31. Lean (Canvas) Modeling

Prof. Dr. Uwe Aßmann
Technische Universität Dresden
Software Engineering Group
http://st.inf.tu-dresden.de

Version 18-0.4, 07.12.18

1) Canvases as collaborative tools
2) Lean modeling with canvases
3) Nested canvases
4) Grading and metrics on canvases
5) The canvas cactus as megamodel

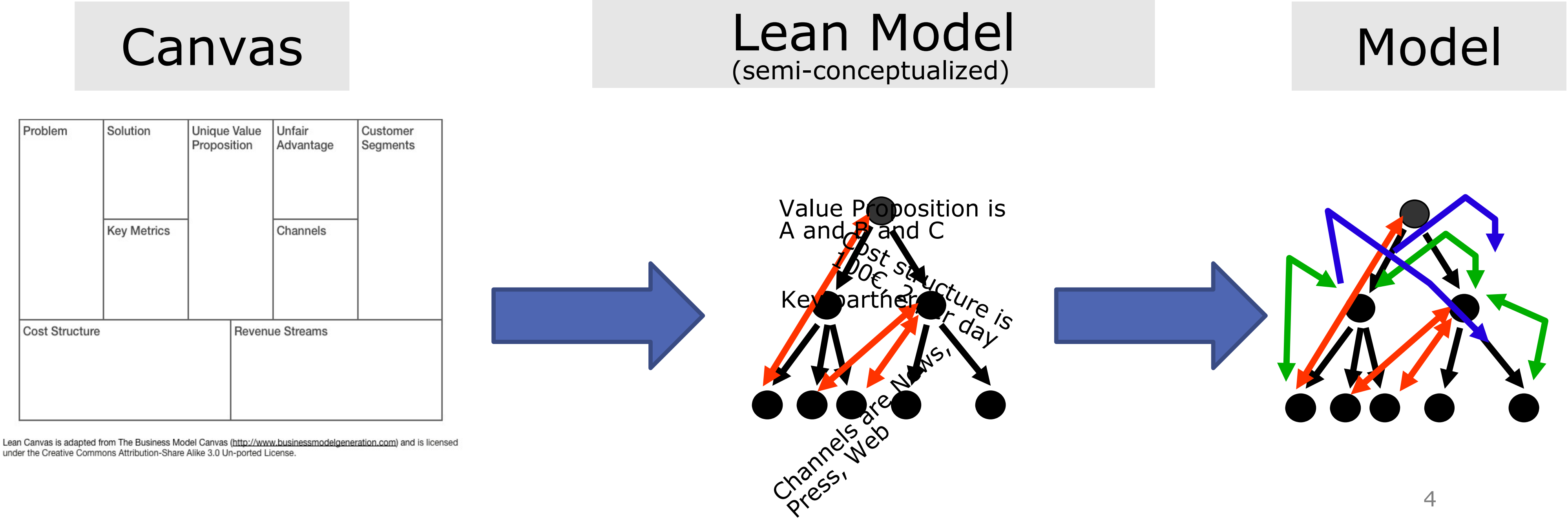
Literature

[CM03] Sitt Sen Chok, Kim Marriott. Automatic Generation of Intelligent Diagram Editors. ACM Transactions on Computer-Human Interaction, Vol. 10, No. 3, September 2003, Pages 244–276.

31.1 Canvases as Light-Weight Cooperation Tools

Canvases as Lean Models

- A **canvas** is a collaborative frontend for a model, in which sticky notes demarcate the formal content from the informal text.
- A **lean model** is a *semi-conceptualized model*, an active document with informal and conceptualized content.
  - XML is a similar idea: semi-structured content
  - Lean models transfer this idea to model-driven development
- **Lean modeling is an agile conceptualization process:**
  - Canvas -> Lean Model -> fully conceptualized Model



Problem

Solution

Key Metrics

Unique Value Proposition

Unfair Advantage

Channels

Customer Segments

Cost Structure

Revenue Streams

31.2. Lean Modeling with Canvases

Schemas for Flat Canvases as Grammars

- A **(flat) canvas** is a structured questionnaire for collaborative development
- It can be represented as a **tree-shaped model**
  - Canvas structure:
    - Canvas left side vs. right side
    - Left part, right part, upper, lower part
    - Canvas fields with sticky text notes, Canvas questions or answers
  - Inter-field references with inter-field constraints
  - Intra-field constraints
  - Canvas fill order (partial order) on the tree nodes
  - NO Subcanvases; Subcanvases are other trees that may be referenced

Schemas for Flat Canvases as Grammars

- The canvas' schema can be *described by a grammar in a Part Grammar (Constraint Multiset Grammar, CMG)* describing Whole-and-Part relationships
  - **Example invariants**: forall stickynotes in CustomerRelations there is a stickynote in Channels; there **must** be a revenue
  - Why is the partial fill order a set of inter-field constraints?
  - Alternative: EBNF and OCL

```
// Example Grammar for BMC
Grammar Fields = Rules {
   Note ::= Question | Answer
   Root Field ::= StickyNote:Note  *
}
Grammar BusinessModelCanvas =  import Fields
Rules {
   Root BMC ::= { LeftPart ValueProposition:Field RightPart }
   LeftPart ::=  { KeyPartners:Field KeyActivities:Field KeyResources:Field Costs:Field }
   RightPart ::= { CustomerRelations:Field Channels:Field CustomerSegments:Field Revenues:Field }
   Invariant { forall s:CustomerRelations.StickyNote*  exists y:StickyNote, y in Channels.StickyNote*
   Invariant MUST exists r:StickyNote in Revenues.StickyNote*  }
}
```

VPC as Grammar with Constraints

```
Grammar ValuePropositionCanvas =  import Fields
Rules {
   Root VPC    ::= { LeftPart RightPart }
   LeftPart    ::= { GainCreator:Field PainKiller:Field ProductsAndServices:Field }
   RightPart   ::= { Gain:Field Pain:Field CustomerSituation:Field }
   Invariant forall s:Gain.StickyNote*  exists y:StickyNote, y in GainCreator.StickyNote*
   Invariant forall s:Pain.StickyNote*  exists y:StickyNote, y in PainKiller.StickyNote*
   Invariant forall s:PainKiller.StickyNote*  exists y:StickyNote, y in ProductsAndServices.StickyNote*
   Invariant forall s:GainCreator.StickyNote*  exists y:StickyNote, y in ProductsAndServices.StickyNote*
}
```

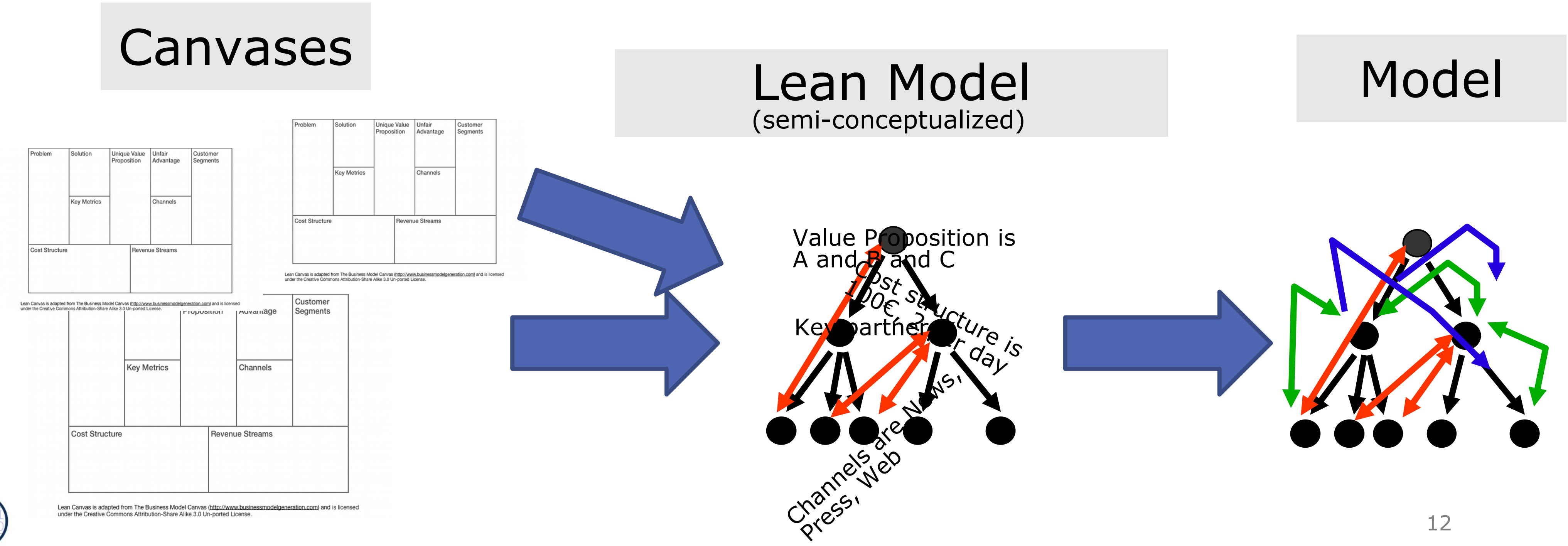
- Invariants:
  - Forall gains there must be a gain creator
  - Forall pains there must be a pain killer
  - Forall pain killers there should be a service or product
  - Forall gain creators there should be a service or product

Validating a Flat Canvas

- A flat canvas is called **well-formed**, if
  - All fields are being computed (filled)
  - All fields fulfill all constraints.
- Validation:
  - Parse the canvas with its sticky notes
  - Evaluate constraints in OCL
  - or with an Attributed Grammar
  - or with an Multiset Constraint Grammar

Parallelly Edited Lean Models can be Merged

- A **lean model** can be merged with another lean model
- A **canvas twin** is a parallelly edited canvas, which can be merged into a lean model by unifying the fields
- **Conceptualization Process:**
  - CanvasTwin * -> Lean Model -> fully conceptualized Model
  - Assembling all constraints
  - Validating all constraints



Canvases

Lean Model
(semi-conceptualized)

Model

Problem
Solution
Unique Value Proposition
Unfair Advantage
Customer Segments
Key Metrics
Channels
Cost Structure
Revenue Streams
Lean Canvas is adapted from The Business Model Canvas (http://www.businessmodelgeneration.com) and is licensed under the Creative Commons Attribution-Share Alike 3.0 Un-ported License.
Value Proposition is A and B and C
Cost structure is 100€ / 2 per day
Key partner
Channels are News, Press, Web

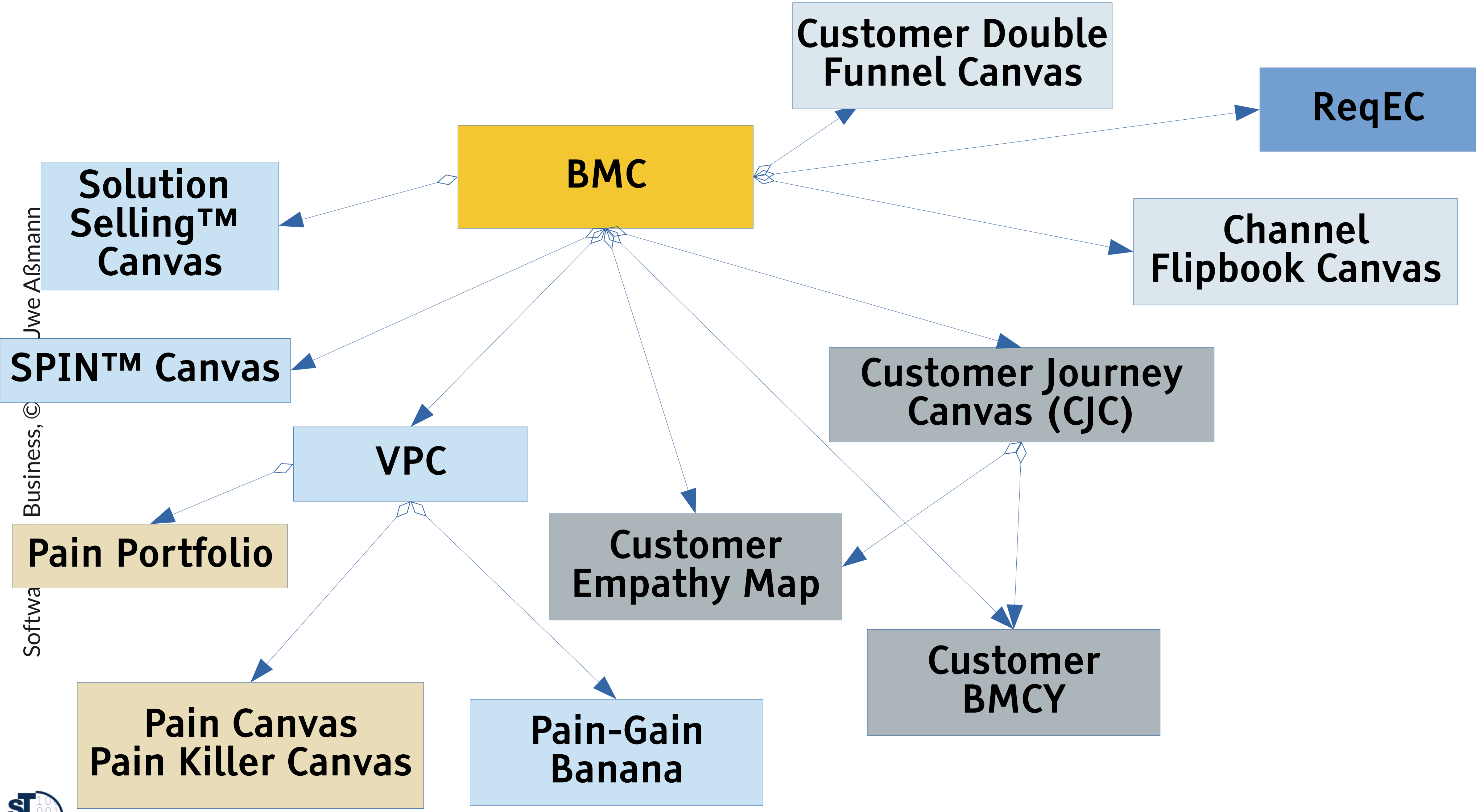
31.3 Nested Canvases

A Nested Canvas

- A ***nested canvas (deep canvas)*** is a link tree with level graphs
  - Every canvas forms a sequence, graph or array of fields
  - Sticky notes attach text to the fields
  - Constraints constrain the content of the canvas fields
- **Subcanvases** form children
  - Grammars of nested canvases are united (grammar composition)
- The **fill order** of the canvas defines a phase structure on the link tree
  - Metrics on advancement (hierarchical wavefront progress)

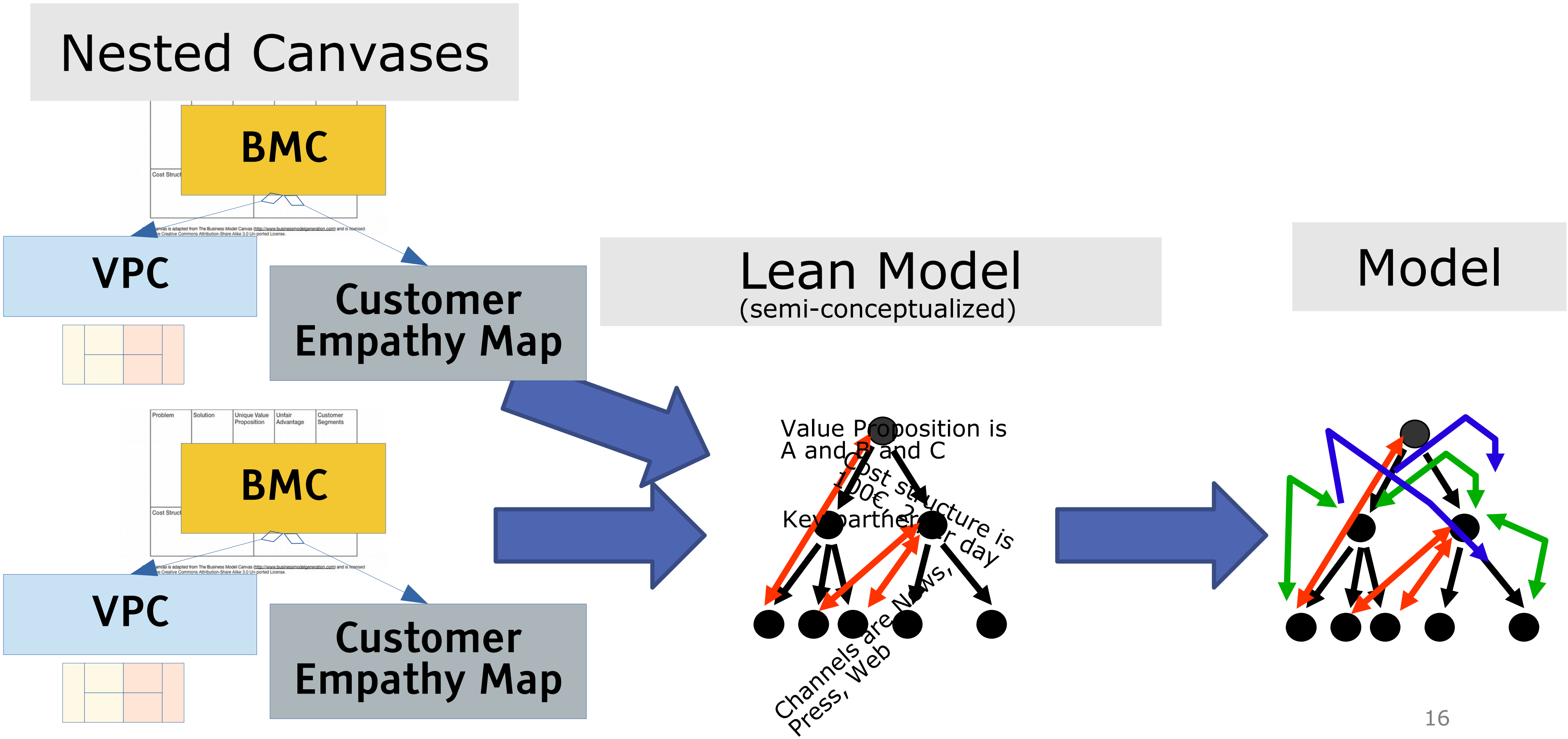
The Nested BMC (Deep BMC)

- Many subcanvases



Parallelly Edited Lean Models can be Merged to Get a More Mature Model

- A **nested canvas twin** is a parallelly edited nested canvas, which can be merged into a lean model by unifying the fields
- **Conceptualization Process:**
  - NestedCanvasTwin * -> Lean Model -> fully conceptualized Model



Nested Canvases

BMC

Cost Struct

VPC

Customer Empathy Map

Problem | Solution | Unique Value Proposition | Unfair Advantage | Customer Segments

BMC

Cost Struct

VPC

Customer Empathy Map

Lean Model
(semi-conceptualized)

Value Proposition is A and B and C

Cost structure is 100€, 2 per day

Key partner

Channels are News, Press, Web

Model

31.4 Grading and Metrics on Canvases

Assessment in Canvases and Nodetypes in Canvas Trees

- **StickyNote dimension:** every node can have a sticky note (Answer to a canvas question)
- **Commenting** is done by spanning up a ***comment dimension*** in a canvas tree
  - Every node can get a comment
- **Corresponding dimension:** Every node (e.g., sticky note or comment) can invoke a corresponding node in another field that has to be filled
  - When a sticky note invokes another sticky note
  - INVARIANT Exists s:StickyNote: corresponding(self, s)
- **Grading** is done by spanning up a *grading dimension* in a canvas tree
  - Every node can get a grade (green-yellow-red, 1-5, 1-10, 1-15)
  - The grading dimension defines grading functions for sticky notes in the fields
- **SWOT dimension:** every node can get a SWOT grading node: "how strong/weak/opportunity-like/trend-like is node?"
  - BMC-SWOT grading matrix canvas uses the SWOT grading dimension
  - LeanCanvas-SWOT uses SWOT grading dimension for LeanCanvas
- **Grading on nested canvases:** Grading is like commenting, but attributing a grade to a node. It defines the grading functions for all tree nodes of the nested canvas.

Examples of Attributes (Variables) of a Canvas Field (Node)

- Node.Questions: List(Question) *// all questions of a field or note*
- Node.SWOT: List(SWOT)
- Node.Comments: List(Comment) *// all nodes in a canvas can be commented*
  - NumberOf *// all lists in nodes of a canvas can be counted*
- Field.AllStickyNotes: List(StickyNotes)
- Field.MissingStickyNodes: List(empty Fields)
- Field.Grade: */* The average of all sticky note grades */*
- StickyNote.Grade: */* the grading: e.g., red, yellow, green */*
- StickyNode.SWOT.Strength.Grade: */* Grade of SWOT */*
- StickyNode.SWOT.Weakness.Grade: */* Grade of SWOT */*
- StickyNode.SWOT.Opportunity.Grade: */* Grade of SWOT */*
- StickyNode.SWOT.Trend.Grade: */* Grade of SWOT */*
- StickyNote.CorrespondingStickyNote: List(Ref StickyNote) */* corresponding sticky nodes or holes */*
- Canvas.Grade: */* The average of all sticky note grades of all nodes */*

Thresholds for Canvas Metrics

- Status of invariants is important for the ***maturity* of the canvas**

A **green** canvas fills all its variables
and fulfills all its invariants.

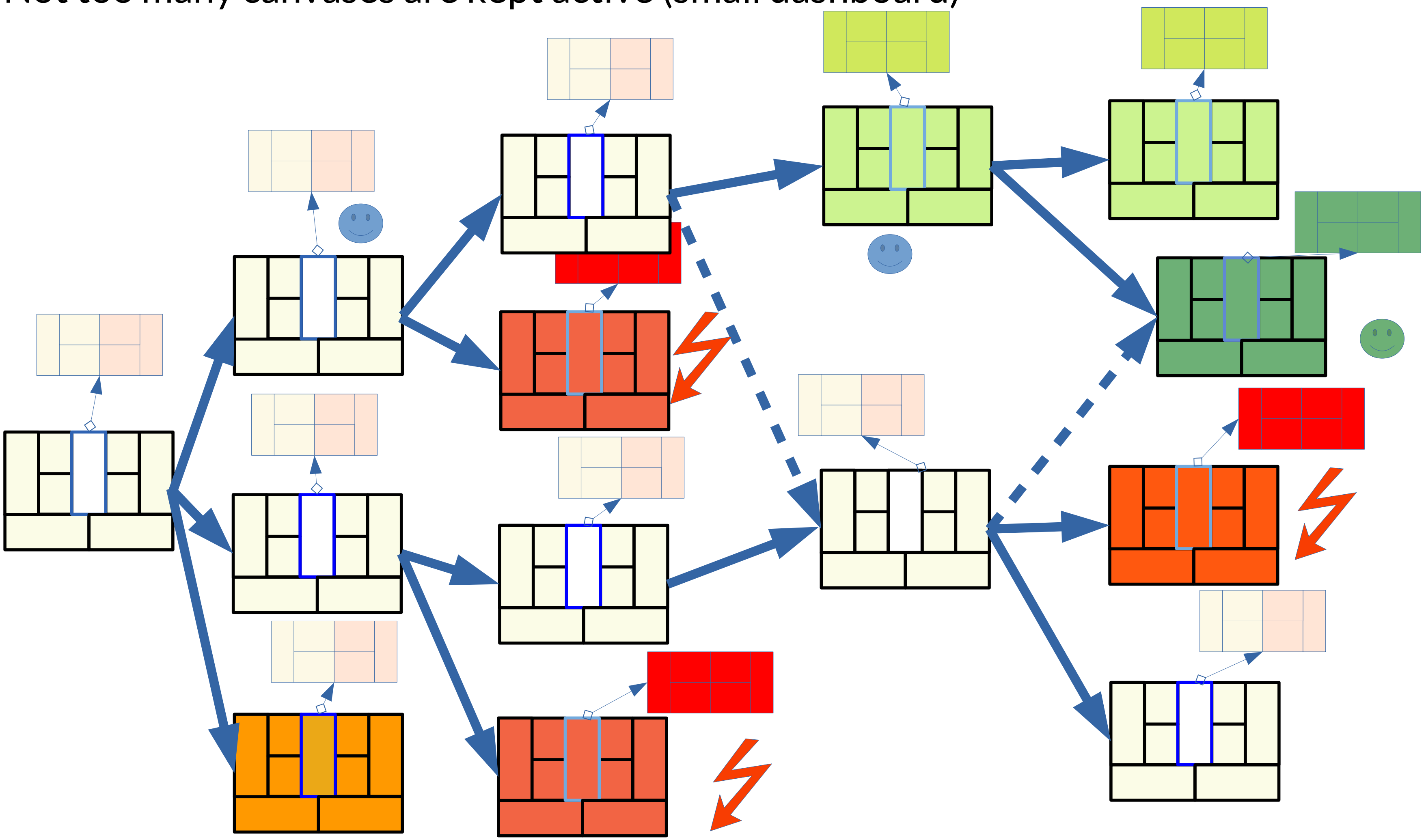
If a set of metric function on a nested canvas does not
fulfil its threshold, or if not all invariants are fulfilled,
we call the canvas ***orange.***

A **red** canvas does not fulfill all its **MUST invariants.**

31.5 The Canvas Cactus as Megamodel and its Metrics

The Evolving BMC-VPC Canvas Cactus (extended)

- Growing a tree with side edges (link tree - cactus) out of a first version
  - Assess with red-yellow-green; choose a current “greenest” “champion”
- Every step tests **hypotheses** about the customer
- Not too many canvases are kept active (small dashboard)

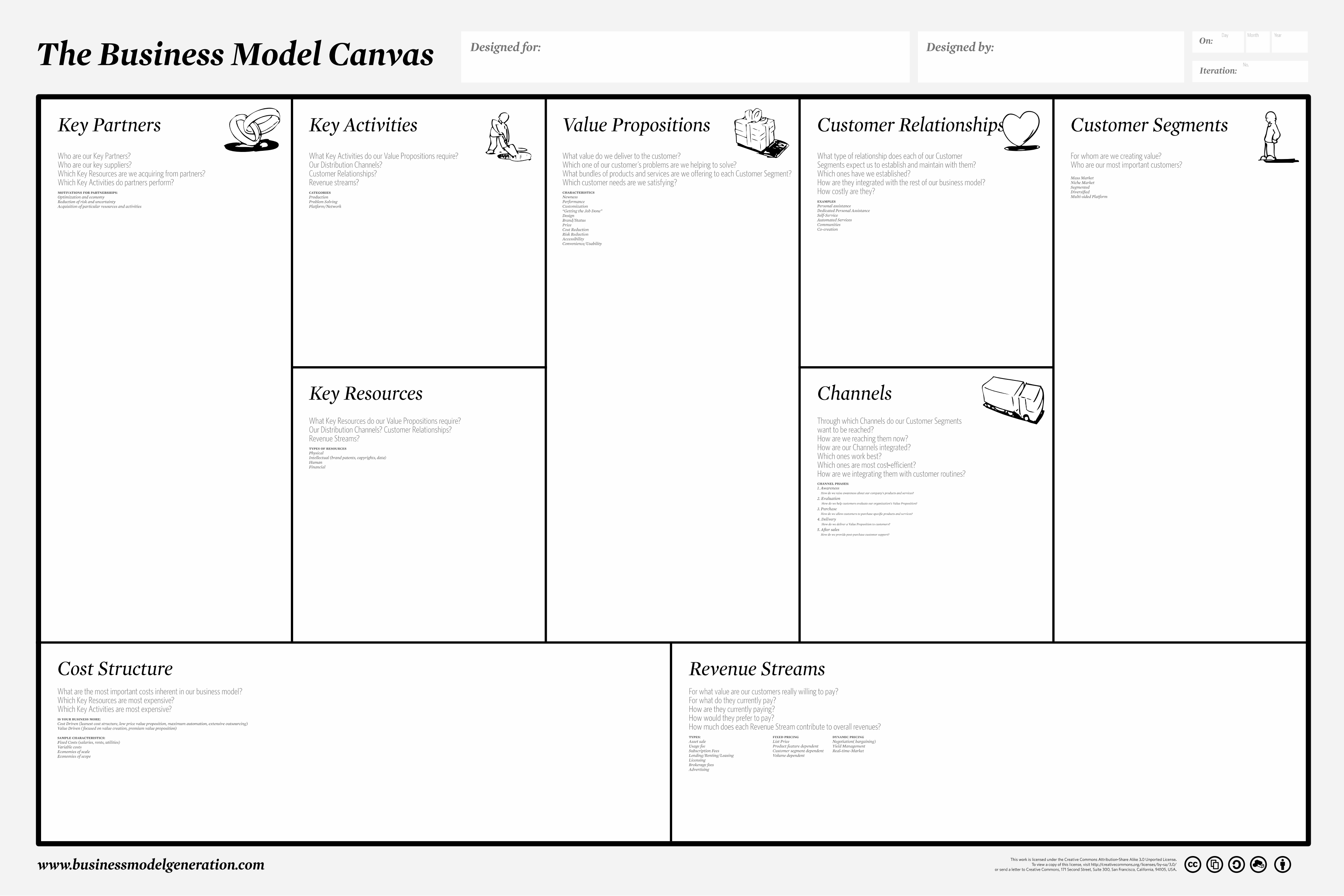


The Megamodel of Evolving Canvases

- A **megamodel** describes a set of models
- A **canvas cactus** is a link tree of canvases, i.e., a link-tree-shaped megamodel of canvases
- Canvas cactus evolution evolves the megamodel with agile modeling
- The megamodel of canvases in a cactus is a link tree and can be analysed by constrained multiset grammar (CMG)
  - Metrics
  - Constraints

Business Model Generation with Osterwalder/Pigneur

- CC-BY-SA: http://www.businessmodelgeneration.com/downloads/business_model_canvas_poster.pdf



The Business Model Canvas

Designed for:

Designed by:

On: Day Month Year

Iteration: No.

Key Partners

Who are our Key Partners?
Who are our key suppliers?
Which Key Resources are we acquiring from partners?
Which Key Activities do partners perform?

MOTIVATIONS FOR PARTNERSHIPS:
Optimization and economy
Reduction of risk and uncertainty
Acquisition of particular resources and activities

Key Activities

What Key Activities do our Value Propositions require?
Our Distribution Channels?
Customer Relationships?
Revenue streams?

CATEGORIES
Production
Problem Solving
Platform/Network

Key Resources

What Key Resources do our Value Propositions require?
Our Distribution Channels? Customer Relationships?
Revenue Streams?

TYPES OF RESOURCES
Physical
Intellectual (brand patents, copyrights, data)
Human
Financial

Value Propositions

What value do we deliver to the customer?
Which one of our customer's problems are we helping to solve?
What bundles of products and services are we offering to each Customer Segment?
Which customer needs are we satisfying?

CHARACTERISTICS
Newness
Performance
Customization
"Getting the Job Done"
Design
Brand/Status
Price
Cost Reduction
Risk Reduction
Accessibility
Convenience/Usability

Customer Relationships

What type of relationship does each of our Customer Segments expect us to establish and maintain with them?
Which ones have we established?
How are they integrated with the rest of our business model?
How costly are they?

EXAMPLES
Personal assistance
Dedicated Personal Assistance
Self-Service
Automated Services
Communities
Co-creation

Channels

Through which Channels do our Customer Segments want to be reached?
How are we reaching them now?
How are our Channels integrated?
Which ones work best?
Which ones are most cost-efficient?
How are we integrating them with customer routines?

CHANNEL PHASES:
1. Awareness
How do we raise awareness about our company's products and services?
2. Evaluation
How do we help customers evaluate our organization's Value Proposition?
3. Purchase
How do we allow customers to purchase specific products and services?
4. Delivery
How do we deliver a Value Proposition to customers?
5. After sales
How do we provide post-purchase customer support?

Customer Segments

For whom are we creating value?
Who are our most important customers?

Mass Market
Niche Market
Segmented
Diversified
Multi-sided Platform

Cost Structure

What are the most important costs inherent in our business model?
Which Key Resources are most expensive?
Which Key Activities are most expensive?

IS YOUR BUSINESS MORE:
Cost Driven (leanest cost structure, low price value proposition, maximum automation, extensive outsourcing)
Value Driven (focused on value creation, premium value proposition)

SAMPLE CHARACTERISTICS:
Fixed Costs (salaries, rents, utilities)
Variable costs
Economies of scale
Economies of scope

Revenue Streams

For what value are our customers really willing to pay?
For what do they currently pay?
How are they currently paying?
How would they prefer to pay?
How much does each Revenue Stream contribute to overall revenues?

TYPES:
Asset sale
Usage fee
Subscription Fees
Lending/Renting/Leasing
Licensing
Brokerage fees
Advertising

FIXED PRICING
List Price
Product feature dependent
Customer segment dependent
Volume dependent

DYNAMIC PRICING
Negotiation(bargaining)
Yield Management
Real-time-Market

www.businessmodelgeneration.com

The End

- More on modeling, lean modeling, and megamodeling in the course
- “Model-Driven Software Development in Technical Spaces (MOST)” in WS 17/18

- Explain the concept of a CMG. Why do we need a grammar to model Canvases?
- Explain why a canvas is an instance of a CMG.
  - Which role do invariants play?
  - Which role do filling functions play?
  - Can the user execute / simulate a filling function?