

Archibald & Prado Research 2010 Results

www.maturityresearch.com

SUCCESS AND MATURITY IN THE ENGINEERING & CONSTRUCTION BUSINESS Summary Report

Organized by
Daniel L. von Sperling
Darci Prado

30/May/2011

We present the **Final Report – Short Version** of the Archibald & Prado Research - 2010 on **Maturity and Success in Engineering & Construction**. There is also available in the website the **Engineering & Construction Report - Complete Version**, which contains all data and a comprehensive analysis of the results.

Considering the complexity of the subject, this research, as the 2006 and 2008 researches, is still an **EXPLORATORY STUDY** that intends to establish a knowledge foundation for further studies. Its objectives are:

- Assess the success level of the Brazilian organizations;
- Verify the existence of a correlation between success and maturity levels according to the Prado-PMMM model;
- Identify the main failure causes and stratify them by maturity levels.

Finally, it is important to mention that this phase of the research is carried out under the same confidentiality policy and statistical strictness considered at the first phase.

- Introduction
- Engineering Subcategory
- Construction Subcategory
- Main Conclusions of this Research
- Organization team and acknowledgements

Introduction

It is important to make it very clear what is being researched.

The research aims to evaluate maturity and success of projects of the following categories, as defined by Russell Archibald: **Engineering** and **Construction** (for more information about Archibald categories, please visit our website at www.maturityresearch.com).

The participants of this research are sectors (or departments) of organizations that carry out engineering or construction (or both) projects, belonging to the Construction business. Thus, these sectors are involved with one or more of the following **subcategories**:

- Real estate
- Services (Industrial Construction, Heavy Construction) for private sector clients
- Public works and Infrastructure (including Heavy Construction) for public sector clients
- Engineering (Design) for external clients, public or private sectors
- Management for external clients, public or private sectors

This research was carried out in two phases:

- 1st Phase: between September and December 2010 (obtainment of maturity related data)
- 2nd Phase: between January and March 2011 (obtainment of success related data)

This report uses the data obtained at the second phase of the research. Data from the first phase can be seen in the General Report – Complete Version, available on our website.

A few comments:

- As it can be seen in the following pages, there was a very small participation of Brazilian organizations in the second phase of the research. This implies statistically questionable results.
- However, submitting the results to professionals that have both large experience in the area and high professional recognition and respectability, we see that the values obtained are quite feasible.
- So we thought it would be worth to release the results, hoping they can motivate Brazilian organizations to participate in the upcoming researches.

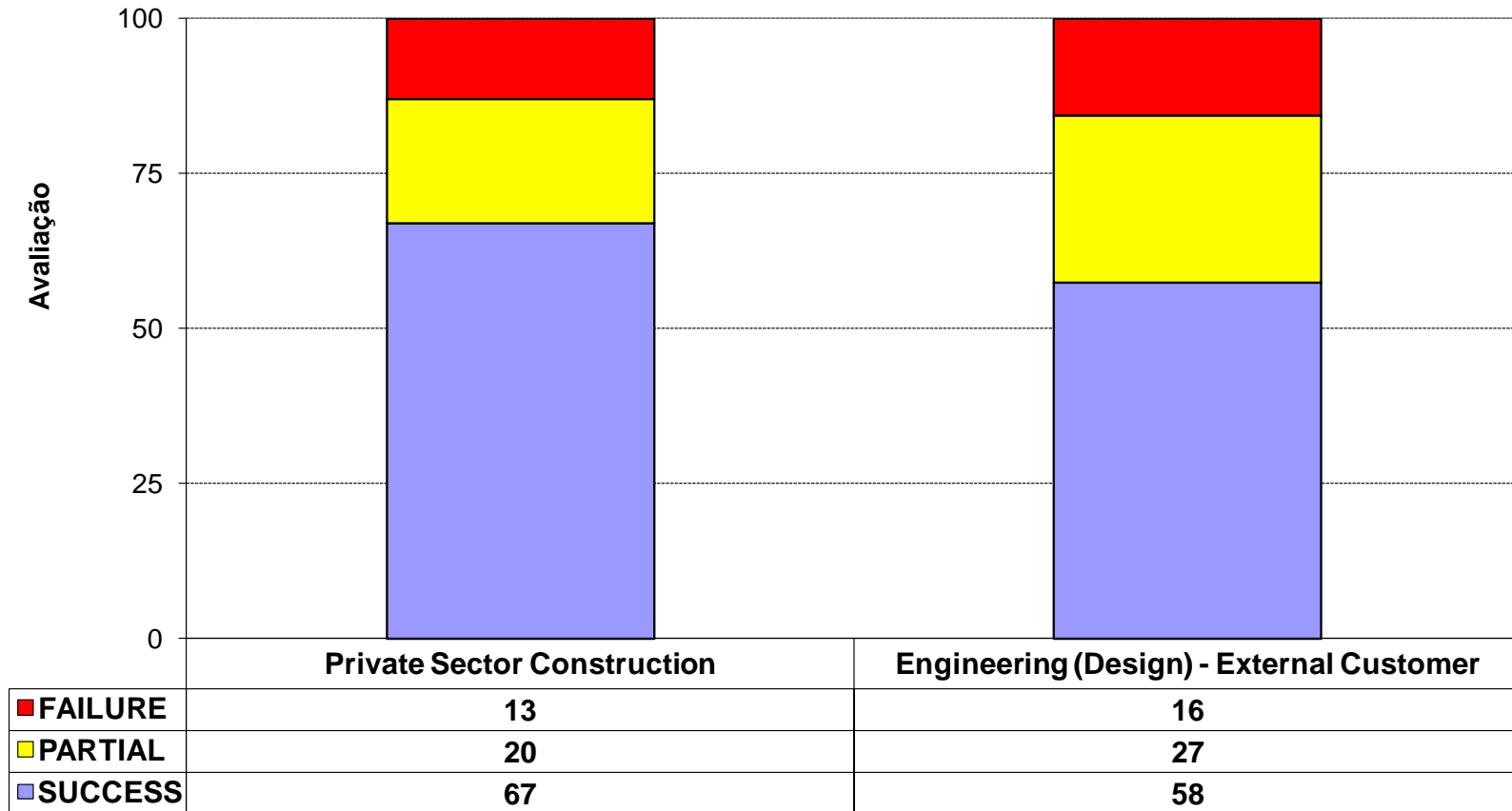
Participation by Subcategories

| SUBCATEGORY | # Particip. | %Particip. | Maturity | SUCCESS | | |
|--|-------------|-------------|-------------|-------------|-------------|-------------|
| | | | | TOTAL | PARTIAL | FAILURE |
| Engineering (Design) - External Customer | 8 | 31% | 2,90 | 58 | 27 | 16 |
| Engineering (Design) - Internal Customer | 2 | 8% | 2,80 | | | |
| Management - External Customer | 4 | 15% | 3,60 | | | |
| Management - Internal Customer | 2 | 8% | 1,14 | | | |
| Building Construction | 2 | 8% | 3,45 | | | |
| Public Sector Construction | 1 | 4% | 3,90 | | | |
| Private Sector Construction | 7 | 27% | 2,90 | 67 | 20 | 13 |
| | 26 | 100% | 3,01 | 60,2 | 26,9 | 12,9 |

Note: groups with less than 5 participants do not have their results presented

SUBCATEGORIES AND SUCCESS - 2010

Sample: 26 Participants



ENGINEERING (DESIGN)

**(Projects of “Design for external clients”
subcategory)**

| EARNIG | # PARTICIP. |
|---------------------------------------|-------------|
| < US\$ 300.000 | 1 |
| US\$300.000 a R\$ 1,7 millions | 0 |
| US\$1,7 millions to US\$ 7 millions | 2 |
| US\$7 millions to US\$ 70 millions | 1 |
| US\$ 70 millions to US\$ 700 millions | 2 |
| > US\$ 700 millions | 2 |

| STATE | # Part. |
|-------|---------|
| DF | 1 |
| MG | 3 |
| PR | 1 |
| SP | 3 |

Participants used the following definition of success:

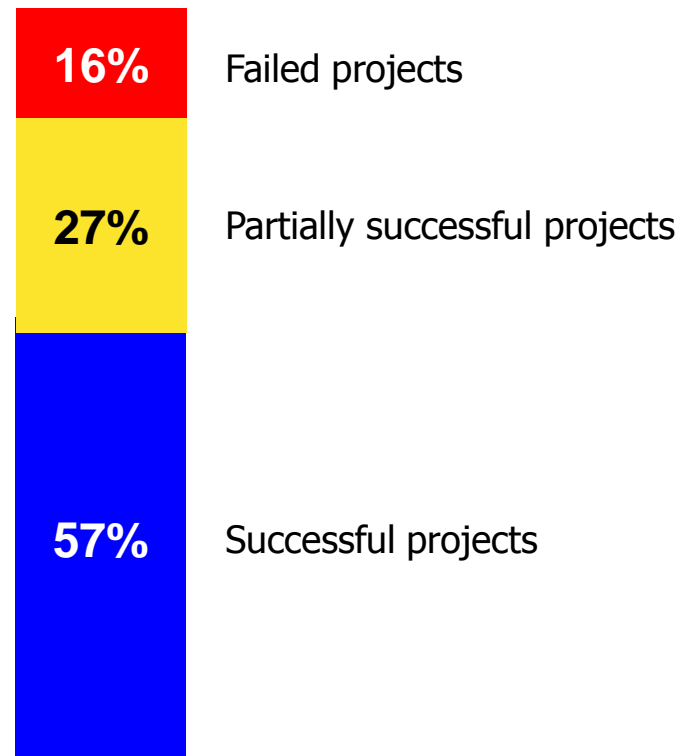
Complete success: the project was completed within the planned time, scope, quality and budget (insignificant differences are accepted). The customer was very satisfied with the delivered product and its performance and the expected financial results were obtained for the company.

Partial success: the work was completed and delivered. However, compromising events happened (significant delay and/or significant cost overrun; and/or the performance of the delivered product was below the expected) and significantly decreased the financial result; and/or the customer received the work, but was not satisfied.

Failure: the work was not completed or the delay and/or cost overrun were so steep that there was a financial deficit, and/or the performance of the delivered product was far below the expected, and/or the customer does not agree to accept the work.

AVERAGE OF SUCCESSFUL PROJECTS: **57%**

(Sample: 8 participants)

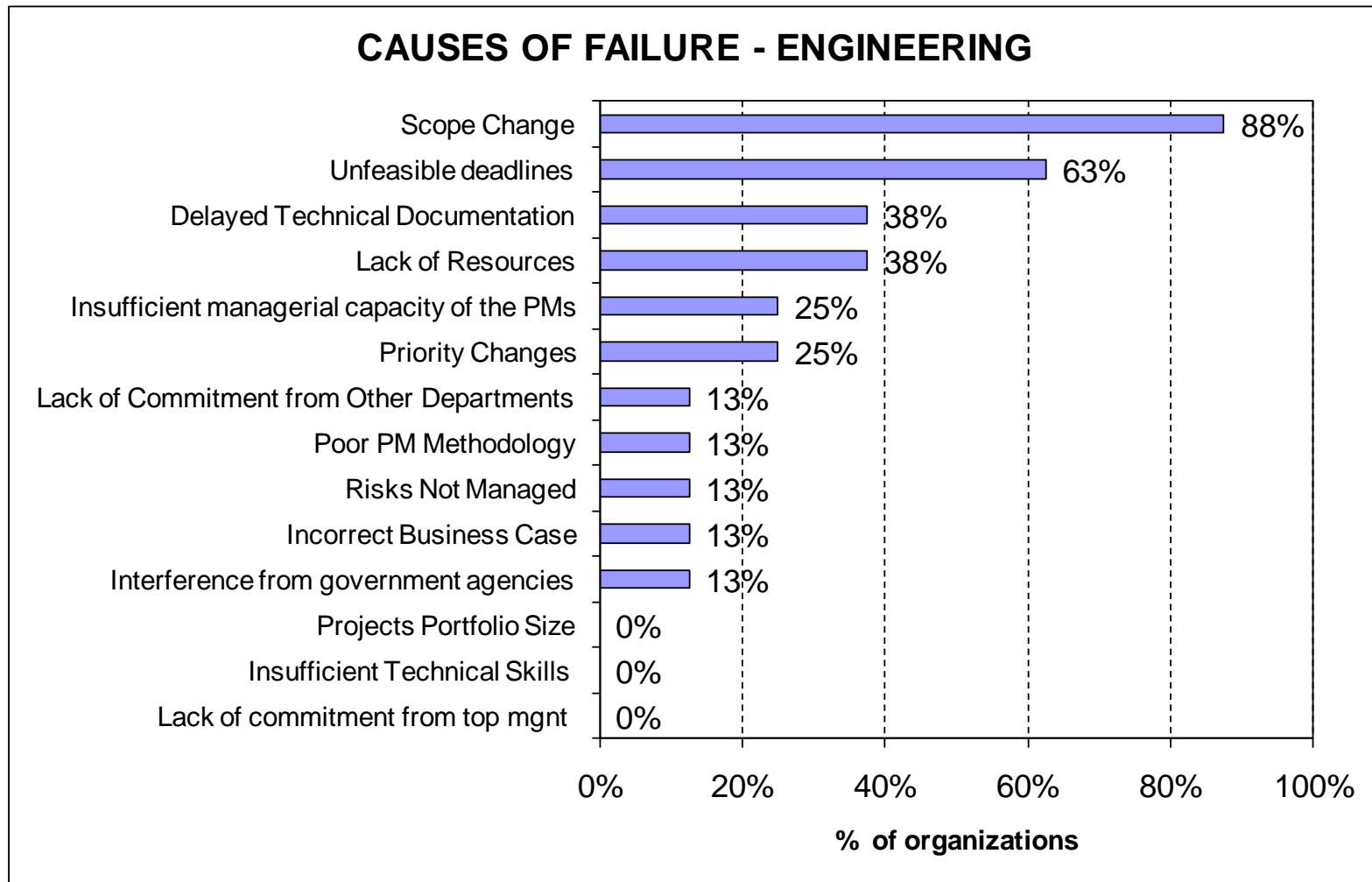


This sample's maturity: 2,90

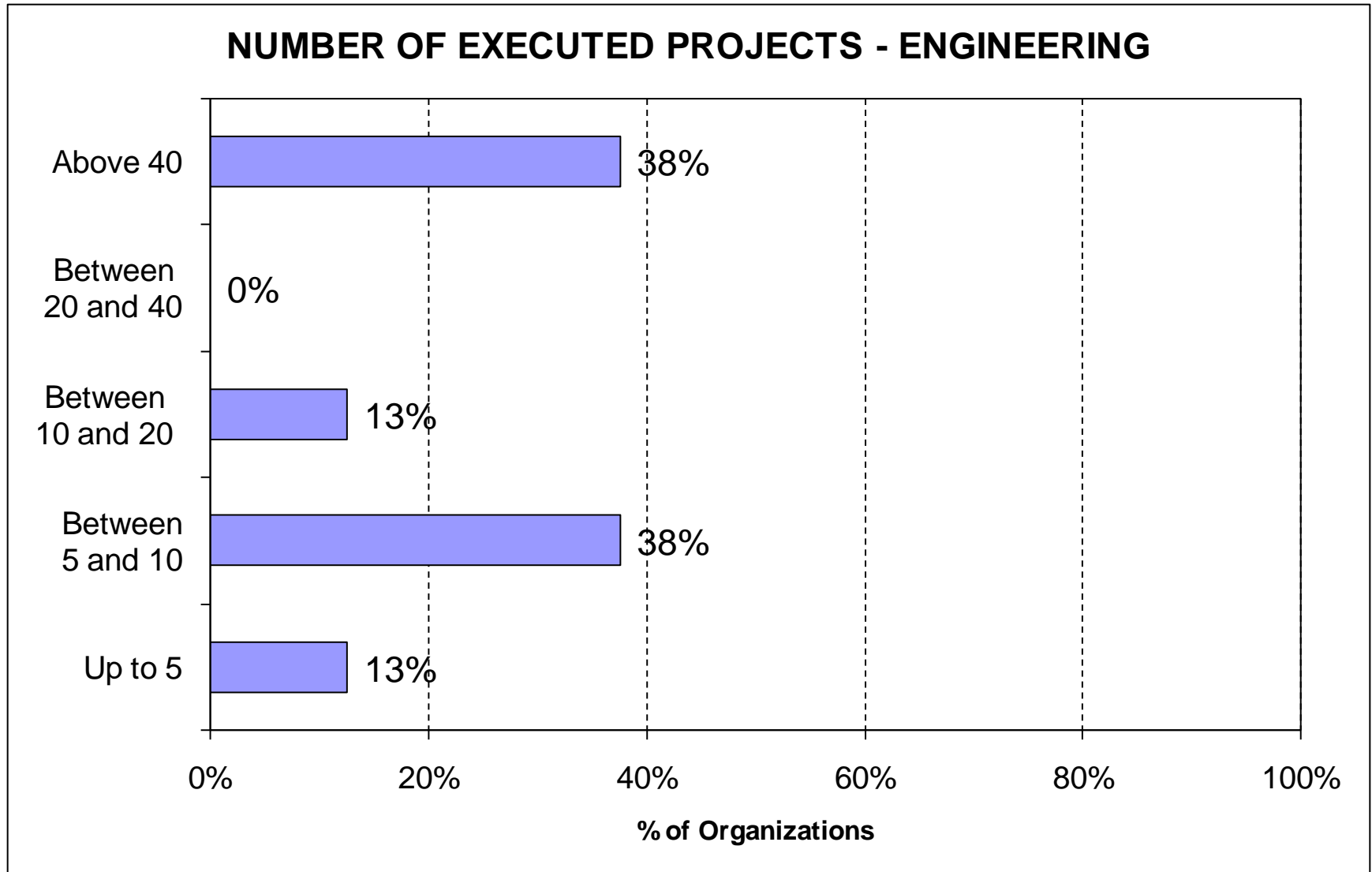
In the research, the participants were asked to point the three main causes of their projects failure, according to the following list:

- Incomplete or incorrect Business Case (or Business Plan)
- Frequent scope change
- Frequent priority changes among the projects portfolio, coming from top management
- Unfeasible deadlines
- Project portfolio size well beyond the departments' capacity to deliver
- Insufficient or inadequate commitment from other departments
- Insufficient or inadequate commitment from top management
- Lack of human, financial and material resources
- Poor methods, tools and techniques for the projects management (deadlines and costs)
- Insufficient managerial capacity of the Project Managers (Work Coordinator, Contract Manager, Engineering Manager, etc.).
- Technical skills of the supervision/execution team (works or engineering) insufficient or inadequate to the challenges
- Risks not properly managed
- Interference from control and supervision government agencies
- Technical documentation not delivered by the hirer with acceptable time

Failure Causes for the Engineering Subcategory

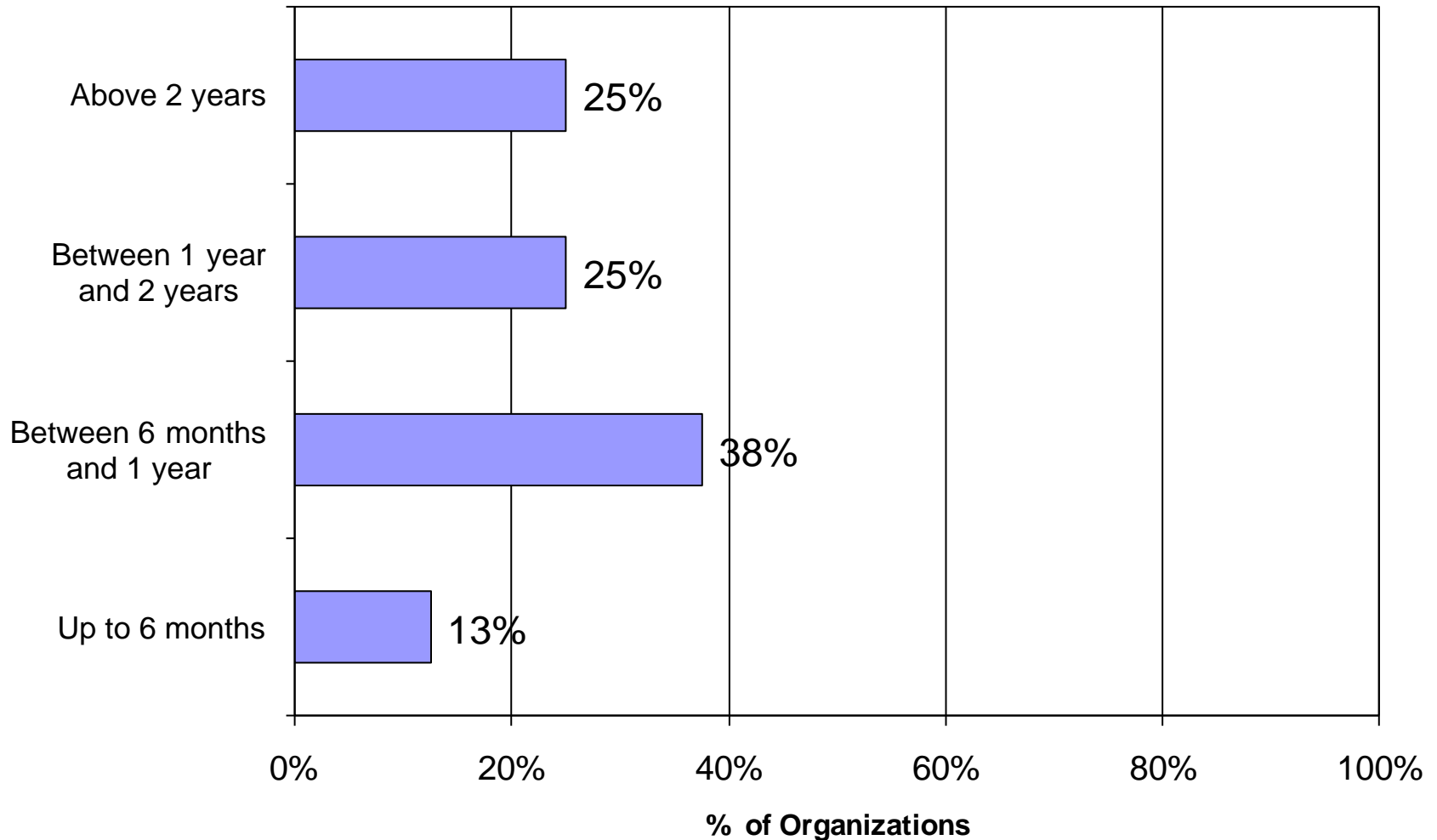


Sample: 8 participants



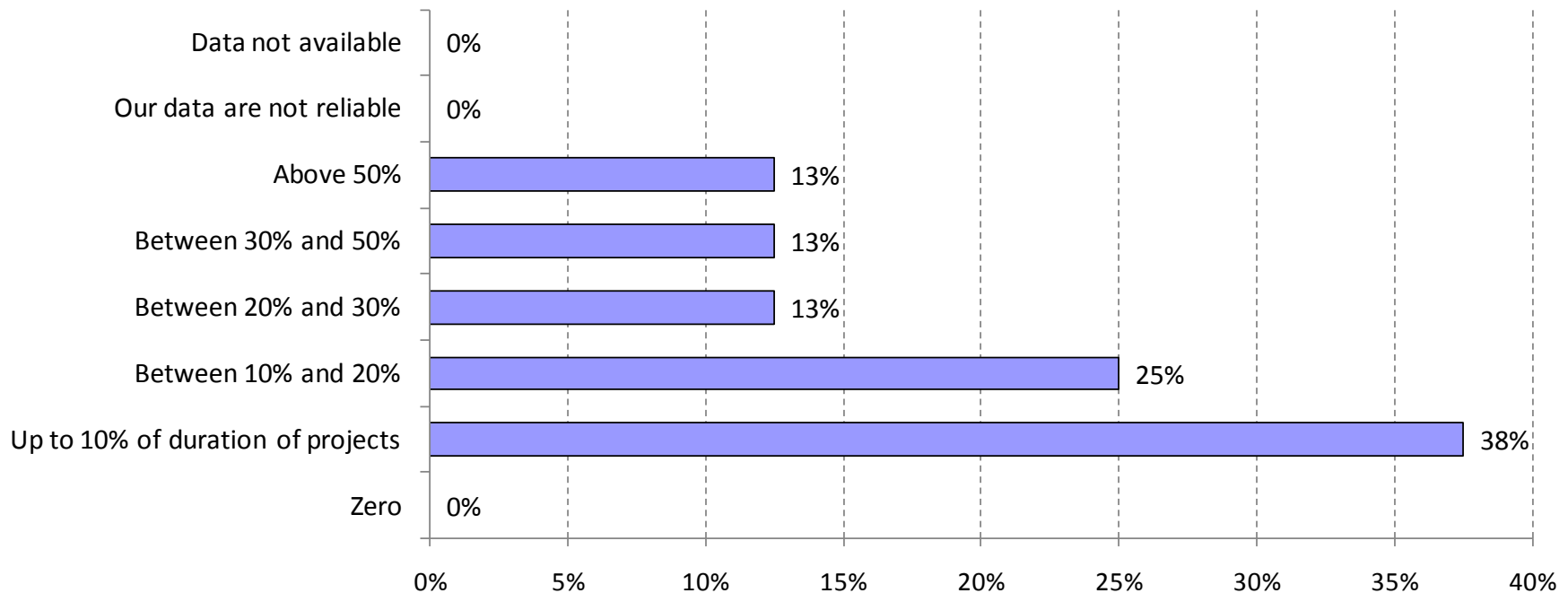
Sample: 8 participants

AVERAGE DURATION OF PROJECTS - ENGINEERING



Sample: 8 participants

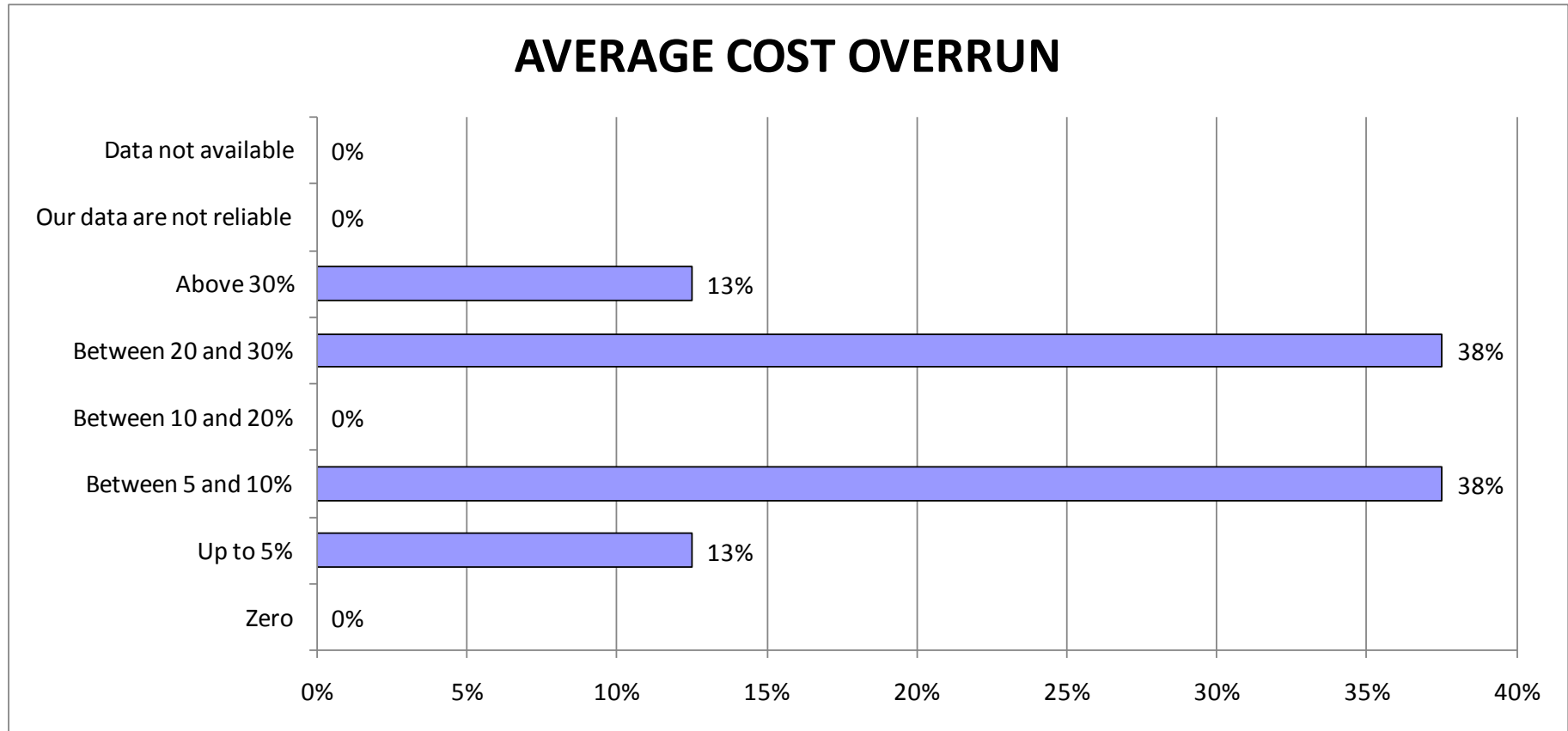
AVERAGE PROJECT DELAY - ENGINEERING



Comment: 62% of the projects had a delay higher than 10% of the initial estimate.

Sample: 8 participants

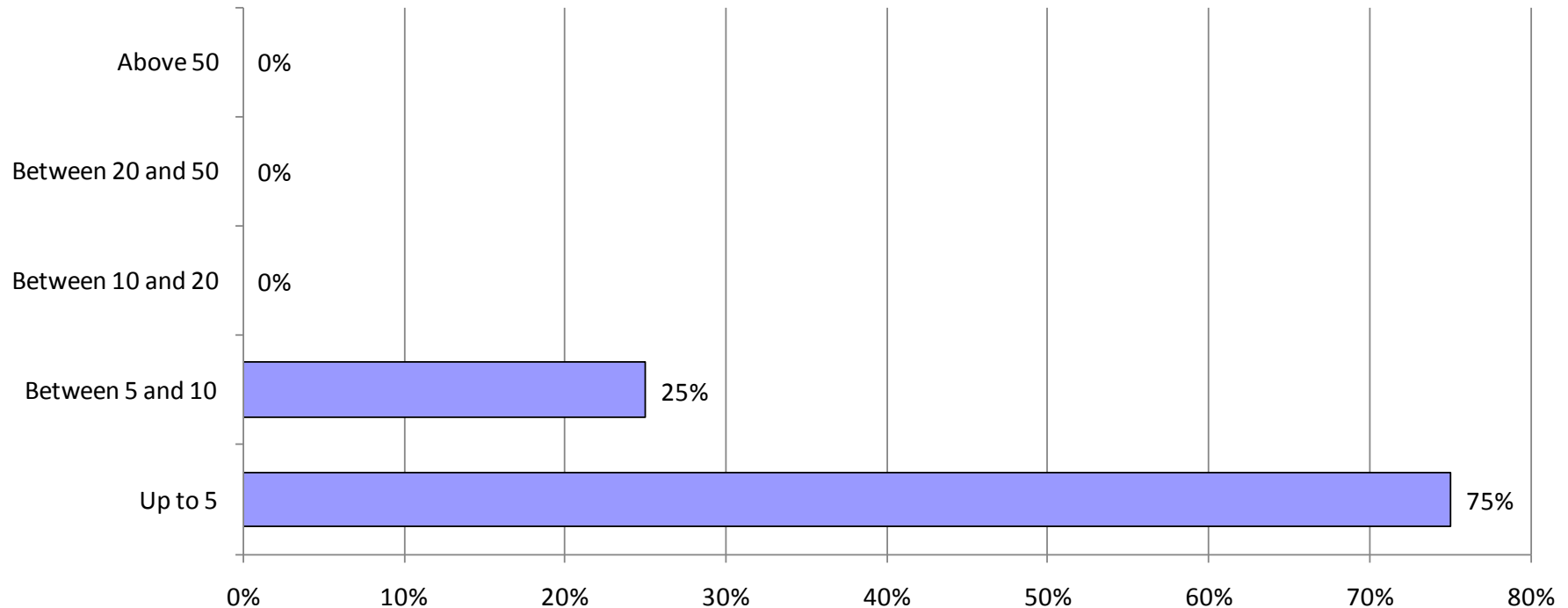
Projects Average Cost Overrun



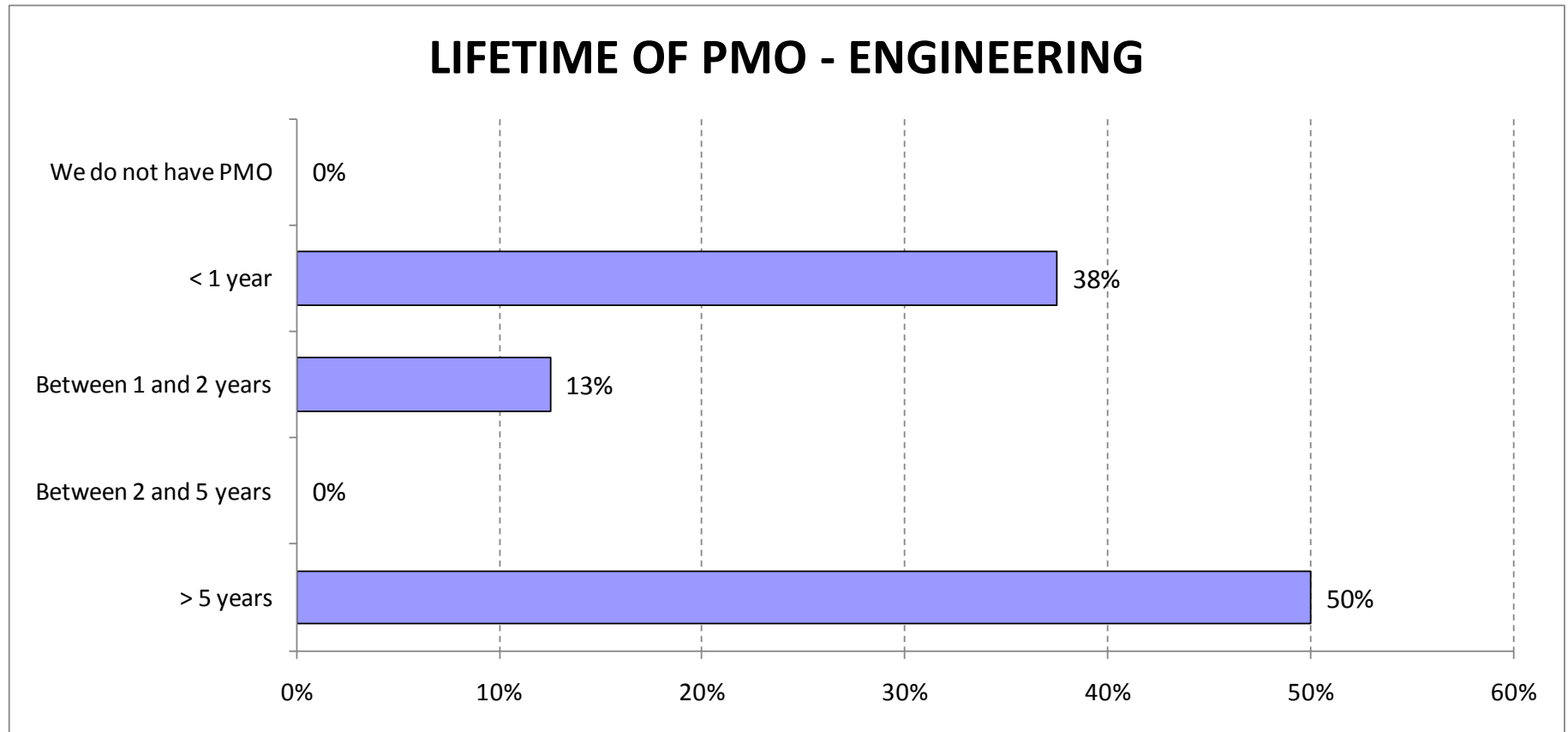
Note: 51% of the projects had a cost overrun higher than 10%

Sample: 8 participants

NUMBER OF PROJECT MANAGERS - ENGINEERING



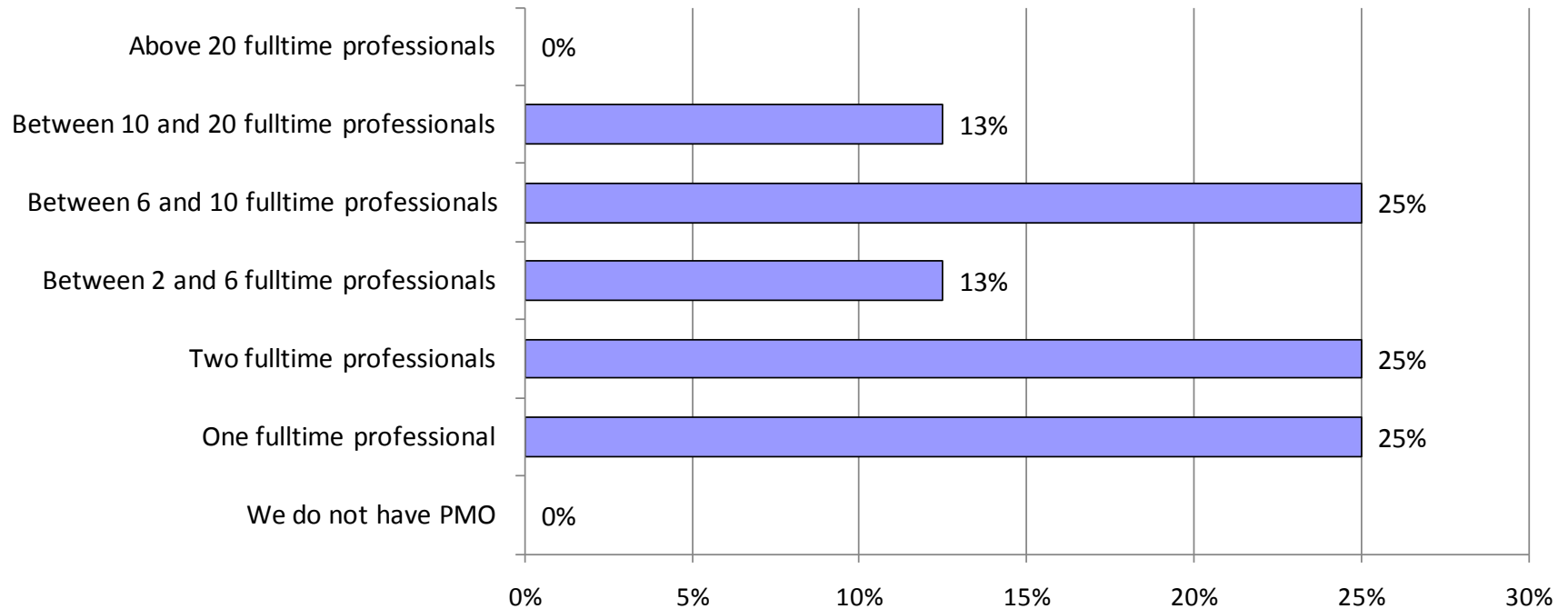
Sample: 8 participants



Note: half of the PMOs is above 5 years old

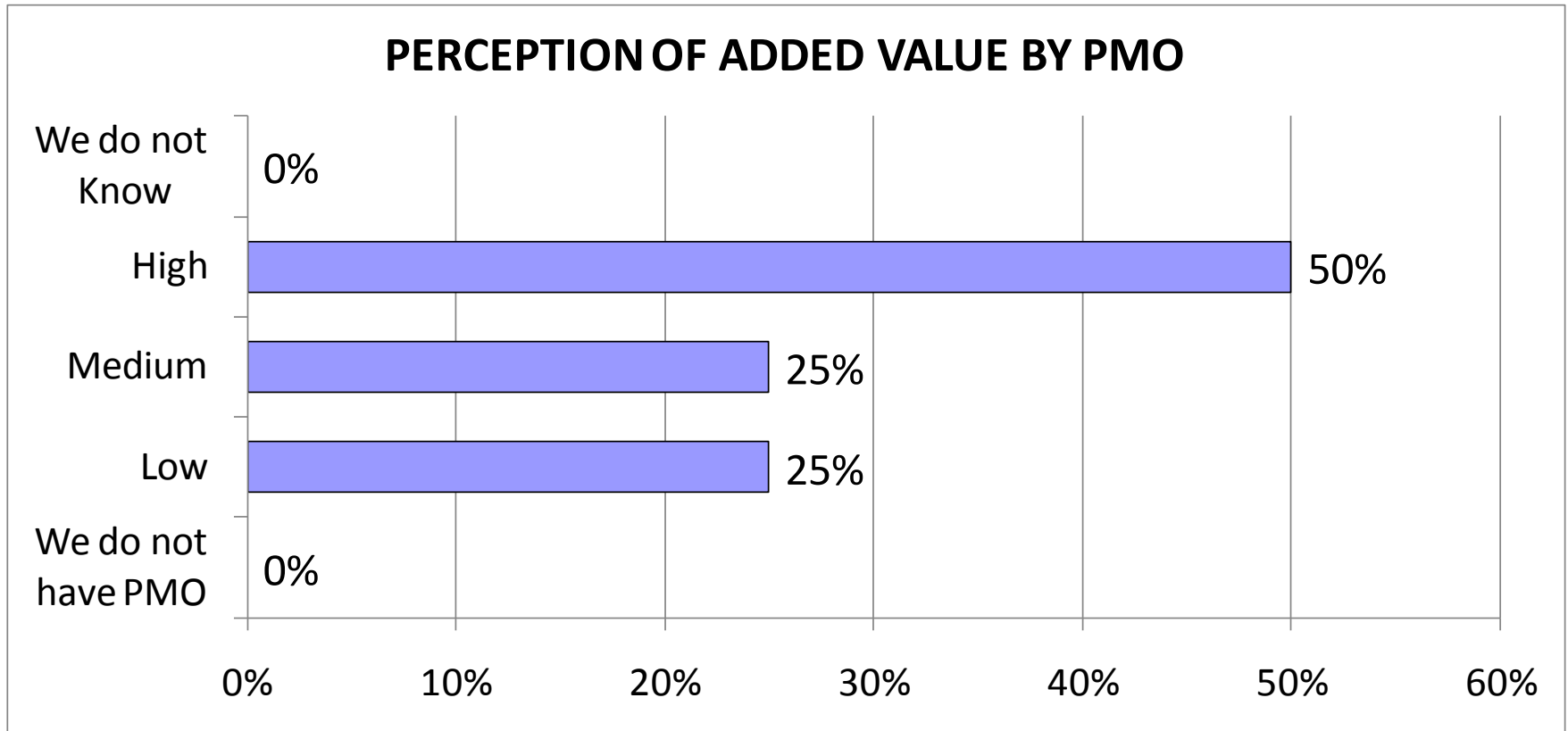
Sample: 8 participants

NUMBER OF PROFESSIONALS AT PMO - ENGINEERING



Note: 75% of the organizations have at least 1 fulltime employee in the PMO

Sample: 8 participants



Note: Engineering organizations have a very good perception of the importance of the PMO

Sample: 8 participants

INDUSTRIAL CONSTRUCTION

(Projects of “Industrial Construction for External Clients” subcategory)

| EARNINGS | # PARTICIP. |
|---------------------------------------|-------------|
| < US\$ 300.000 | 0 |
| US\$300.000 a R\$ 1,7 millions | 0 |
| US\$1,7 millions to US\$ 7 millions | 0 |
| US\$7 millions to US\$ 70 millions | 1 |
| US\$ 70 millions to US\$ 700 millions | 6 |
| > US\$ 700 millions | 0 |

| STATE | # Part. |
|-------|---------|
| MG | 4 |
| SP | 3 |

Participants used the following definition of success:

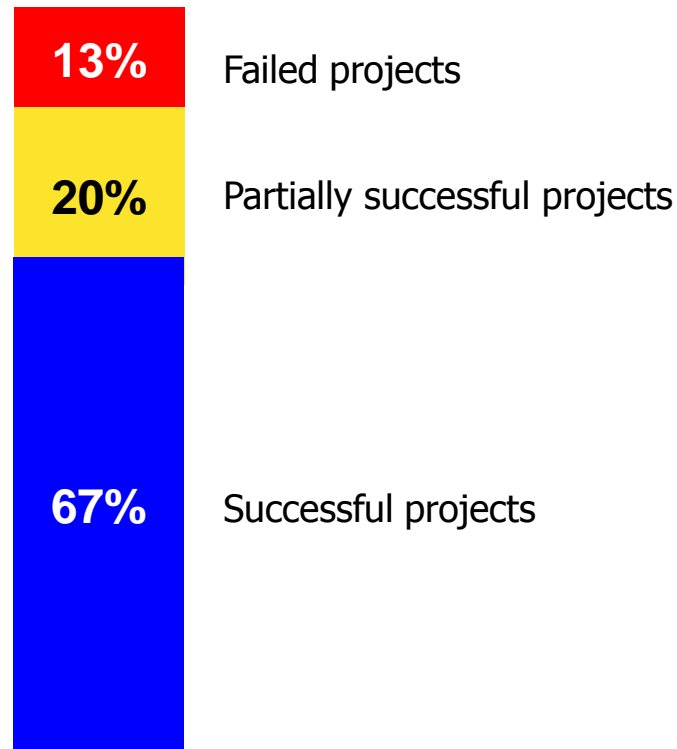
Complete success: the works were completed within the planned time, scope and budget (insignificant differences are accepted). The customer was very satisfied with the delivered product. The company obtained the expected financial profit and there is no technical, legal or labour significant liabilities. There was no severe accident during construction.

Partial success: the works were completed and delivered. However, compromising events happened (significant delay and/or significant cost overrun) that significantly decreased the works profitability; or there are minor technical, legal or labour liabilities that will certainly reduce the expected financial profit; and/or the customer received the work, but was not satisfied; and/or accidents occurred, but their severity did not exceed the reference parameters.

Failure: the works were not completed or the delay and/or cost overrun were so steep that there was a financial deficit; or there are extremely significant technical, legal or labour liabilities that will certainly lead to financial deficit; and/or the customer does not agree to accept the works; and/or severe accidents that harmed the reputation of the company occurred during construction.

AVERAGE OF SUCCESSFUL PROJECTS: **67 %**

(Sample: 7 participants)



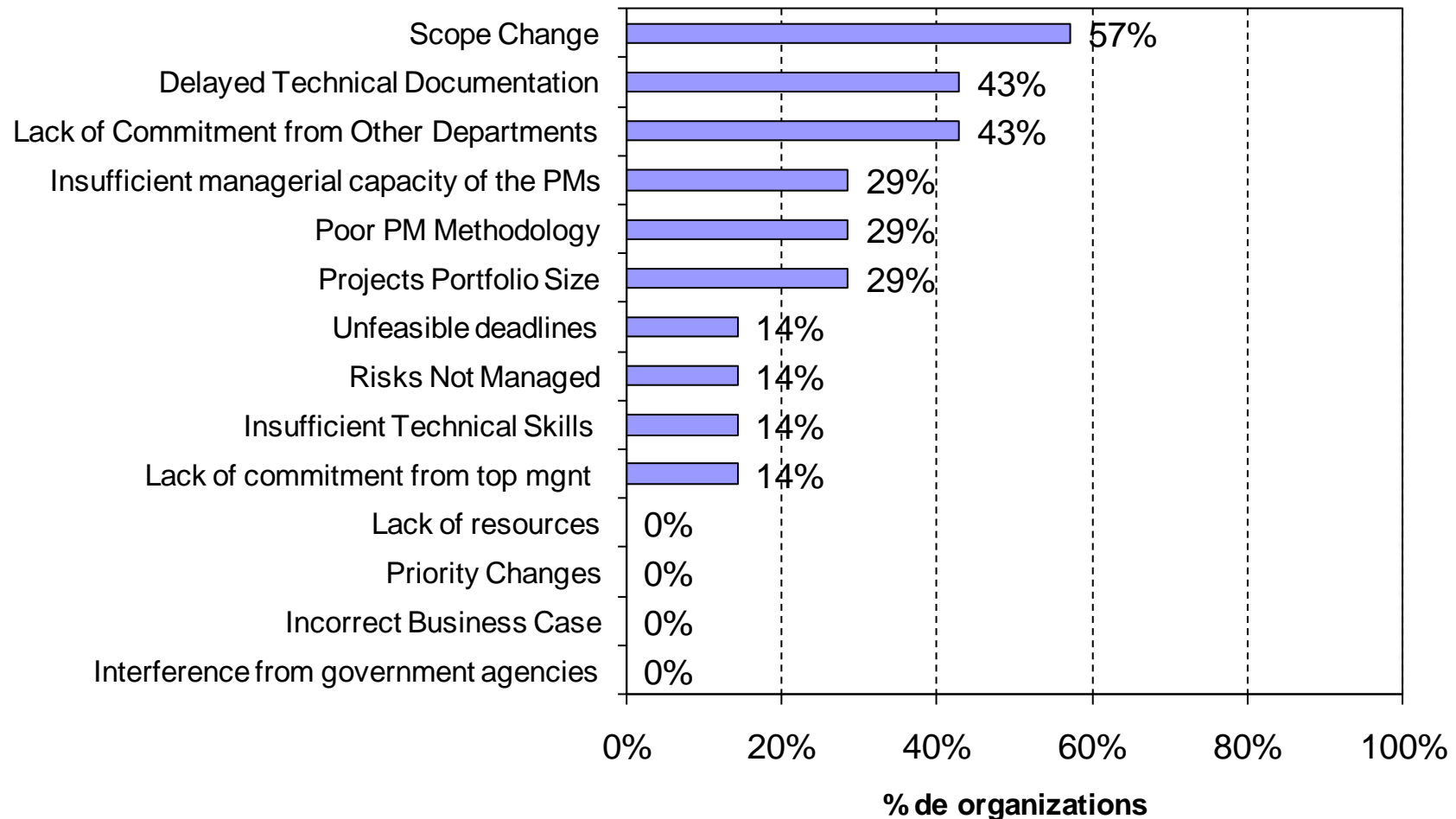
This sample's maturity: 2,90

In the research, the participants were asked to point the three main causes of their projects failure, according to the following list:

- Incomplete or incorrect Business Case (or Business Plan)
- Frequent scope change
- Frequent priority changes among the projects portfolio, coming from top management
- Unfeasible deadlines
- Project portfolio size well beyond the departments' capacity to deliver
- Insufficient or inadequate commitment from other departments
- Insufficient or inadequate commitment from top management
- Lack of human, financial and material resources
- Poor methods, tools and techniques for the projects management (deadlines and costs)
- Insufficient managerial capacity of the Project Managers (Work Coordinator, Contract Manager, Engineering Manager, etc.).
- Technical skills of the supervision/execution team (works or engineering) insufficient or inadequate to the challenges
- Risks not properly managed
- Interference from control and supervision government agencies
- Technical documentation not delivered by the hirer with acceptable time

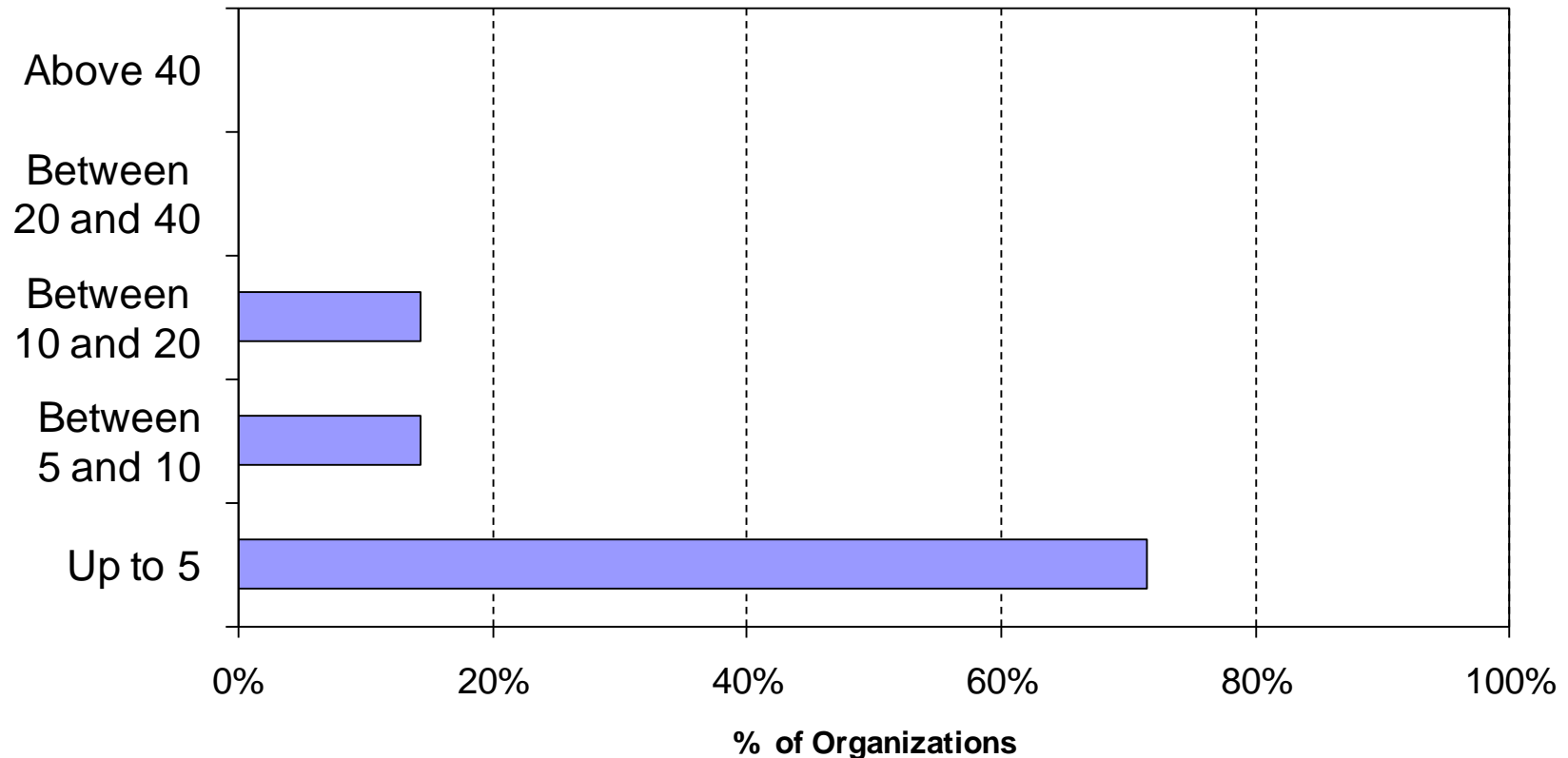
Failure Causes for the Industrial Construction Subcategory

CAUSES OF FAILURE - CONSTRUCTION

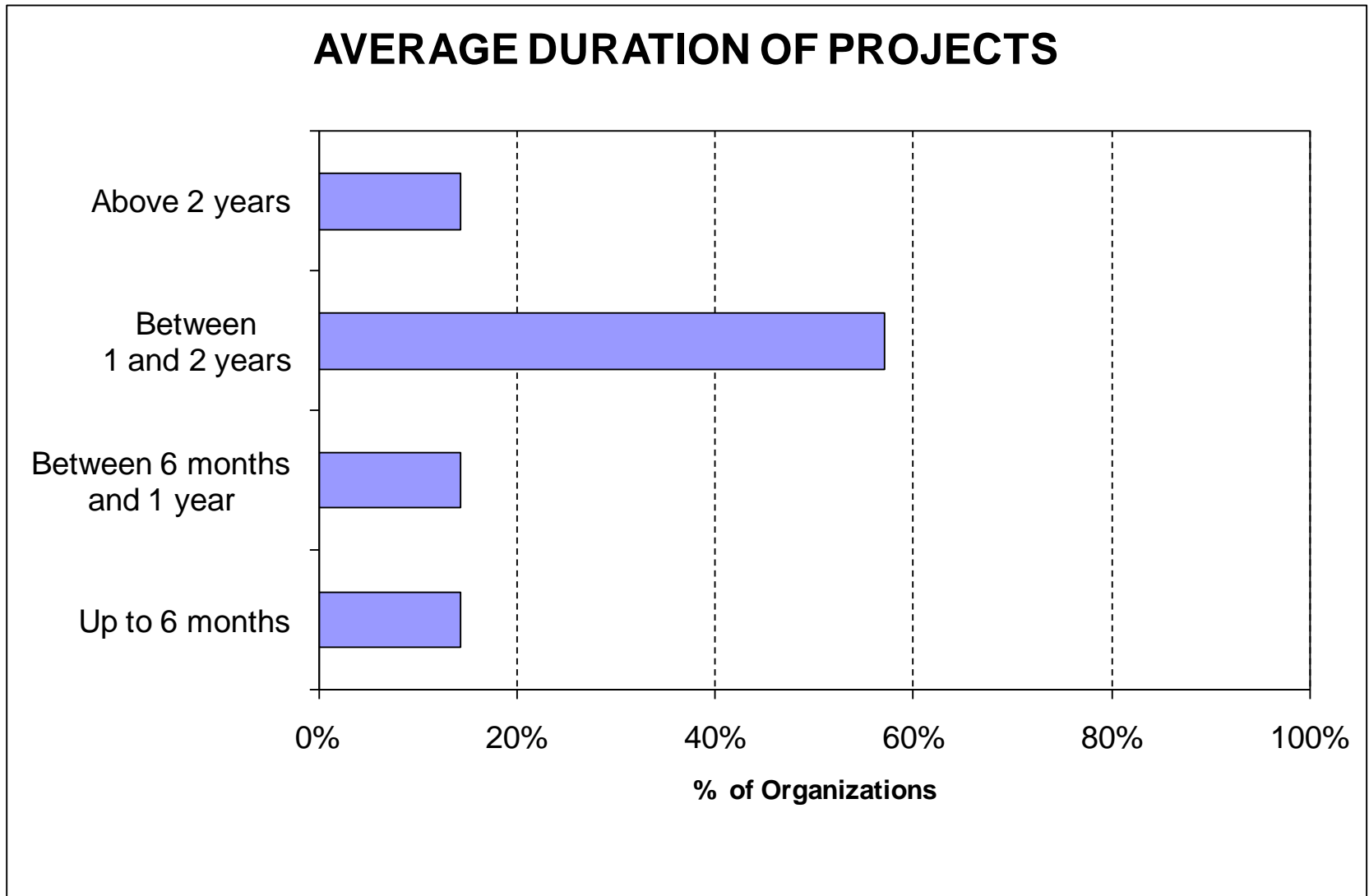


Sample: 7 participants

EXECUTED PROJECTS - CONSTRUCTION

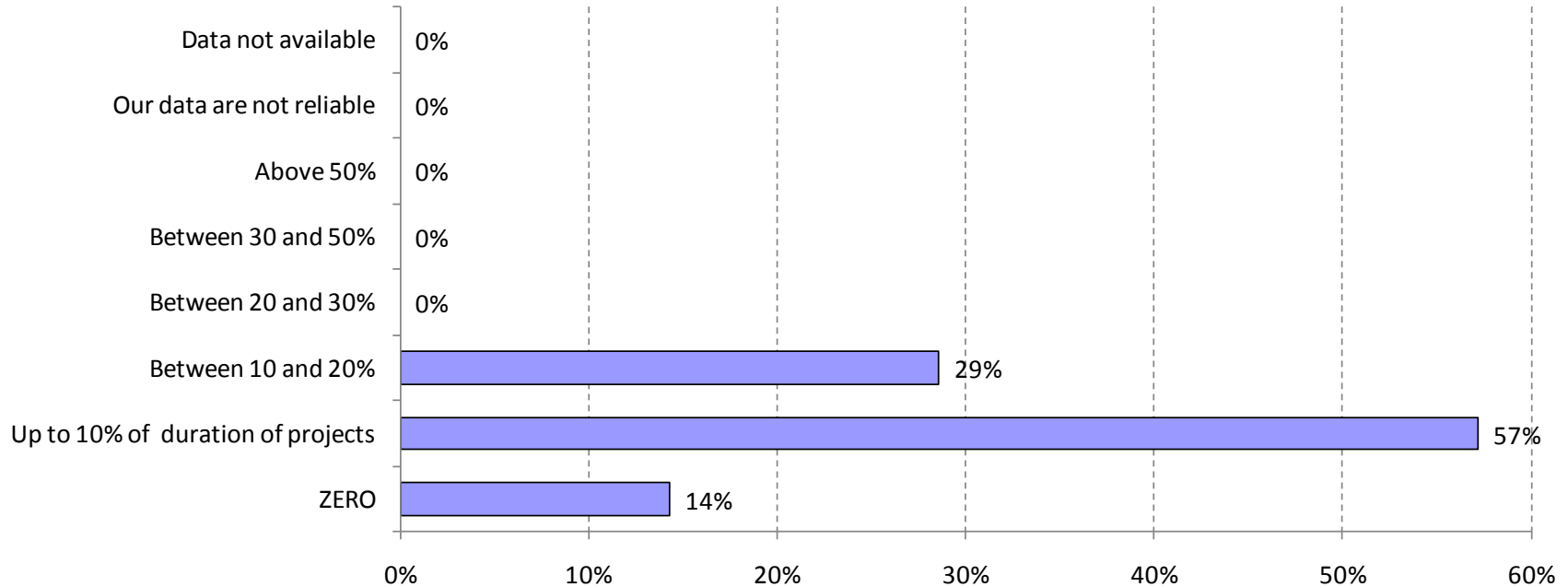


Sample: 7 participants



Sample: 7 participants

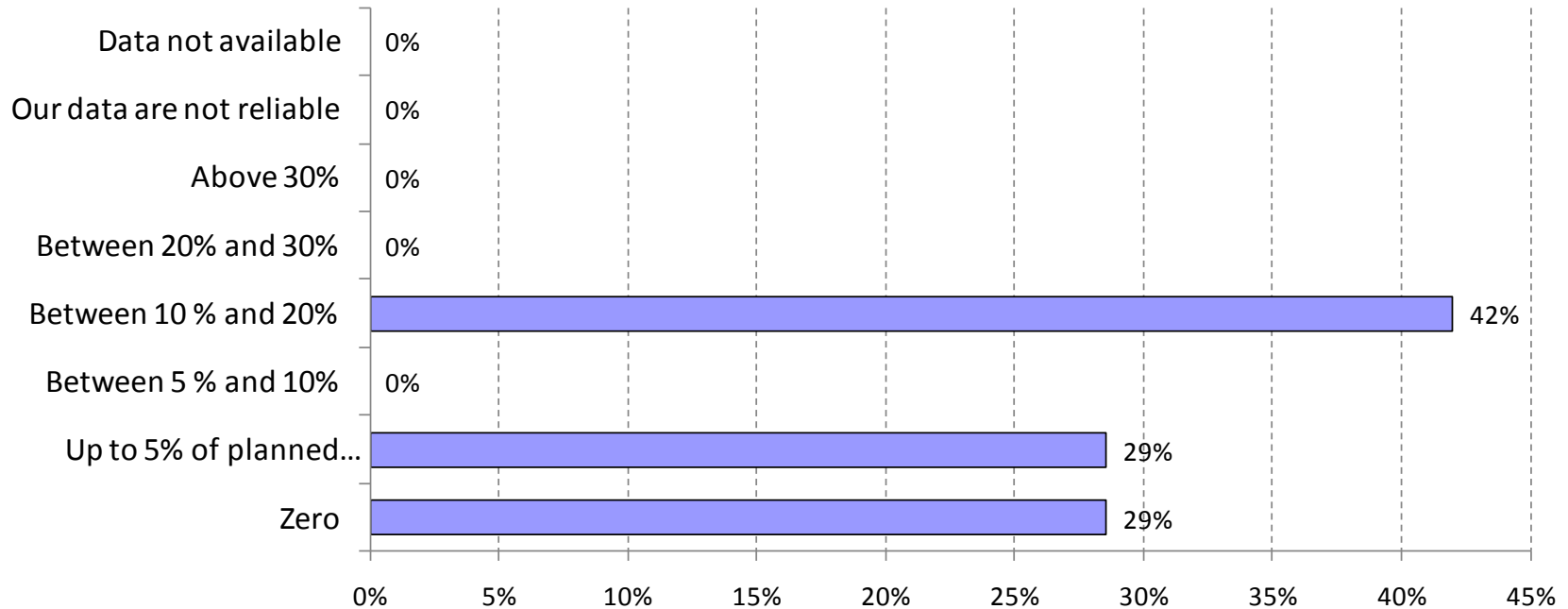
AVERAGE DELAY OF PROJECTS - CONSTRUCTION



Comment: 29% of the projects had a delay higher than 10% of the initial estimate.

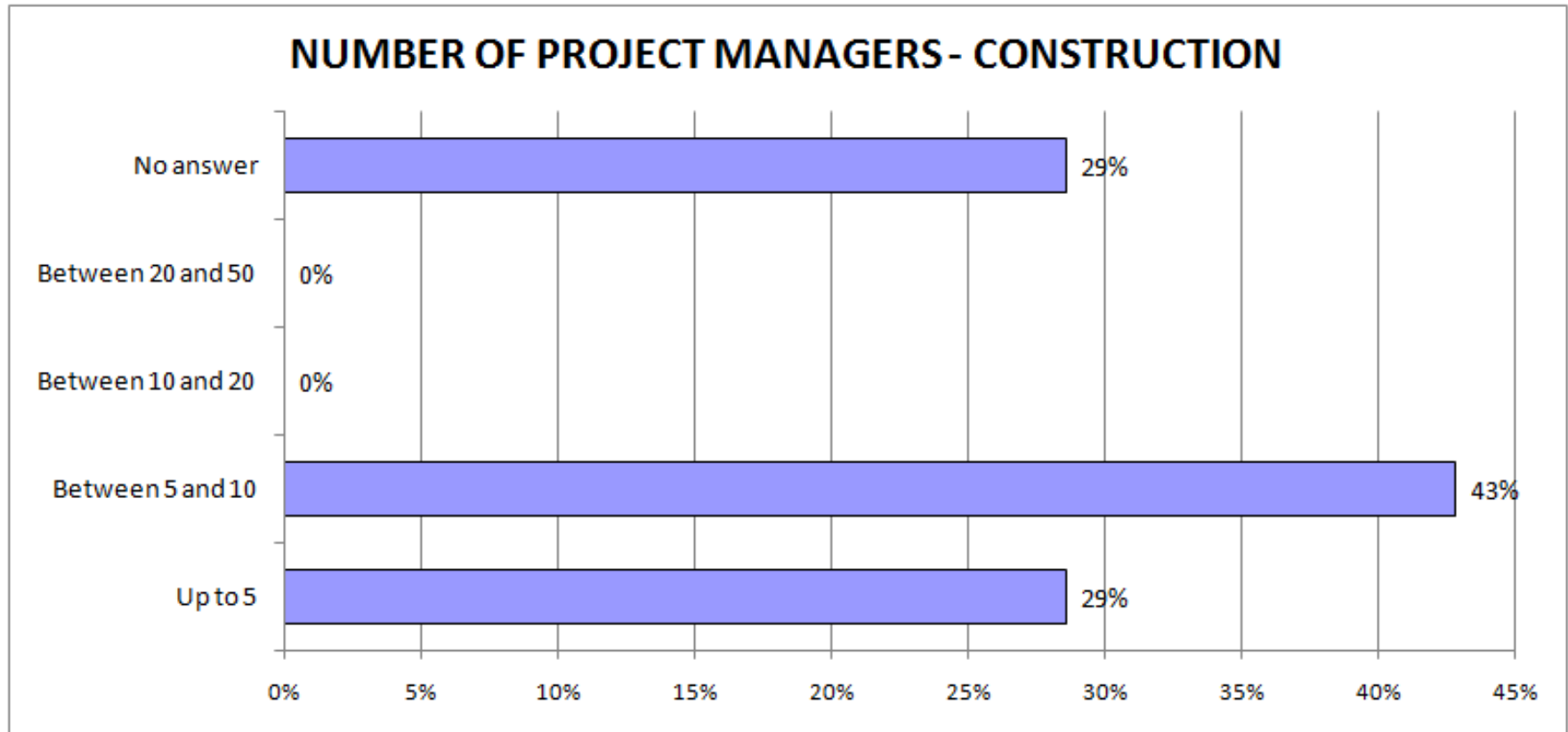
Sample: 7 participants

COST OVERRUN - CONSTRUCTION



Note: 43% of the projects had a cost overrun higher than 10%

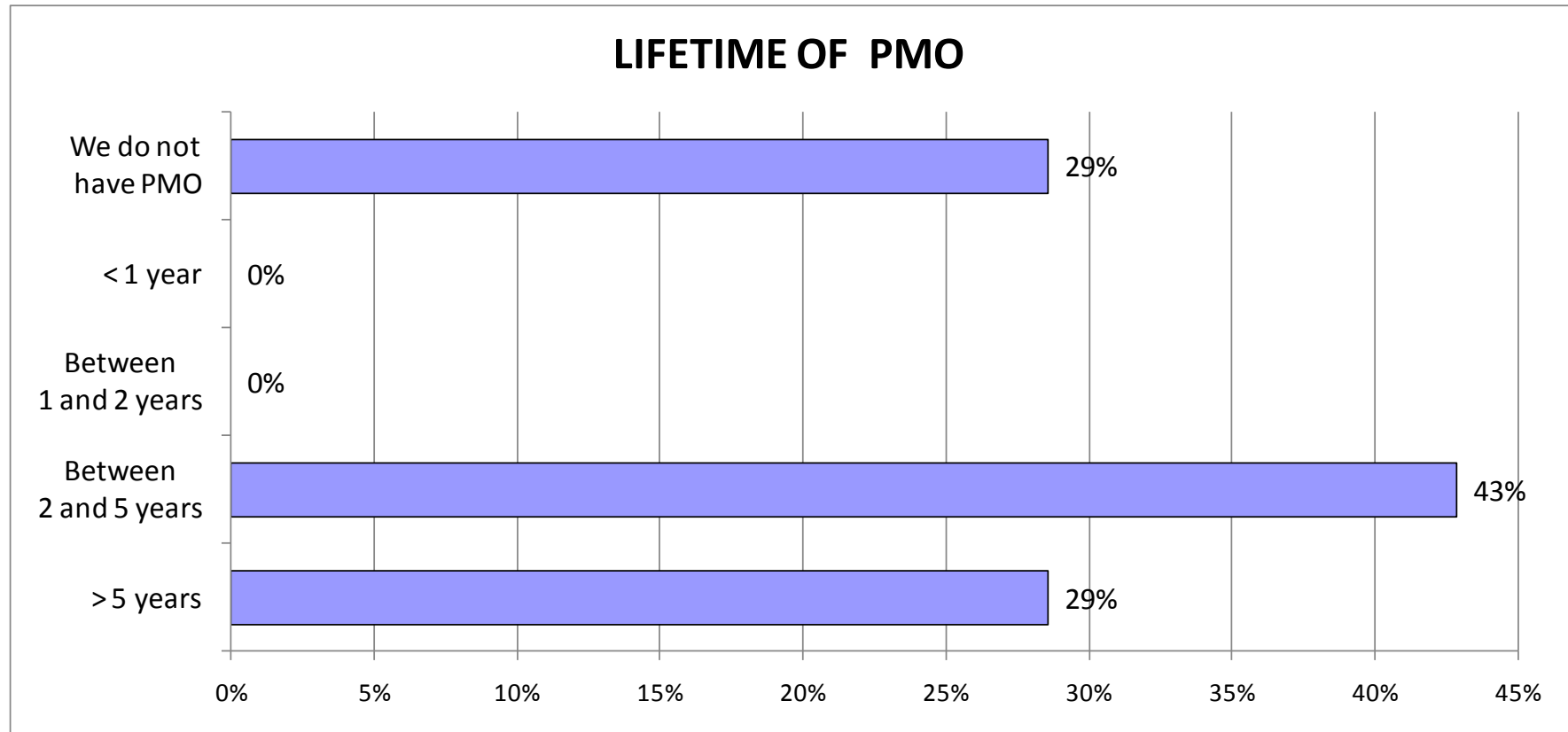
Sample: 7 participants



Comentário: This work function has several different designations in the Construction business.

Maybe it explains the high number of companies that did not answer.

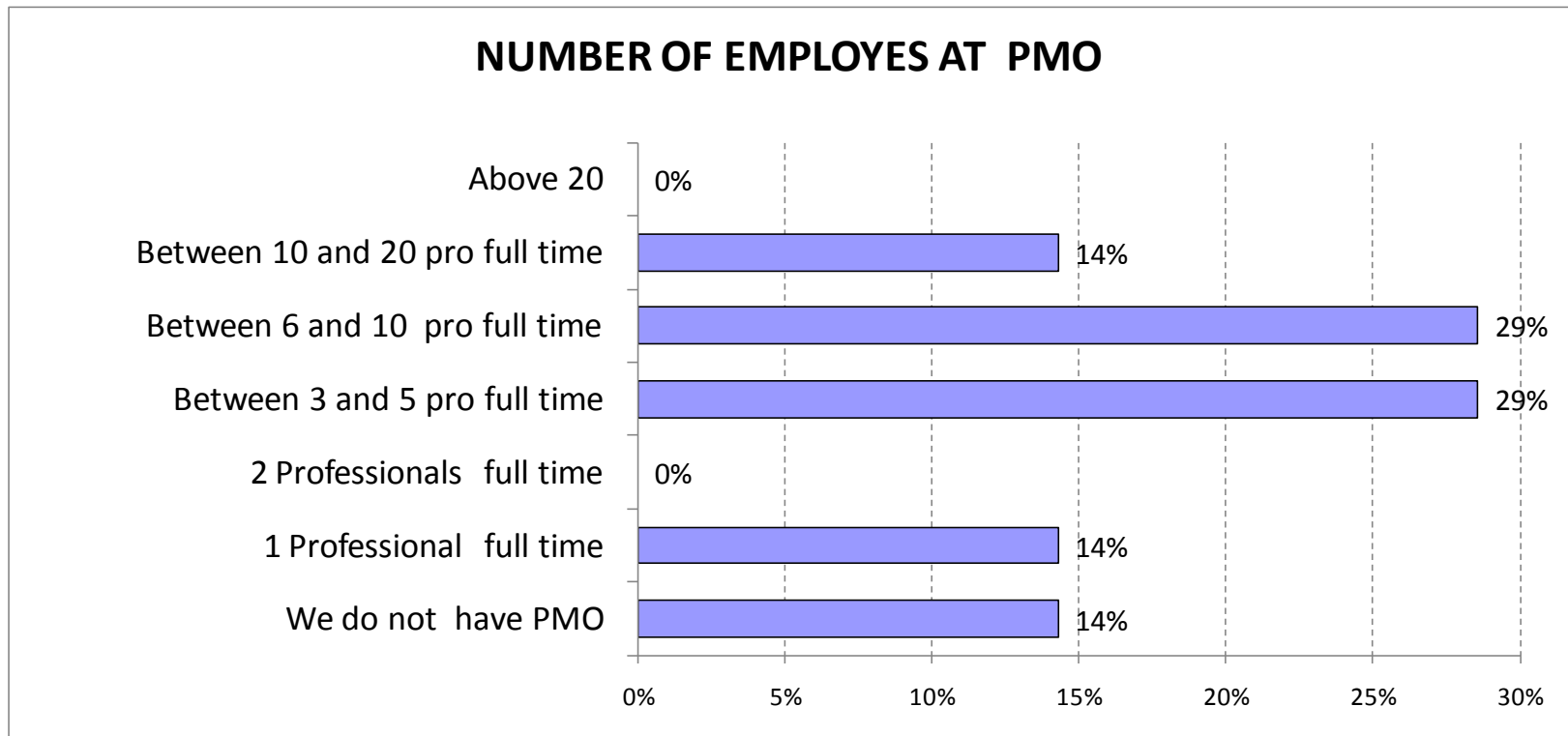
Sample: 7 participants



Comentário: 71% of thre PMOs have a lifetime greater than 2 years.

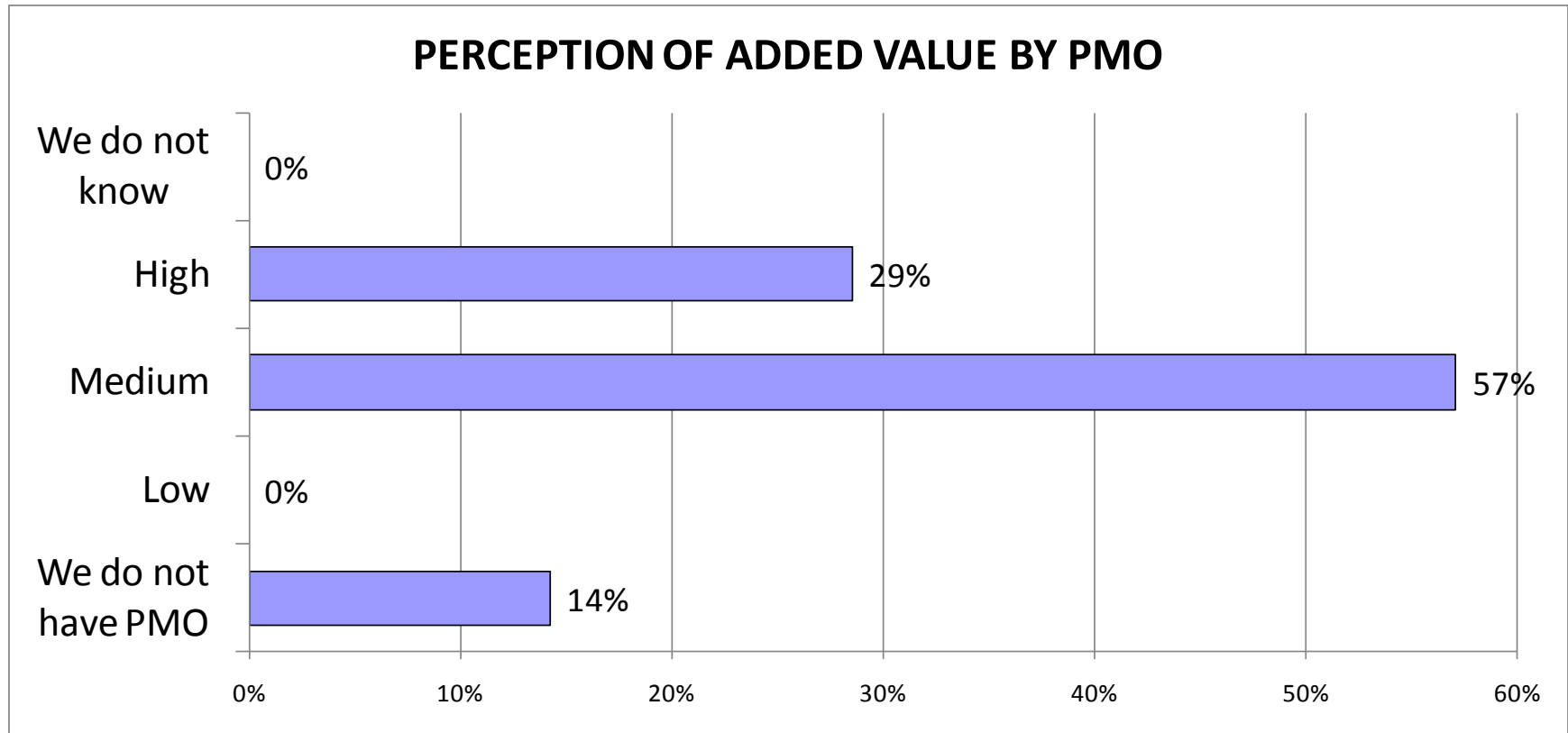
Sample: 7 participants

Number of Employees in the PMO



Note: Most of the organizations have at least 1 fulltime employee in the PMO

Sample: 7 participants



Note: Construction organizations have a very good perception of the importance of the PMO

Sample: 7 participants

MAIN CONCLUSIONS OF THIS RESEARCH

- The average overall success level is 60%, being 58% for the Engineering subcategory and 67% for the Industrial Construction subcategory.
- The maturity level 4 corresponds to a success level greater than 80%.
- There is a positive relationship between success and maturity.
- The PMO is a key factor for the maturity and success evolution, considering the two subcategories analyzed. In the Engineering organizations it is observed that when the PMO lifetime is higher than 2 years the best maturity values (3,20) are found. The same happens with the Industrial Construction organizations, where a maturity of 3,65 is observed for those organizations whose PMOs lifetime is higher than 2 years.

- In general, there is significant agreement among the organizations surveyed about the importance of the PMO to projects success. However, it is not yet a consolidated role in the organizations.
- In general, the Project Manager role is the one with the highest lifetime numbers. As the PMO, the Committee is an organizational element not yet consolidated in the two analyzed subcategories.
- The main cause of failure is still "change of scope". It reaches 88% in the Engineering subcategory and 57% in the Industrial Construction subcategory . Their sources point to deficiencies in the Project Management processes during the project life cycle (in other words, deficiencies in the Project Management platform).

Organizing Team and Acknowledgements

COMMITTEE

Russell Archibald, Darci Prado, Carlos E. Andrade, Fernando Ladeira,
Manuel Carvalho Filho, Marcus Vinicius Marques and Warlei Oliveira

GENERAL COORDINATION

Darci Prado

WEBSITE DEVELOPMENT AND MAINTAINANCE

Portuguese and English languages: Warlei Oliveira, Carlos E. Andrade and José Carlos Tinoco
Italian language: Theodoro Procopiu, Lucas Pinheiro, Carlos E. Andrade and Italian team

DATABASE

Carlos E. Andrade

DATA HANDLING

Marcus Vinicius Marques, Bruno Machado and Renata Ferreira

SUMMARY REPORT

Darci Prado, Warlei Oliveira and Daniel Lages von Sperling

ENGINEERING & CONSTRUCTION COMPLETE REPORT

Organized by: Cristiano Alvarenga
Authors: see Complete Report

PROMOTION

Darci Prado, Rosania Fernandes, Andriele Ribeiro, Maria Fátima B. Borssatto, Carlos Ely and Daniel Furletti.

- Support:
 -  **PZM**
MINAS GERAIS
 -  **SUCESU-MG**
www.sucesumg.org.br
 -  **SINDUSCON-MG**
CONSTRUINDO SOLUÇÕES
 -  **CBIC**
 -  **FGV**
management
 -  **ipmabr»**
 -  **REVISTA**
mundo **PM**
Project Management
- Promotion:
 - Organizations and Associations:
 - PMI: Chapters AM, BA, DF, ES, GO, MG, PE, PR, RJ, RS, SC e SP
 - IPMABr
 - MBC, ASBRAER, CBIC
 - SUCESU: ES, MG, PR, RJ, RS, SC, SP
 - SINDUSCON: ES, MG, PR, RJ, RS, SC, SP
 - CREA: MG e SP
 - FIEMG
 - IPT-SP
 - ANPEI
 - Postgraduate Schools
 - FGV, FUNDAÇÃO DOM CABRAL, IETEC, IBMEC

END