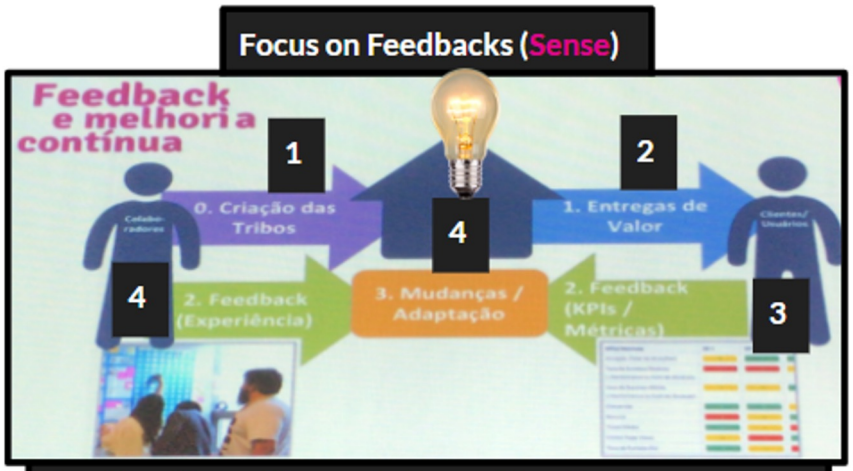
Subsumption Architecture @Livelo (Slack):

1. Tribe = Business Unit with 1 Customer Segment (eg. B2C, B2B, ...) and with N Products/ Services
2. Software Team - build and Run Products/ Services
3. Other Structures - departments in subsumption with the Business Unit - dependencies!



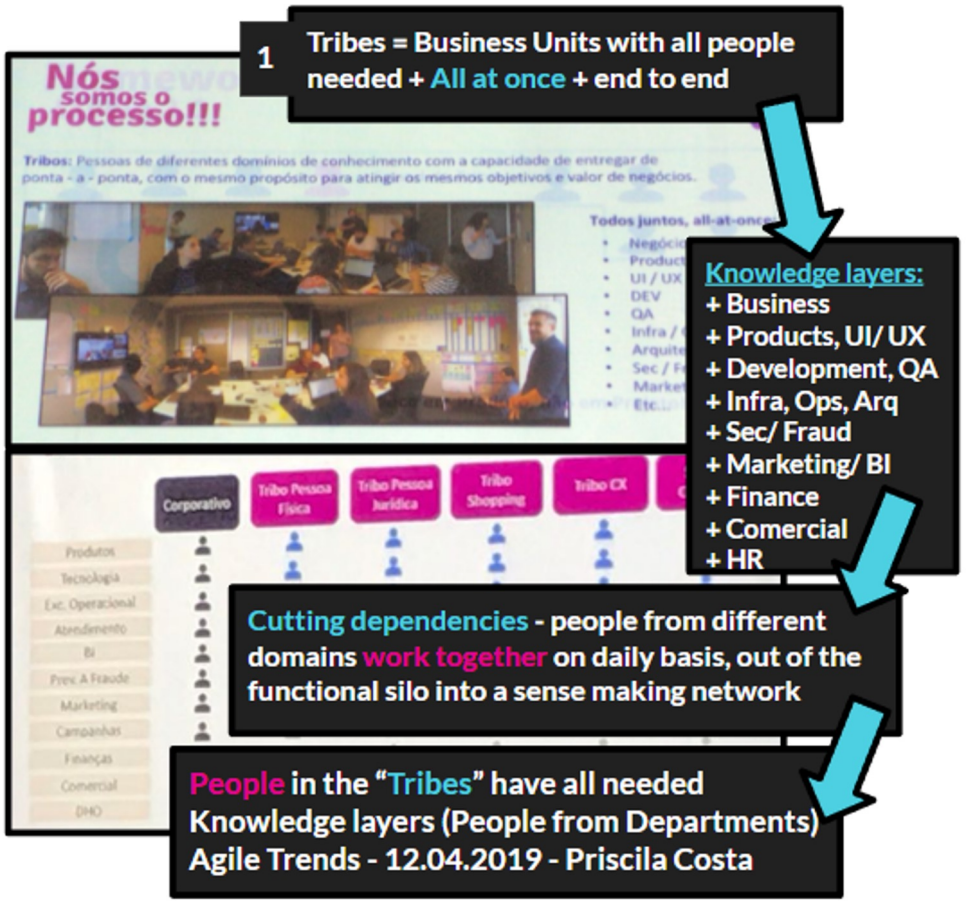
Enterprise Scrum Definition Business Agility for the 21st Century - Authored, Developed and Sustained - By Mike Beedle - January 8, 2018 Release 4.0 -

Knowledge Share between **Hierarchy Layers**



Application of Open Information System ~ evolution in cycles:

1. Creation of Tribes = Business Units (with all needed knowledge layers)
2. Delivery of Value to Customer Segments
3. Customer & Collaborators Feedback (direct/ indirect)
4. Adaptation of all needed for next cycle (include/ exclude knowledge layers)



"Business Agility - The concept that has impacted Livelo's business." - link - Presented @Devcamp 10.08.2018 - by Felipe Pontieri (CIO Livelo)

Challenges with Implementing Subsumption Architecture

Challenges with Implementing Subsumption Architecture

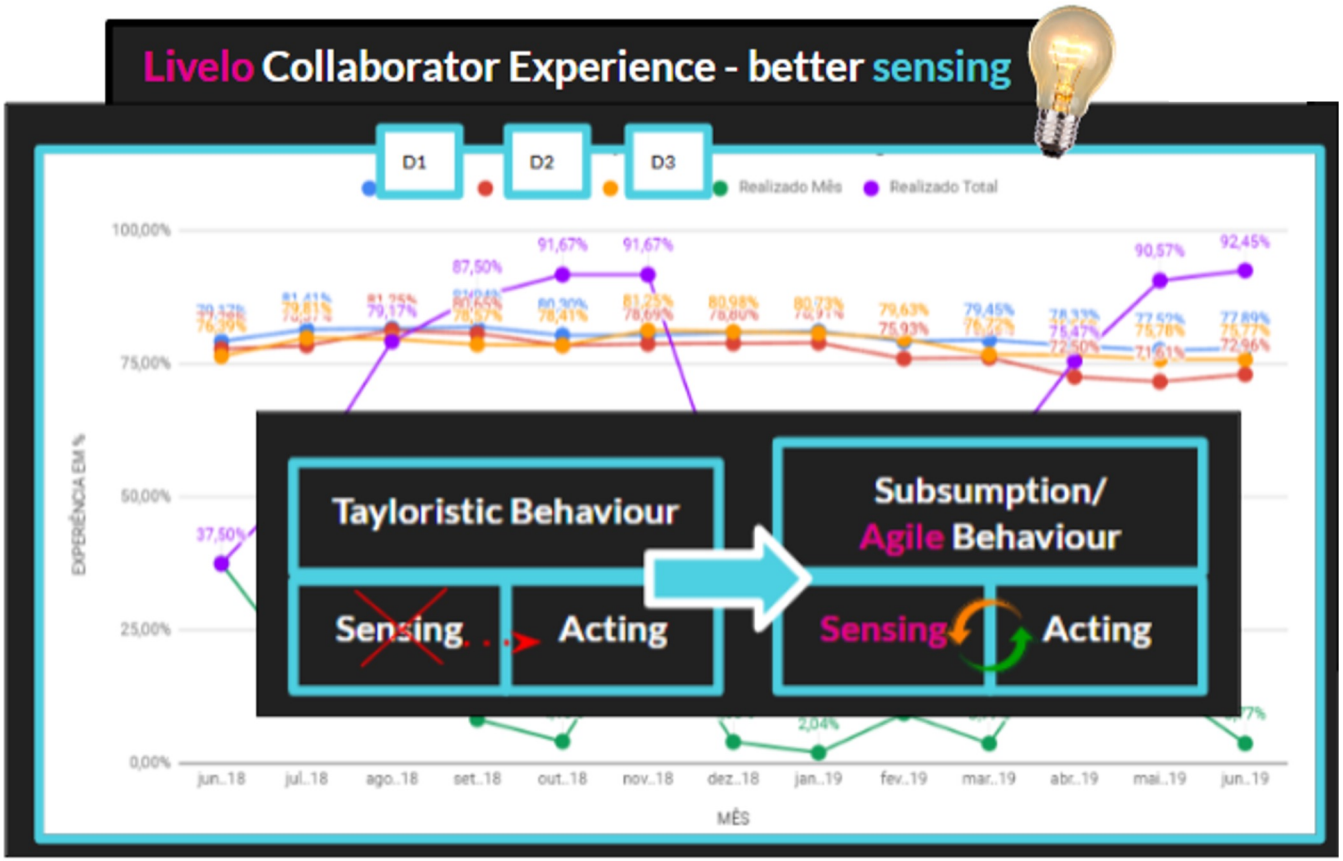
Paradigm Shift

Knowing when to apply - at what stage of a Product Life Cycle

what to use to subsume – Value Network – Customer Segment

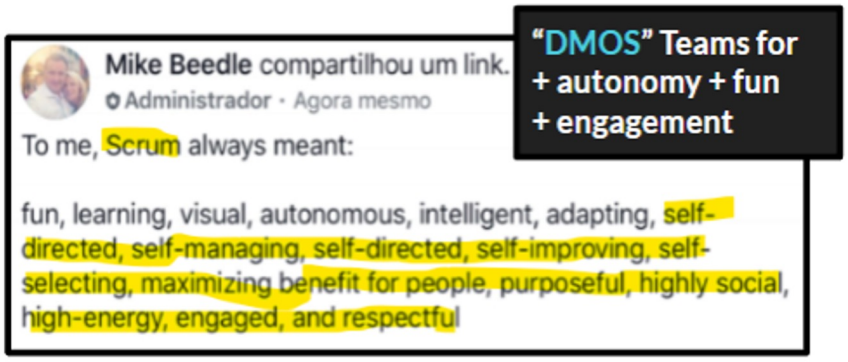
Perhaps use other criteria to group/subsume

Challenge - **Collaborator´s Andon**



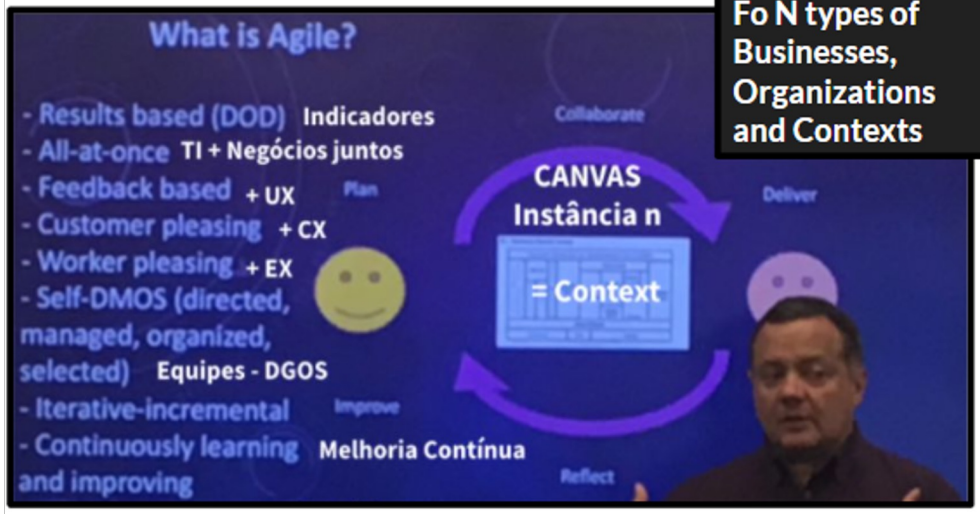
Cihangir Deniz Ozdemir - Agilist of the past - Agile Praxis - Meetup - 19.06.2019 - by Pierre Neis - link

Critical Point - **DMOS & Resonant Agility**



"DMOS" Teams for + autonomy + fun + engagement

Resonant Agility

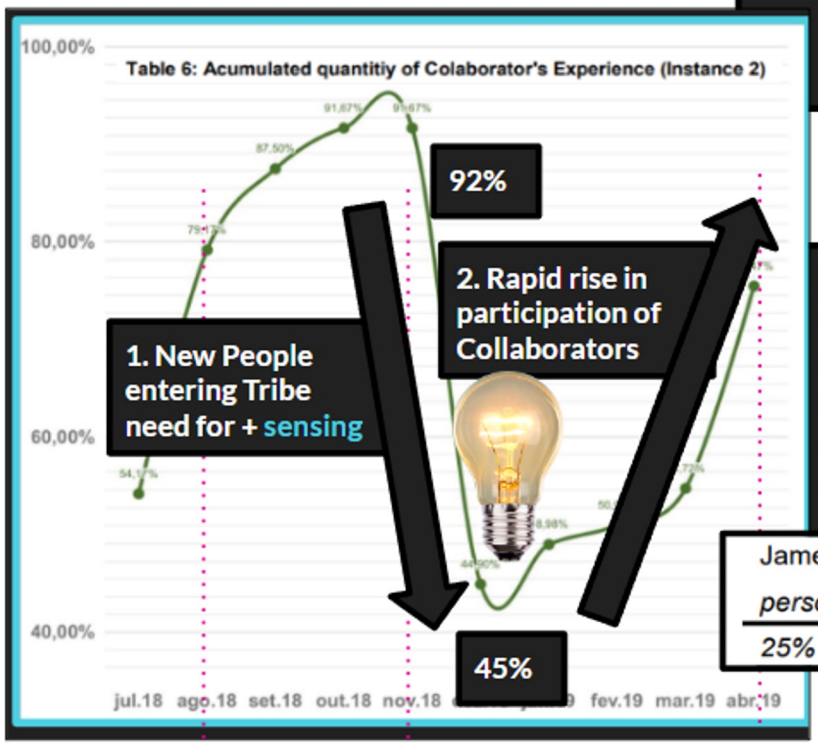


Fo N types of Businesses, Organizations and Contexts

https://agile-lounge.com/services-agile-training-agile-lounge/what-is-agile/
https://twitter.com/mikebeedle/status/942169227057926144?s=20

Advantages & Benefits

Benefits - Following the Subsumption



% of Collaborators Experience measured
Example Tribe = Business Unit

Scrum Values

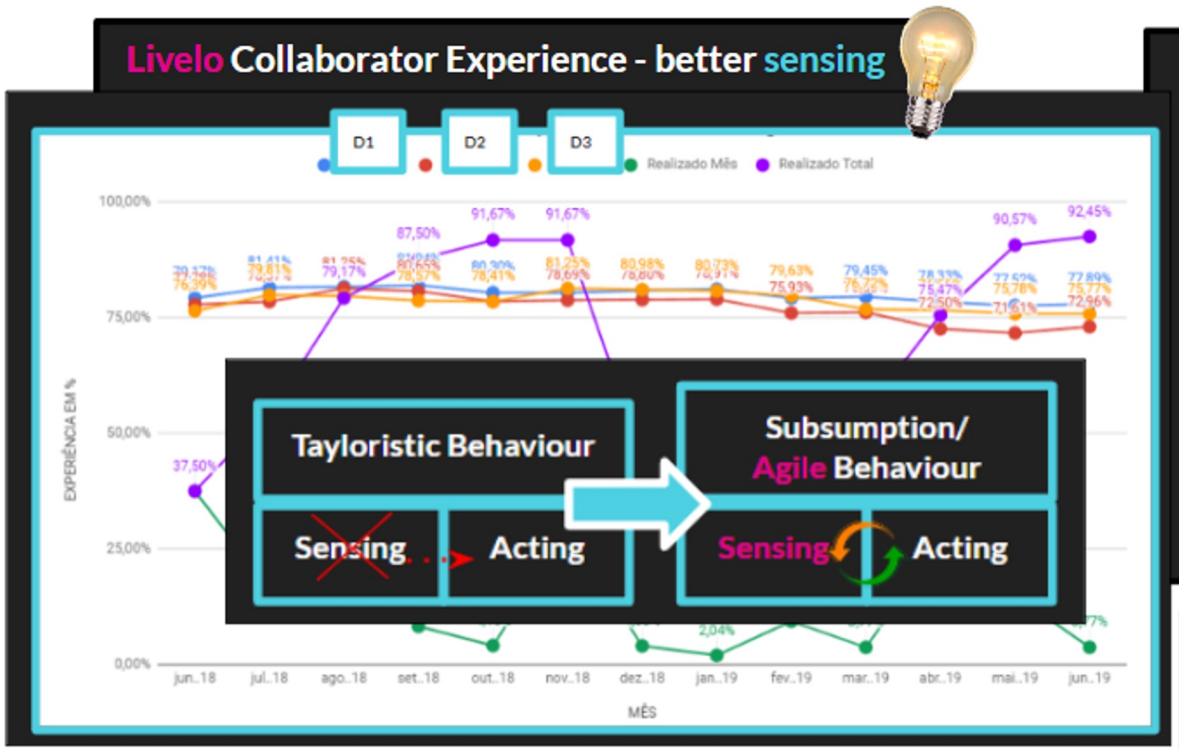
Benefits:

- More alignment - Vision, Plans, less parallel work (openness)
- More participation in Tribes (courage and focus)
- Less anonymous posts in Retrospectives (courage)
- More active collaboration between more people (respect)
- Less cumulative responsibilities/ roles (commitment)

James Coplien[35], in "A Scrum Book - rule of thumbs" , says that "*each new person detracts from the effectiveness of everyone else on the team by about 25% for about 6 months*". We need further studies to understand how the

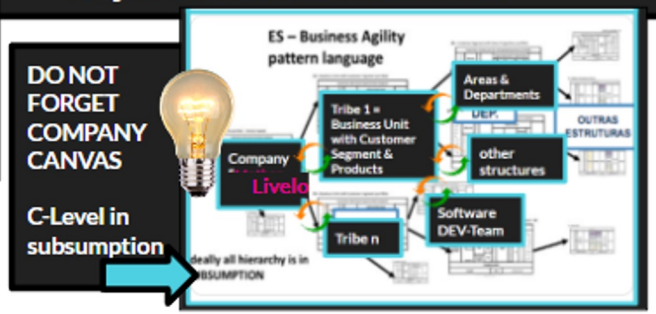
Changer Deniz Ozdemir + Marina Ozdemir - Agile Management The quest for a people-centric approach - São Paulo, Brazil 2019 - link

Collaborator´s Andon



Reorganization (acting) based on Collaborators Experience:

- New communication tools for distributed teams - Telepresence
- Adjustment in existing Structures
- (Re-) construction of Facilities (less noise, more places, better ...)
- Better Integration of collaborators (Buddies, etc...)
- Trainings (Business, IT, Processes and Framework)
- Adjustments in Framework



Changer Deniz Ozdemir - Agilist of the past - Agile Praxis - Meetup - 19.06.2019 - by Pierre Neis - link

So much more in Enterprise Scrum

Structural patterns that would guide you with scaling

Business Agility

Terminology for not just software teams for an entire organization

Not just for software industry

Canvases

Pluggable & Configurable

Visit

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How might this work for your organization?

&

Questions?

Want to find out how to start?

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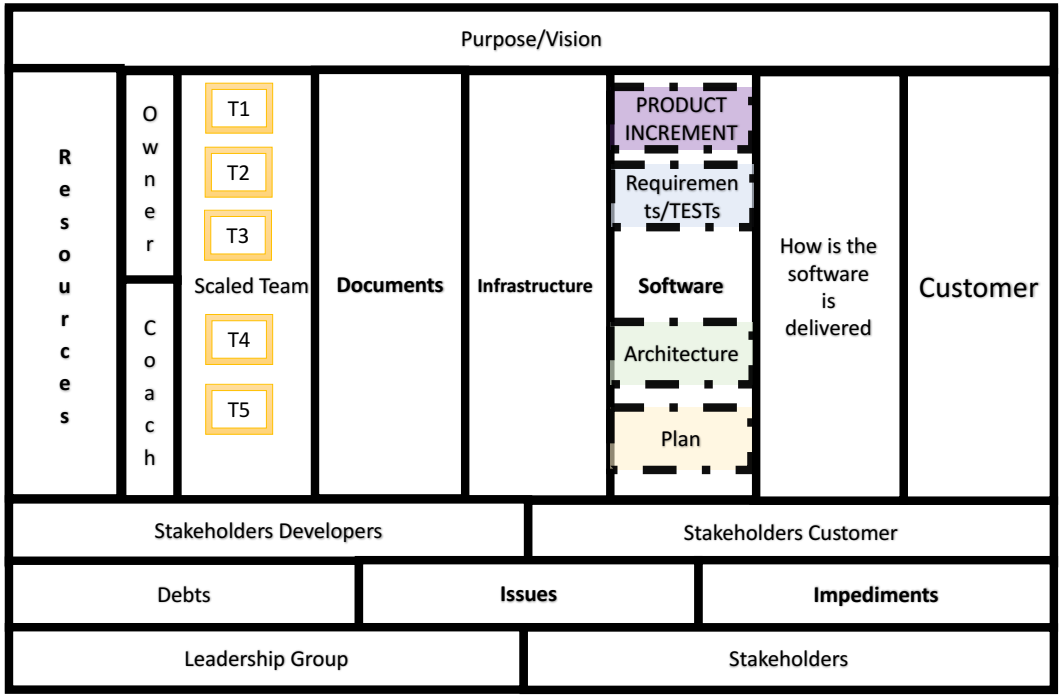
Software Team

ES – SCALED Software Development Canvas

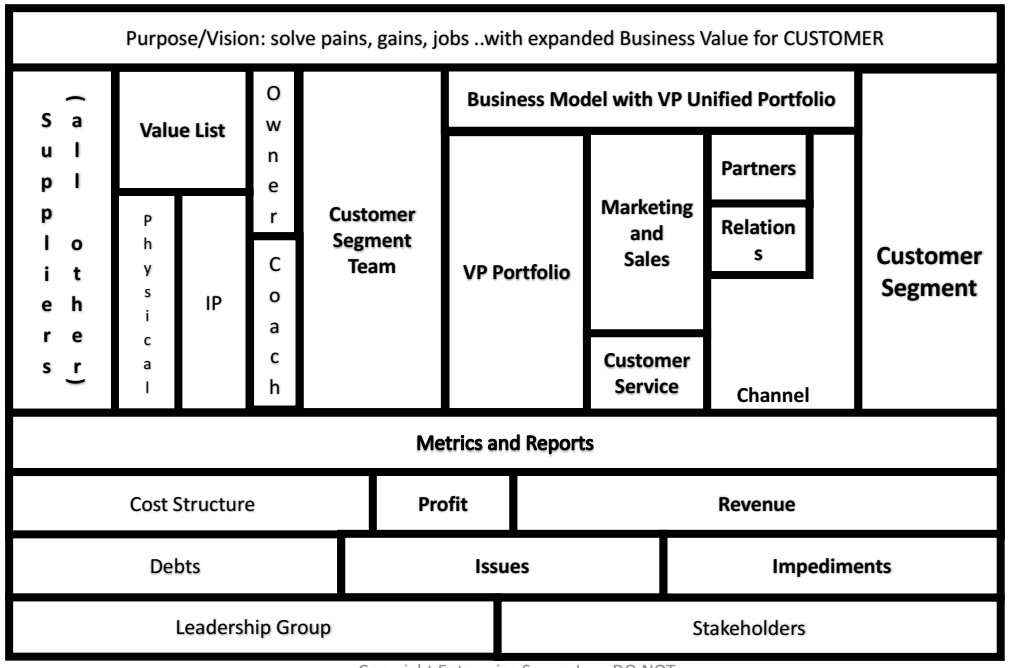


February 10, 2018

Back

Customer Segment with Value Proposition Portfolio

ES – Customer Segment with Value Proposition portfolio

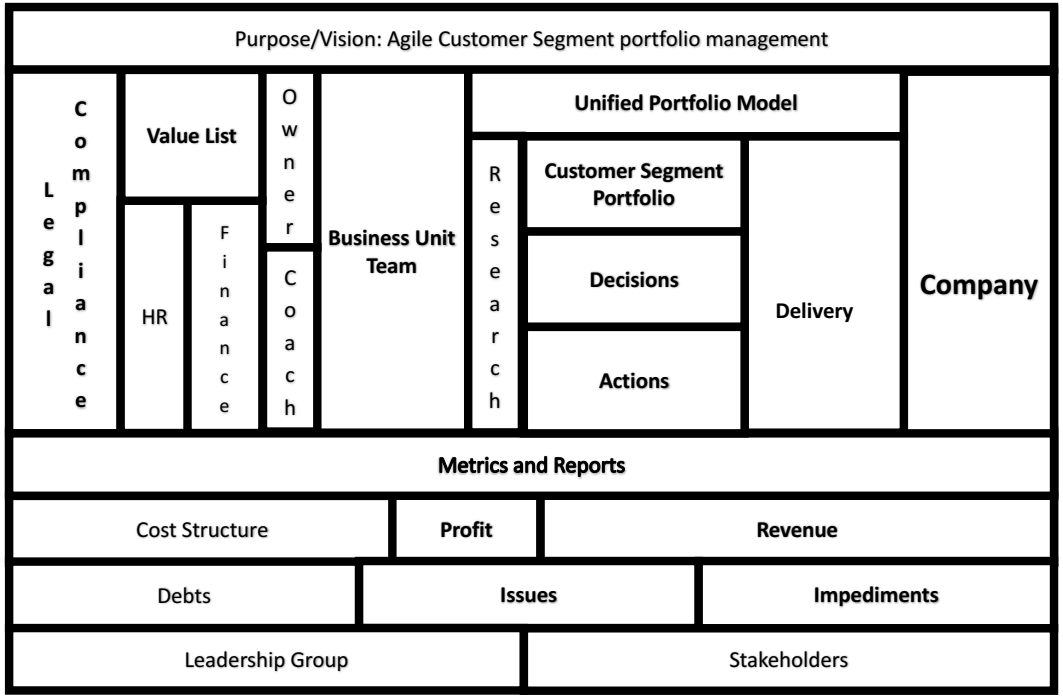


February 10, 2018

Back

Business Unit with Customer Segment Portfolio

ES – Business Unit with Customer Segment portfolio

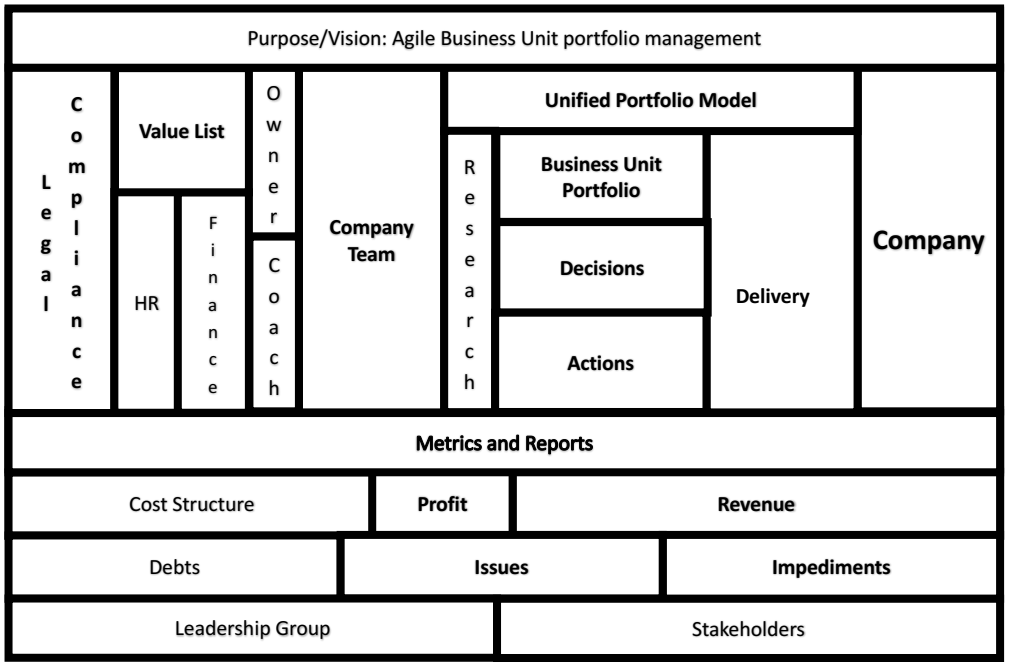


February 10, 2018

Back

VC with Business Unit Portfolio

ES – Business Unit portfolio – Venture Capital



February 10, 2018

Back

Figure 2.2 Examples of Three Value Networks