

COMPARING LEAN MANAGEMENT PRINCIPLES AND EVOLUTIONARY DESIGN IN NATURE

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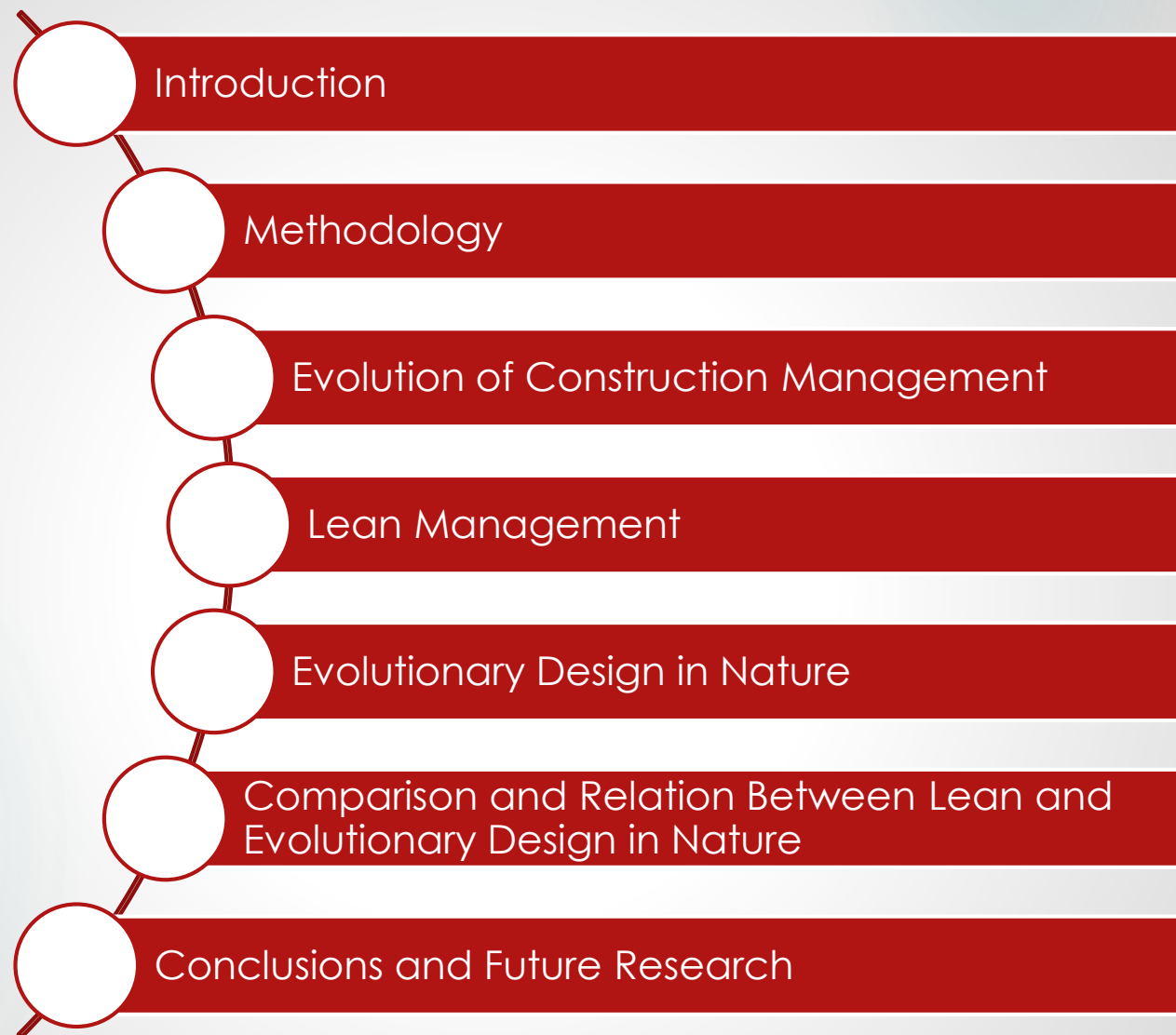


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Outline



Introduction

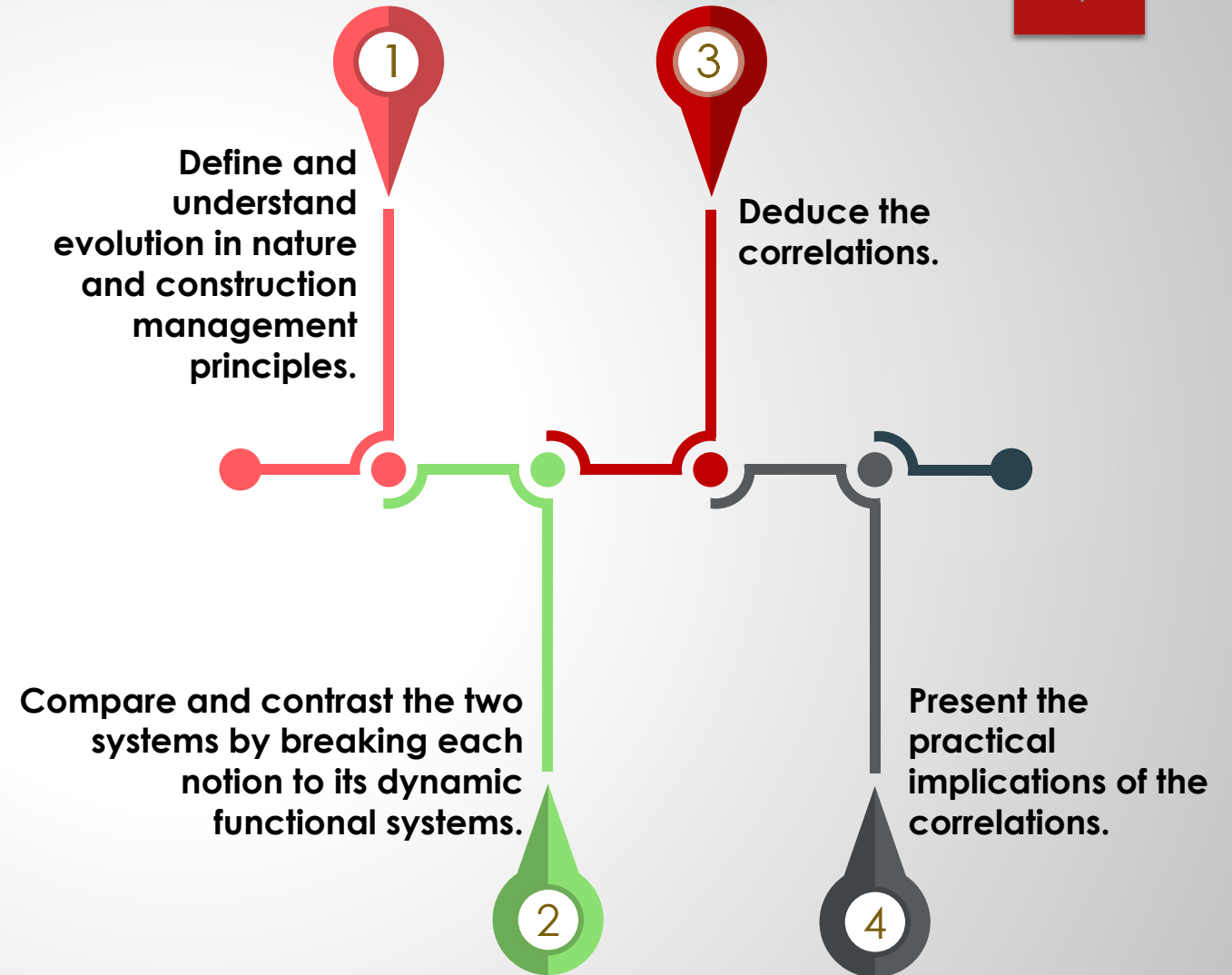
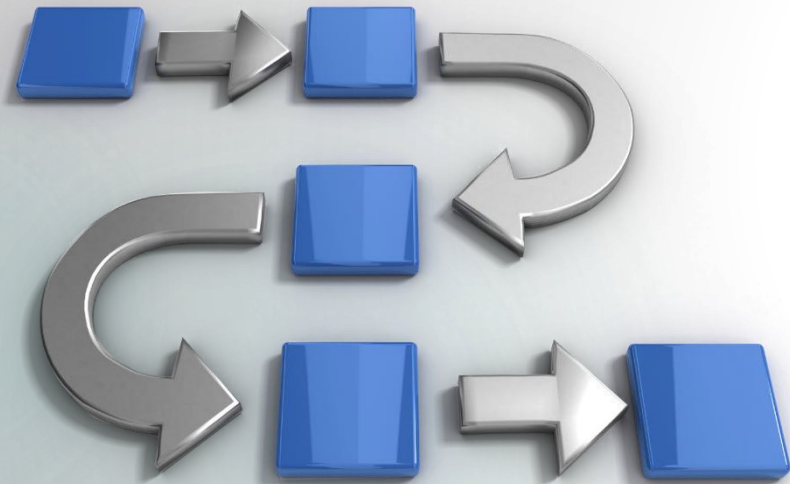
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Flow systems are of
everywhere. Therefore, all
the things that we
seek flow to be better
in form, and
Lean Construction
is a natural evolution
of construction
betterment



Methodology

4



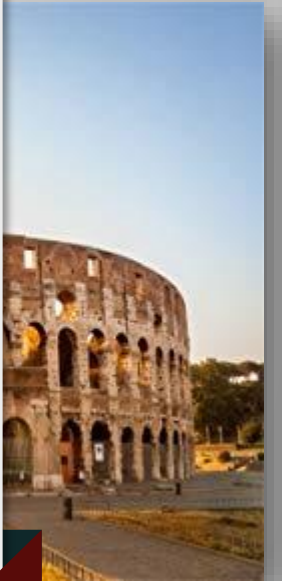
Evolution of Construction Management

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Project management has been practiced since the establishment of humanity.

Few instances of documentation show the strategies and techniques that existed at that time (Symour and Hussein 2014).

Upper society focused more on the final structure than the construction part. Craftsmen kept execution details secret among their tribes to preserve their specialization (Symour and Hussein 2014).



Evolution of Construction Management

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Craft system to Human Relations Administration

- Better transportation and telecommunication systems.
- Gantt charts were also developed.
- Concept of job specification.



1958

Application of Management Science

- Core project management tools such as PERT and CPM
- The use of Work Breakdown Structure (WBS)
- Computer technology developments

1980



Production Center: Human Resources

- Revolution in Information Technology (IT), which helped in managing large complicated projects.
- Theory of Constraints (TOC) was introduced.

Creating a new environment

- Technology continued to develop, increasing productivity and efficiency.
- Create concepts and strategies rather than tools.
- Lean Construction was started.



1992

(Kwak 2003).

Lean Construction Briefing

7

Lean Management can be most completely understood as a way of life rather than a specific technique or method.



Lean Construction at MAN Enterprise

MAN Enterprise is an international leader in the construction industry. We currently have projects in several locations in the MENA region.

Projectly, management at MAN Enterprise has been evaluating simple its implemented at MAN Enterprise in 1971, as:



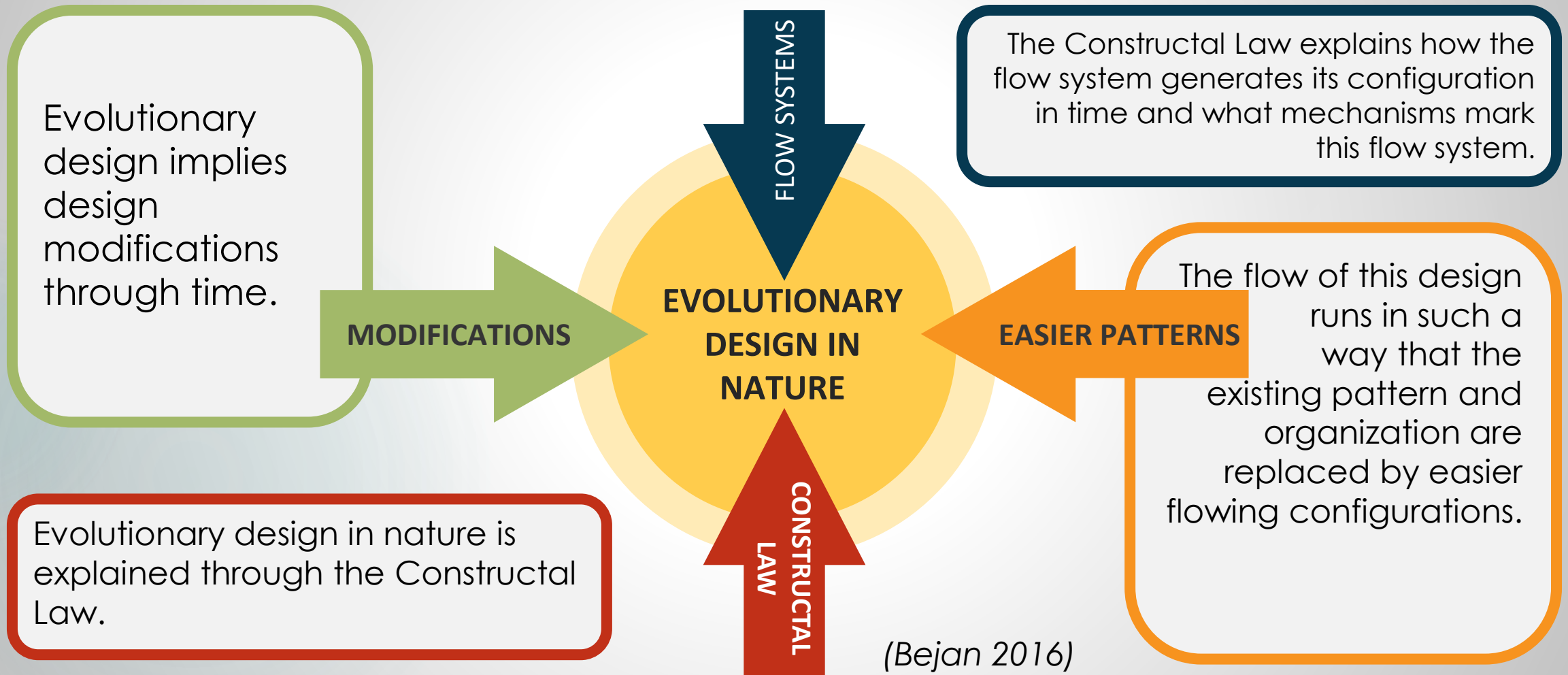
Sama Beirut, Lebanon



downstream Standardization National Museum of Qatar

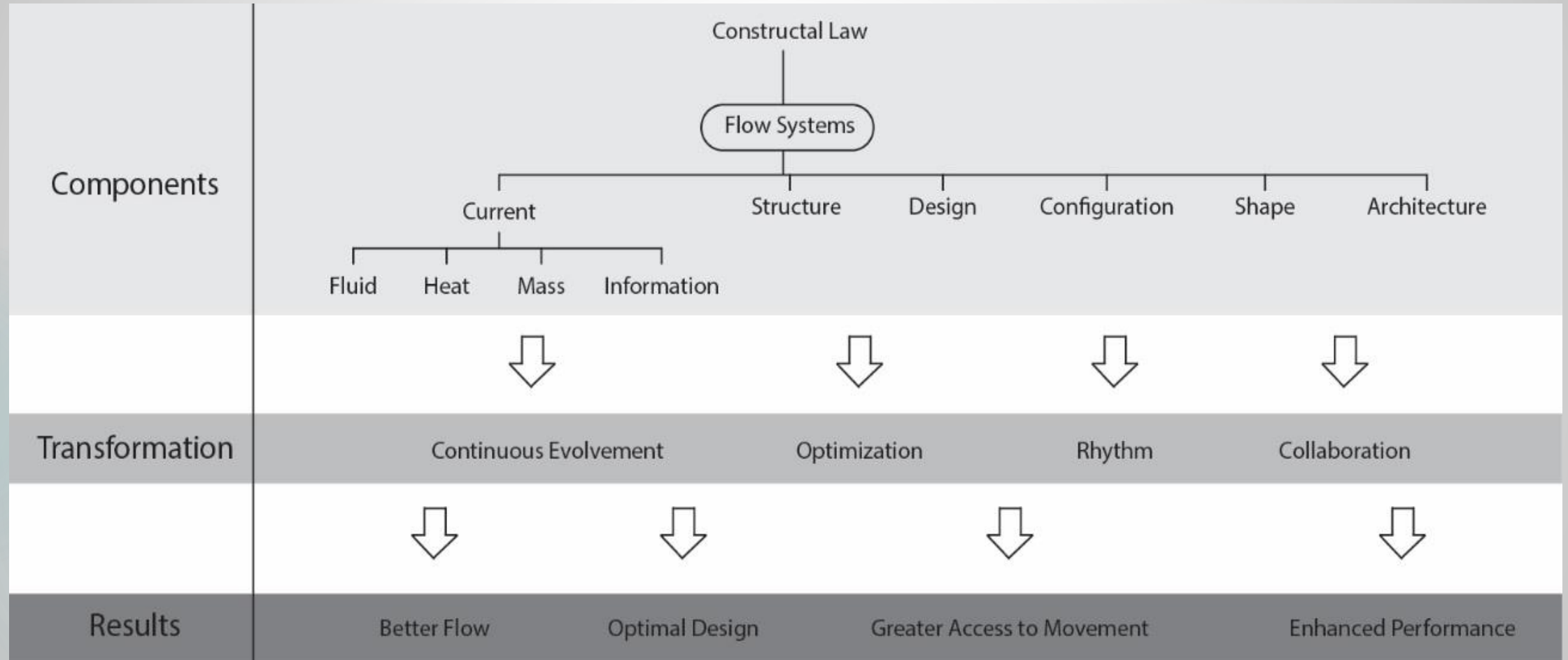
Evolutionary Design in Nature

9



Evolutionary Design in Nature

10



Constructal Law in nature

Features of evolution

11

Optimization

- Continuous improvements
- Choosing between the different alternatives
- Purpose-driven process

Rhythm

- A rhythm of continuous improvement
- Respiration, discretion, blood circulation, and other periodic body functions.

Collaboration

- Collaboration aims to help individuals flow together.
- It enhances the individual and the overall performance of the entities

(Bejan 2016)

Lean and Evolutionary Design in Nature are compared based on their definition, features and through examples.



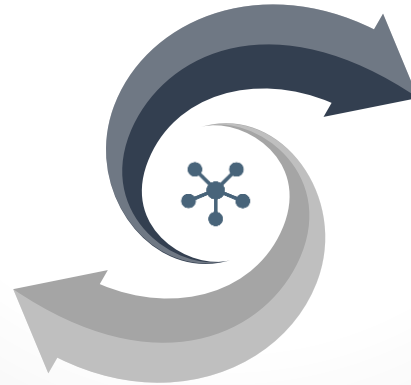
Comparison Between Lean and Evolution In Nature

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01 EVOLUTIONARY DESIGN

The phenomenon of evolutionary organization facilitates accessing everything that flows, evolves, spreads (technology, river basins, animal life and migration, etc.)

Definitions



02 LEAN CONSTRUCTION

Lean principles aim to create “process” flow, and continuous improvement and development, which are related to evolution in nature as shown when river basins are ever changing to find optimum routes, or when migration patterns are optimized for shortest duration.

Comparison Between Lean and Evolution In Nature

Lean Principles

Long-Term Philosophy

Continuous Process Flow

Standardized Tasks and Processes

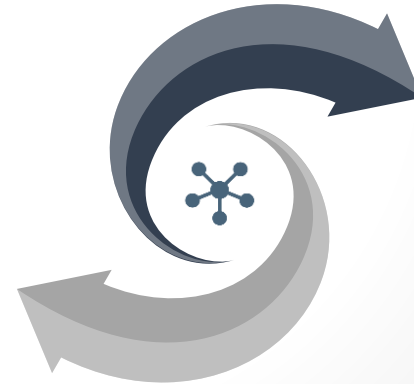
Make Decisions slowly by Consensus

Relentless Reflection and Continuous Improvement

Level out the Workload

Pull Systems

Features



Better Flow
(Rivers)

Optimization

Continuous
Evolution

Collaboration
(Work)

Rhythm
(Lungs)

Features of Evolution

Comparison Between Lean and Evolution In Nature

Lean Principles Applied

Beehive

Reduce waste in various types: overproduction, unnecessary inventory, defects, inappropriate processing

Standardized processes

Waste to perfect

Optimization

architectural

Space Efficiency (lower the river to reveal rocks)



Conclusions

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01

Evolution is a gradual process in which something changes into a different and usually better form.

02

Evolutionary design evolves over time to **make flow easier**, to make **better designs**, to **increase flow access**, to **enhance performance**.

03

Construction Management has been evolving since its establishment, it moved from primitive to more advanced theories and systems, reaching Lean Construction.

04

After relating Lean to evolutionary design in nature, it is concluded that Lean is the natural evolution of construction management.

Future Research

01

Future research can possibly observe what nature's age-old wisdom can teach us, and see how we can apply its principles in advancing Lean.

Further research may also consider further comparisons between evolutionary design and lean management.

02

