DMAIC MANUAL FOR AN INTEGRATED MANAGEMENT SYSTEM: APPLICATION IN A CONSTRUCTION COMPANY

Mariana Bravo - PhD Candidate, School of Civil Engineering, Architecture and Urban Design, UNICAMP – University of Campinas, São Paulo, Brazil

Camila Augusto Euphrosino - MSc Student, School of Civil Engineering, Architecture and Urban Design, UNICAMP – University of Campinas, São Paulo, Brazil

Patricia Stella Pucharelli Fontanini - Professor, Architecture and Construction Department, School of Civil Engineering, Architecture and Urban Design, UNICAMP – University of Campinas, São Paulo, Brazil.

Introduction

Objectives and structure of the article

Introduction

The implementation of a Manual for an Integrated Management System with a focus on Lean Six Sigma, using DMAIC as a structure for the dissemination of waste reduction and simultaneously reducing the variation of the delivered products, is the description of this work.

This implementation took place in 2017, in an XYZ construction company under the responsibility of one of the researchers, who in this period was a quality coordinator and lean six sigma specialist.

Structure of article

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APPLICATION

- Analyze the XYZ Company
- Integrated Management System
- Six Sigma: Resources and Implementation

DMAIC MANUAL

- 05 steps for DMAIC
- Structure of Manual

DISCUSSIONS AND RESULTS

- Challenges
- Results

Application

Prepare for implementation of DMAIC Manual

Application: Analyze the construction company

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Timeline of management maturity (Authors)

Application

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Integrated Management System (IMS)

It was a way of managing in the light of the vision, values and strategic planning of the construction company XYZ, and not only under the requirements required in the reference standards for certification.

Application: Integrated Management System (IMS)

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INTEGRATED MANAGEMENT SYSTEM: CERTIFICATIONS

The certifications of the Integrated Management System (IMS) under the standards presented to construction, real estate and corporate clients that construction company XYZ had the ability to deliver to the customer the product and service that were requested. For society and the market, such certifications could present maturity in their organizational structure.

The standards used as references for applied certification:

Brazilian Habitat Quality and Productivity Program Reference for Construction Works Execution	ISO 9001:2015	AQUA-HQE
Maintainer: **Ministry of Cities** **Federal Government**	Maintainer: **ABNT** **(Brazilian Association of Technical Standards)**	Maintainer: **Vanzolini Foundation**
PROJECT APPLICATION: **Design phase, Project execution, Edification**	PROJECT APPLICATION: **Design phase, Project execution, Edification**	PROJECT APPLICATION: **Design phase, Project execution, Edification**

Application: Six Sigma

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Structure for implementation

The addition of Lean Six Sigma to the IMS started simultaneously the need to adapt the IMS to the new strategic planning of the construction company XYZ and to meet the revisions of the ISO 9001 and PBQP-H standards.

Application: Six Sigma

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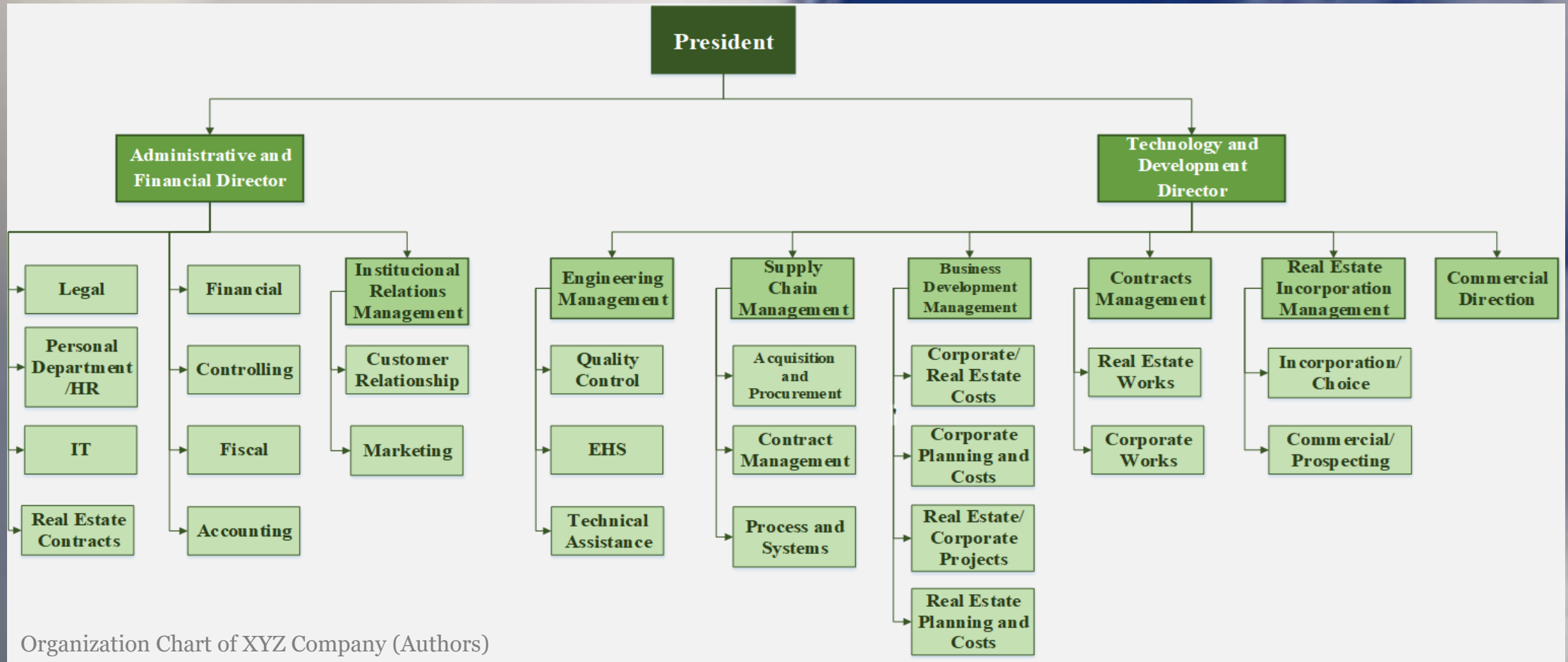
Structure for implementation



Organization Chart of XYZ Company (Authors)

Application: Six Sigma

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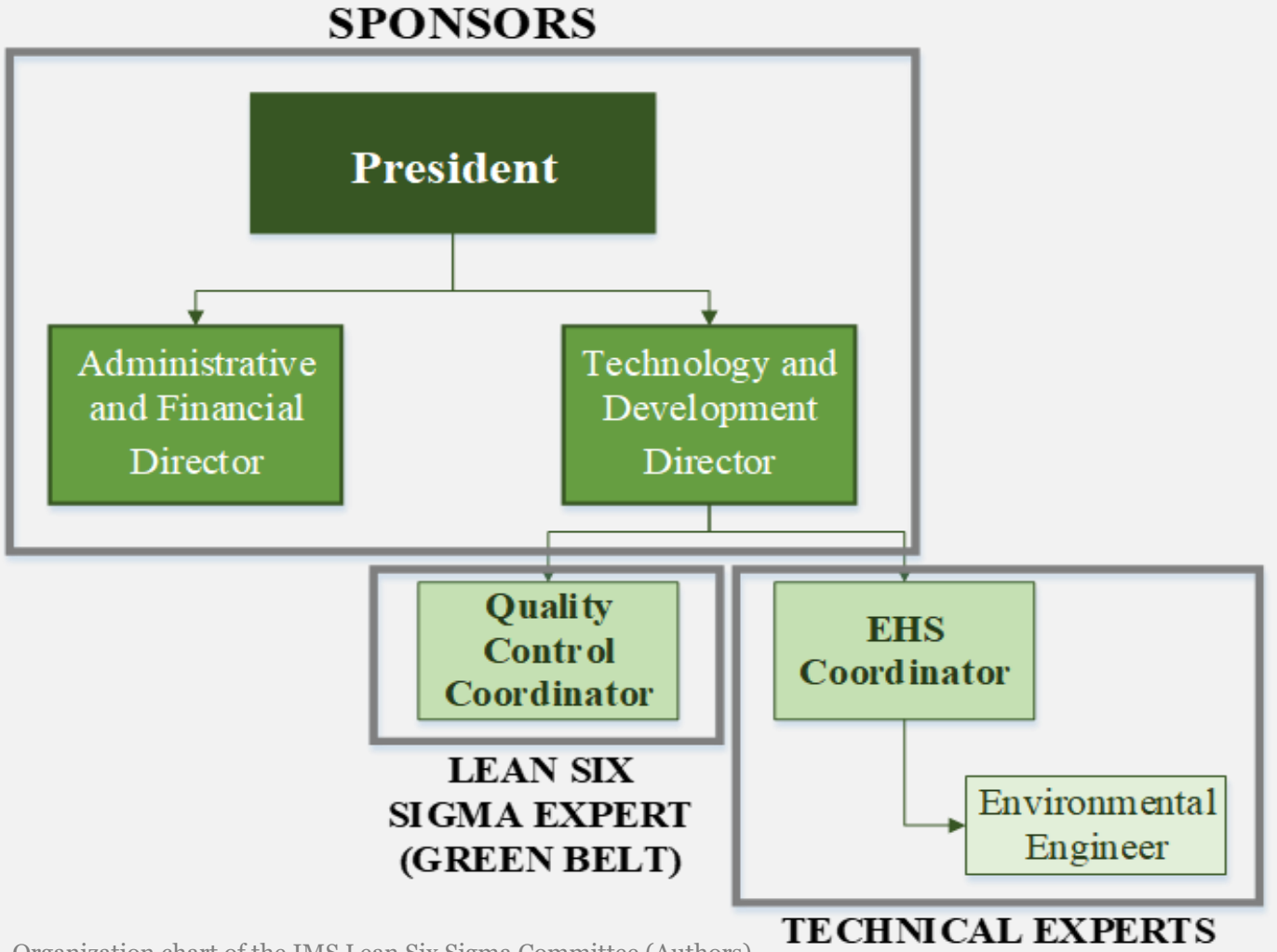
Team for Lean Six Sigma in XYZ Construction Company



Organization chart of the IMS Lean Six Sigma Committee (Authors)

Application: Six Sigma

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<u>Planning of Activities:</u> The committee started working in the first two months of 2017

Planning of Activities: The committee started working in the first two months of 2017 (Part 1/2)

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Schedule - 2017											
#	Activity	Responsible	jan	feb	mar	apr	may	jun	jul	aug	sep
1	Form the committee: establish the activities for the implementation of the IMS Lean Six Sigma	Sponsors									
2	Change of the PDCA cycle to DMAIC cycle	Lean Six Sigma Expert (Green Belt)									
3	Define: definition of the organization and its context, based on the requirements of the Client and the market in which it operates	Sponsors, Lean Six Sigma Expert (Green Belt)									
4	Measure: how IMS processes are performed measured	Lean Six Sigma Expert (Green Belt), Technical Experts									
5	Analyse: analysis of the behavior of processes and performance indicators	Lean Six Sigma Expert (Green Belt), Technical Experts									
6	Improve: improvements to existing processes and their effects on the company are monitored, proposed and evaluated	Lean Six Sigma Expert (Green Belt), Technical Experts									

Schedule for the implementation of SGI Lean Six Sigma (Authors)

Planning of Activities: The committee started working in the first two months of 2017 (Part 2/2)

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Schedule - 2017											
#	Activity	Responsible	jan	feb	mar	apr	may	jun	jul	aug	sep
7	Control: actions are taken so that the processes reach their goals in order to ensure that the Client's requirements are being met	Lean Six Sigma Expert (Green Belt), Technical Experts									
8	Complete the DMAIC Manual for the IMS	Sponsors, Lean Six Sigma Expert (Green Belt), Technical Experts									
9	Presents the DMAIC Manual for the IMS for Managers	Sponsors, Lean Six Sigma Expert (Green Belt), Technical Experts									
10	Presents the DMAIC Manual for the IMS for others workers from the company	Lean Six Sigma Expert (Green Belt), Technical Experts									
11	Deploy the DMAIC Manual to the IMS	Lean Six Sigma Expert (Green Belt), Technical Experts									
12	ISO 9001 recertification (2015 version)	Sponsors, Lean Six Sigma Expert (Green Belt), Technical Experts									

Schedule for the implementation of SGI Lean Six Sigma (Authors)

Application: Six Sigma

DMAIC: conversion from PDCA to DMAIC

- **Defining**: identify the clients requirements and the items that can affect the results of processes;
- **Measuring**: crucial datas to the problem through Six Sigma.
- **Analyzing**: using management control tools to identify the causes of problems.
- **Improving**: using methods obtained in the analysis phase.
- **Controlling**: monitoring the process using process control to supports the improvements.

PDCA X DMAIC (in Werkema, 2012)

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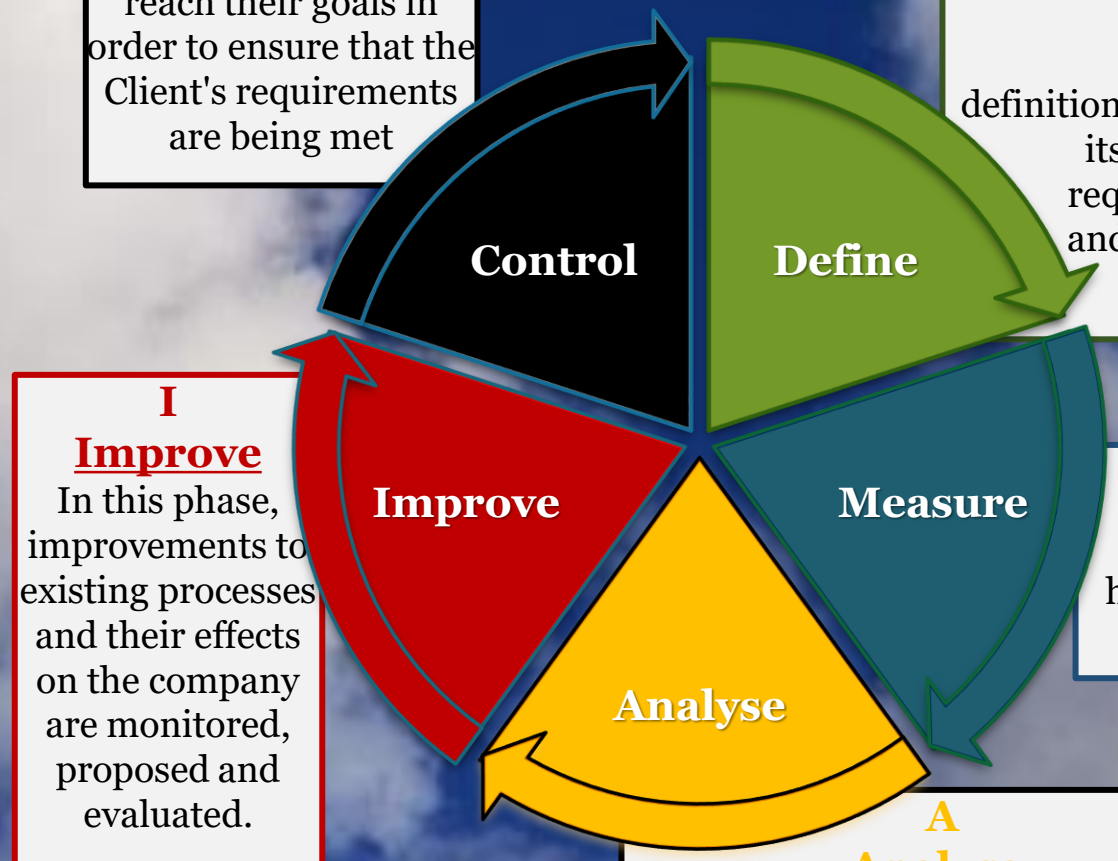
DMAIC Manual

Initiate implementation of Six Sigma: A Manual

DMAIC Manual

The Integrated Management System Manual based on the DMAIC was divided into 05 (five) phases distributed in chapters:



DMAIC Circle for the Integrated Management System (Authors)

C
Control
actions are taken so that the processes reach their goals in order to ensure that the Client's requirements are being met

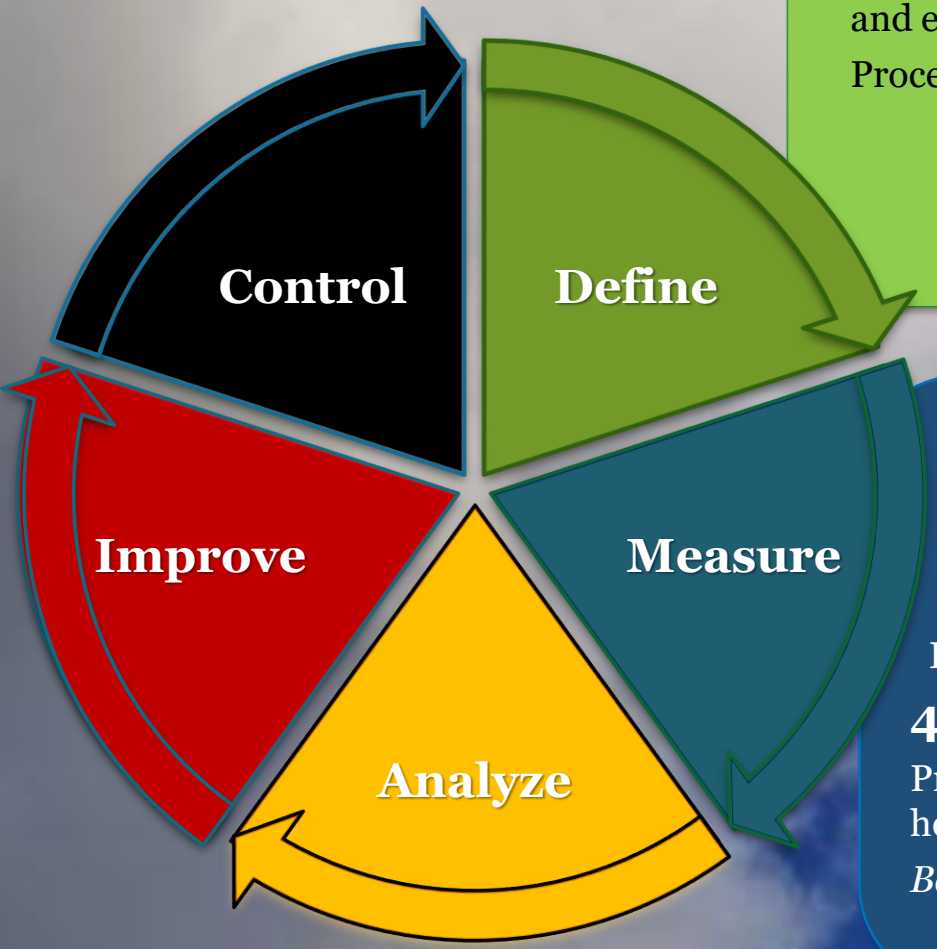
D
Define
definition of the organization and its context, based on the requirements of the Client and the market in which it operates

M
Measure
how IMS processes are performed measured

A
Analyse:
analysis of the behavior of processes and performance indicators

I
Improve
In this phase, improvements to existing processes and their effects on the company are monitored, proposed and evaluated.

DMAIC Manual



1. XYZ Construction Company

Organization context

Leadership and organizational responsibilities

Stakeholder mapping

Customer Focus

Availability of resources (people, infrastructure and environment to operate the processes)

Process mapping (inputs and outputs)

2. Documented information

Documents control

Records control

3. Risk and opportunity management

Approach to business and product risks hazard identification, risk assessment and control determination;

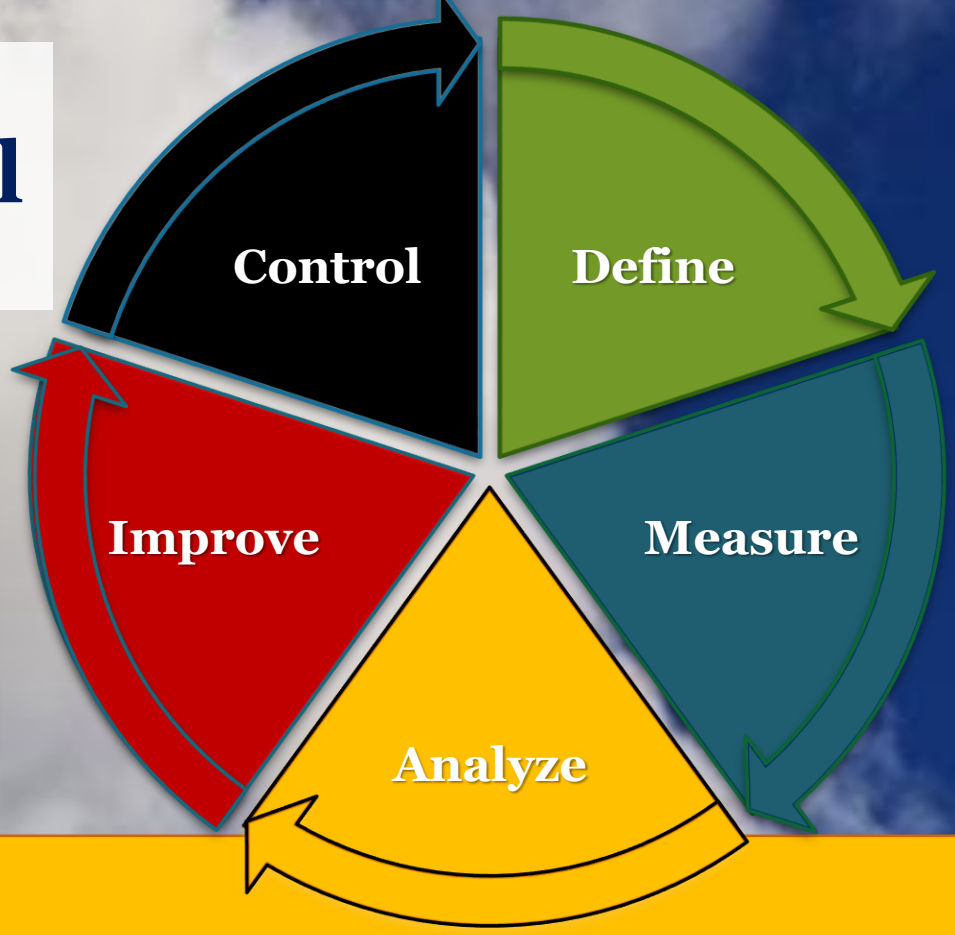
Environmental aspects and impacts

4. Goals and objetives

Process performance indicators, sustainability indicators, work safety and occupational health indicators

Balanced Scorecard.

DMAIC Manual



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5. Requirements for products and services

7. Projects and development of products and services

8. People management (human development): competencies (job description, recruitment and selection), goal plan

9. Organizational knowledge management

10. Audits

DMAIC Manual

14. Production and provision of services: identification and traceability, enterprise planning, property belonging to external customers or providers, preservation, non-compliant outputs

15. Work instructions and procedures

16. Measurement of product and service compliance: operational indicators of works

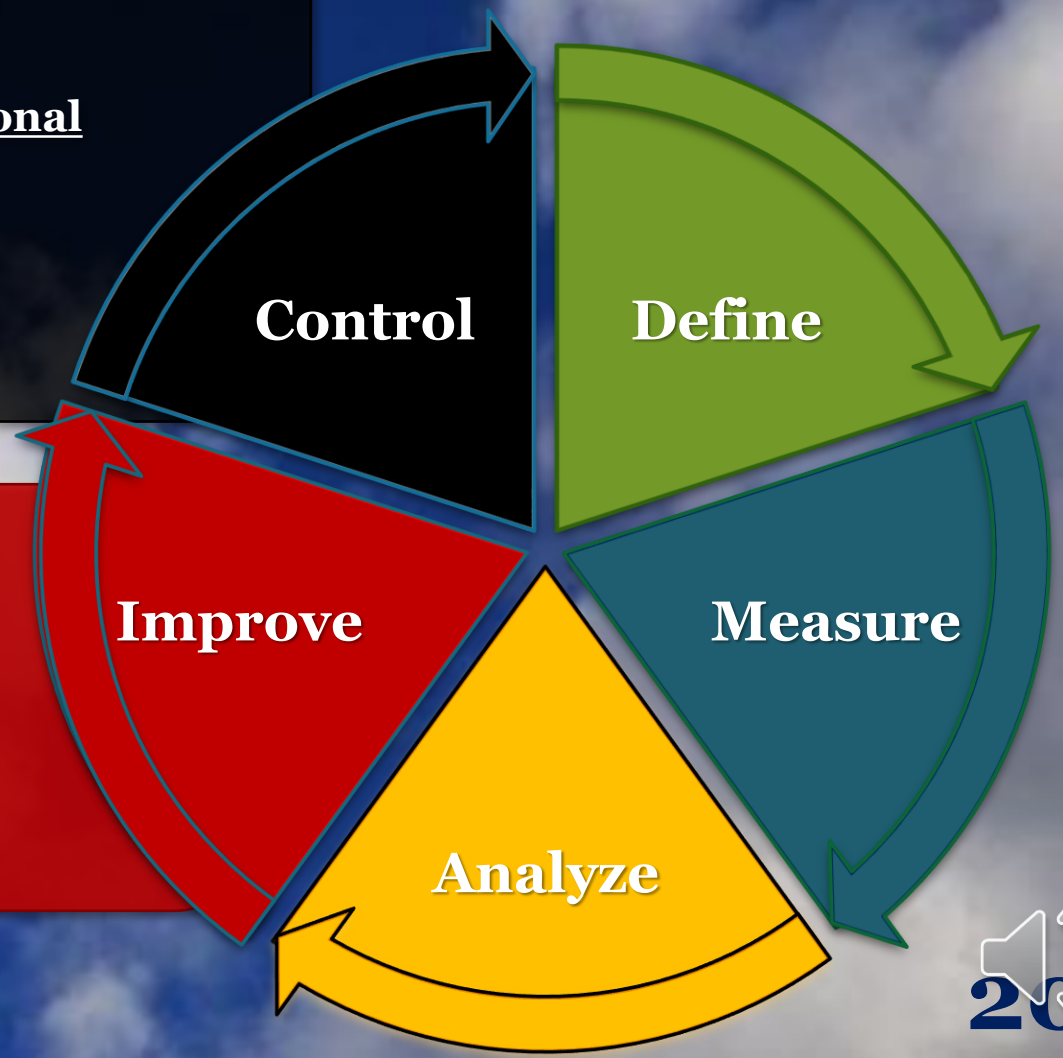
17. Change management: change management and control

18. Post-construction activities: technical assistance, customer service.

11. Non-compliance, corrective and preventive action

12. Incident investigation

13. Critical Analyzes



DMAIC Manual

The information was compiled by the committee with the other departments of the company and the Manual was approved by the sponsors. Then it was introduced to the entire company through training and meetings.

Even though it is not a normative requirement, the Manual was still in use until 2019, according to information from the company itself.

Discussions and Results

Challenges and examples

Discussions and Results
Challenges

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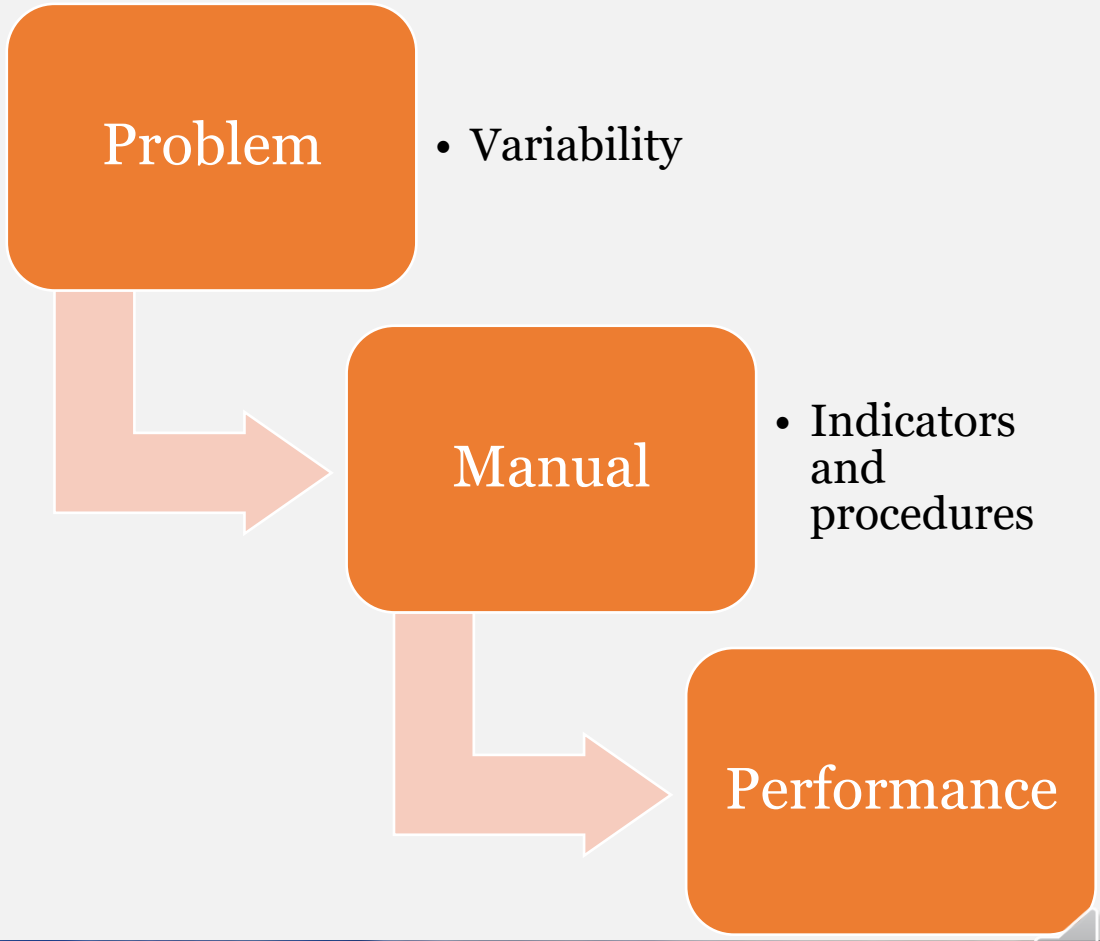
TIME	FINANCIAL MOMENT	RESISTENCE
Dating back to end of 2017	Crisis in Construction sector during 2016 and extended for 2017	Non engaged workers managers in improve continuous

Discussions and Results
Using DMAIC Manual

It was found that activities and management processes showed greater variability in their results.

<u>Example</u>: the budgets that were prepared for new works were designed according to the requirements of the future client, without considering the resources available within the company



Conclusions

Conclusions

It was determined that activities and management processes must be structured according to the company's organizational maturity, not just to meet reference standards or to obtain certifications. One must first understand who they are and what their customers need in order to make valuable transformations.

Future research

Future research

There is an immense opportunity for the implementation of the Lean Six Sigma approach in civil construction, especially when it comes to management tools targeted. Manuals, business plans, standardized work procedures, Key Performance Indicators, Balance Score Cards for management focused on reducing waste and variability, may have their uses more explored on construction sites as well as at the headquarters of the construction company.

This practice of Lean Six Sigma tools and management systems for construction companies can be further explored in the academy with the presentation of models that can assist professionals in the implementation of more mature and leaner management systems.

Acknowledgments

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UNICAMP

CAPES

Thanks!