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Do project managers use indicators for measure performance in their projects?

Guillermo Montero Fernández – Vivancos[1]; Luis Onieva Giménez[1]; Javier Pajares Gutiérrez[2]

[1]Universidad de Sevilla; [2]Universidad de Valladolid;

Many authors acknowledge that use of project performance indicators is a key factor for its success, and allows to get a feedback and brings forward future behaviors. In this sense, we performed an exploratory survey in a non-probabilistic sample of project management experts and professionals to know the degree of use of this tool. 798 responses were obtained from different countries and sectors, which indicates a majority use of metrics, but with certain nuances such as the regularity in its use, what type of indicators are the most used or those related to earned value analysis that do not have as frequent use as we might expect.

Keywords: indicators; metrics; kpis; performance; project management; monitoring

¿Utilizan los directores de proyectos indicadores para medir el rendimiento de los proyectos?

Gran número de autores reconocen que el uso de indicadores de rendimiento de los proyectos es un factor clave de éxito en los mismos, que además permite obtener retroalimentación y adelantar comportamientos futuros. En esta línea, hemos realizado un estudio exploratorio en una muestra no probabilística de expertos y profesionales de gestión de proyectos para conocer el grado de uso de esta herramienta. Se han obtenido 798 respuestas procedentes de distintos países y sectores, que señala un uso mayoritario de dicha herramienta, pero con ciertos matices como la regularidad en su uso, qué tipo de indicadores son los más usados o como los relacionados con el análisis del valor ganado no tienen un uso tan frecuente como podría esperar.

Palabras clave: indicadores; métricas; kpis; rendimiento; gestión de proyectos; monitorización

Correspondencia: Guillermo Montero gmontero@us.es

DO PROJECT MANAGERS USE INDICATORS FOR MEASURE PERFORMANCE IN THEIR PROJECTS?

1. Introduction

This exploratory research focuses on the use of a questionnaire based on a non-probabilistic sample within 798 professionals and managers related to project management. The objective was to know the use of indicators in projects, using simple questions that included questions to characterize the sample, as well as to identify the use of indicators in the projects or the use of concrete indicators.

The results obtained have been analysed, firstly based on independent variables, both on the categorization of the sample, and on the variables used in the use of indicators. In a second analysis, two variables were analysed in order to identify dependency relations between the responses. This study focuses mainly on the search for relationships between the variables of use of indicators.

Finally, we consider the independence of the response obtained between Spanish professionals and the rest of the world.

2. State of Art

The use of indicators is popular in different areas as Accounting, Quality Control, Strategy, … However, the focus in measuring and monitoring particular aspects related to the management performance is relatively new. There is not an extensive bibliography about the use of performance measurements in Project Management, with the exception of specific areas, i.e. Earned Value Analysis, Maturity Models or project evaluation (Montero, Onieva, & Palacin, 2015).

Some authors are aware of the importance of using measures to achieve required results in the projects (Bourne, Mills, Wilcox, Neely, & Platts, 2000; Bryde, 2005). There is a relationship between project management performance and project success (Frinsdorf, Zuo, & Xia, 2014; Mir & Pinnington, 2014). In fact, the use of metrics in projects, programmes and portfolios is considered as a success factor to get a feedback or anticipate future behaviours (Atkinson, 1999; Cooke-Davies, 2002; Mir & Pinnington, 2014; Munns & Bjeirmi, 1996). The performance indicators have highest impact over the project performance (Qureshi, Warraich, & Hijazi, 2009).

3. Research Framework

The study is based in an exploratory research in order to obtain a preliminary and indicative analysis.

It has been chosen for a non-probabilistic sampling among professionals with experience in project management, as well as with those that take part actively in forums and groups of social networks.

The research team developed two questionnaires, one in Spanish and another one in English, validated initially in a pilot test. The channel selected for the development of this exploratory study was through a web questionnaire.

For developing the survey, an anonymous questionnaire is used, which constitutes a formalized plan to collect data of the respondents and a correct design of the same allows avoiding later biases (Taylor & Kinnear, 1995).

As we said before, the used sample for the research was groups of experts related to project management. This people were located in associations like AEIPRO, IPMA, different PMI chapters or alumni from project management courses. The data capture period was two months, obtaining 798 responses.

4. Research Results

For information, the next figures show the characterization of the sample, performed on the study.

**Figure 1: Characterization of respondents.**
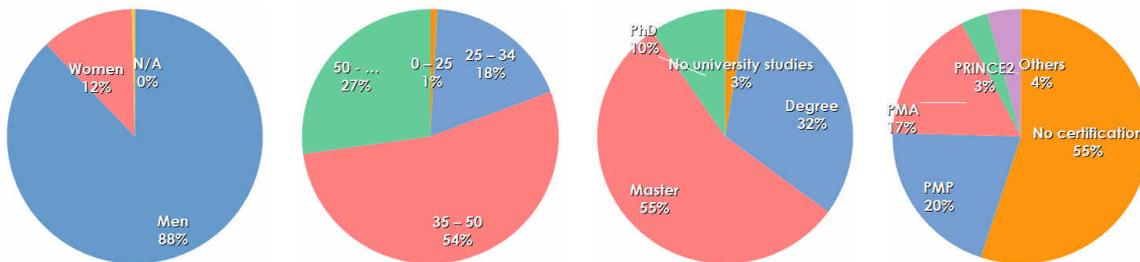
Figure 2: Characterization of respondents (cont.).
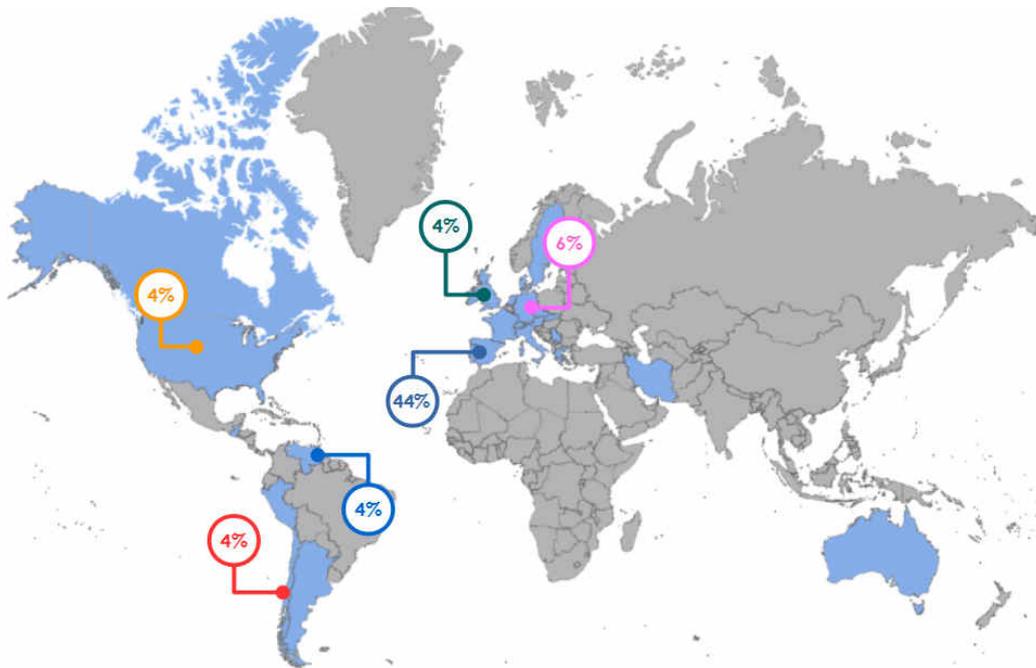
The detail of frequencies in the study appears in the following tables. Table 1 shows the distribution by gender of the people surveyed, where there is a clear predominance of male gender.

Table 1: Characterization of sample according to gender.

Gender	Frequency	
	Absolute	Relative
Male	701	87.84%
Female	94	11.78%
N/A	3	0.38%

The Table 2 shows the distribution of the sample for age, with a high percentage of persons in a band of age from 35 to 50 years, followed for major of 50.

Table 2: Characterization of sample according to age.

Age	Frequency	
	Absolute	Relative
0 – 25	7	0.88%
25 – 34	147	18.42%
35 – 50	427	53.51%
50 - …	217	27.19%

Most of the sample has a minimum level of university studies (see Table 3).

Table 3: Characterization of sample according to study level.

Study level	Frequency	
	Absolute	Relative
Without university studies	21	2.63%
Bachelor Degree	259	32.46%
Master's Degree	441	55.26%
PhD, Doctorates	77	9.65%

An interesting aspect to consider is a participation of 55 % of executives or professionals without certification in Project management (PMP, IPMA, PRINCE2...) and almost 45% certified. The Table 4 shows the distribution of the sample according to the type of certification.

Table 4: Characterization of sample according to type of certification.

Certification in Project Management	Frequency	
	Absolute	Relative
None	455	55.08%
PMP	168	20.34%
IPMA	140	16.95%
PRINCE2	28	3.39%
Others	35	4.24%

Though a clear predominance of answers exists from Spain, response came from 26 countries. The distribution for countries shows itself in the Table 5. Later, there appear the results segregated for Spain and the rest of the world.

Table 5: Characterization of sample according to country.

Country	Frequency		Country	Frequency	
	Absolute	Relative		Absolute	Relative
Argentina	14	1.75%	Italia	14	1.75%
Australia	14	1.75%	Kosovo	7	0.88%
Austria	14	1.75%	Netherlands	7	0.88%
Canada	14	1.75%	Peru	14	1.75%
Chile	63	7.89%	Portugal	7	0.88%
Czech Republic	7	0.88%	Serbia	7	0.88%
Denmark	7	0.88%	Slovakia	7	0.88%
France	14	1.75%	Spain	350	43.86%
Germany	49	6.14%	Sweden	14	1.75%
Greece	7	0.88%	Switzerland	21	2.63%
Guatemala	14	1.75%	United Kingdom	35	4.39%
Iran	14	1.75%	USA	35	4.39%
Ireland	14	1.75%	Venezuela	35	4.39%

Going into detail on the results on the use of indicators, theses appears in the following tables.

In a first question, the maturity of the Project management was valued in terms of planning by means of an ordinal scale of five levels. It is necessary to bear in mind that these values are subjective. The Table 6 shows the results of the exploration, but almost 60% of responders considers that their projects are planned to regulate and systematically with a high level of maturity (4 or 5).

Table 6: Results related to maturity in project planning.

Level	Frequency		
	Absolute	Relative	Accumulate
1 Informal or minimal planning	49	6.14%	6.14%
2	63	7.89%	14.04%
3	210	26.32%	40.35%
4	308	38.60%	78.95%
5 All project management areas are planned	168	21.05%	100.00%

The objective of this question was orientative, to focus the respondent on the central theme of the study, the use of indicators.

Table 7: Results related to maturity in project monitoring.

Level	Frequency		
	Absolute	Relative	Accumulate
1 Informal or minimal monitoring	35	4.39%	4.39%
2	77	9.65%	14.04%
3	168	21.05%	35.09%
4	364	45.61%	80.70%
5 All project management areas are monitored	154	19.30%	100.00%

The following question also valued the maturity in the monitoring and control of projects. The scale used has a structure parallel to that used to assess planning. The Table 7 shows the results obtained, with maturity levels similar to those of planning.

The relationship between these two variables is verified using the coefficient τ_b of Kendall (Wessa, 2015), which obtains a value of 0.61. That means that there is a strong relationship between the two. The Table 8 shows the contingency table of both two variables.

Table 8: Contingency table of the maturity in planning and monitoring.

		Maturity in project monitoring					
		1	2	3	4	5	Total
Maturity in project planning	1	35	14	0	0	0	49
	2	0	21	42	0	0	63
	3	0	35	63	105	7	210
	4	0	7	56	189	56	308
	5	0	0	7	70	91	168
	Total	35	77	168	364	154	798

After analyzing the dependence of maturity in both aspects, the next step is to consider the use of indicators. In a first case, on the use of these when they refer to aspects linked to the project itself and secondly to those who consider points of project management.

From the two answers, we proceeded to see the next cases:

- No use of indicators.

- Use of any sort of indicators.

- Use of both type of indicators.

The Table 9 shows the results obtained for the use of own project indicators and reveals that more than half of cases they do not use.

Table 9: Use of indicators related to projects.

	Frequency	
Use indicators for projects	Absolute	Relative
Yes	364	45.61%
No	420	52.63%

In a second question, about the use of indicators linked to project management, the Table 10 shows the obtained results. The research concluded that a large majority do use some indicator of this type.

Table 10: Use of indicators related to project management.

|	Frequency	
Use indicators for project management	Absolute	Relative
Yes	588	73.68%
No	210	26.32%

The following table, Table 11, shows those respondents who answered that they do not use any type of indicator (negative answer in the two previous cases) and those that use some indicator or both in their project management (positive response in one of the previous cases or both). The positive result is greater than in the two previous cases.

Table 11: Use of any sort of indicator in projects.

Use of indicators	Frequency	
	Absolute	Relative
Yes	637	79.46%
No	161	20.54%

The Figure 3 shows graphically this data. This is a rather interesting aspect, understanding that its use as seen above is an aspect that experts consider key and success factor.

Figure 3: Use of indicators in projects.
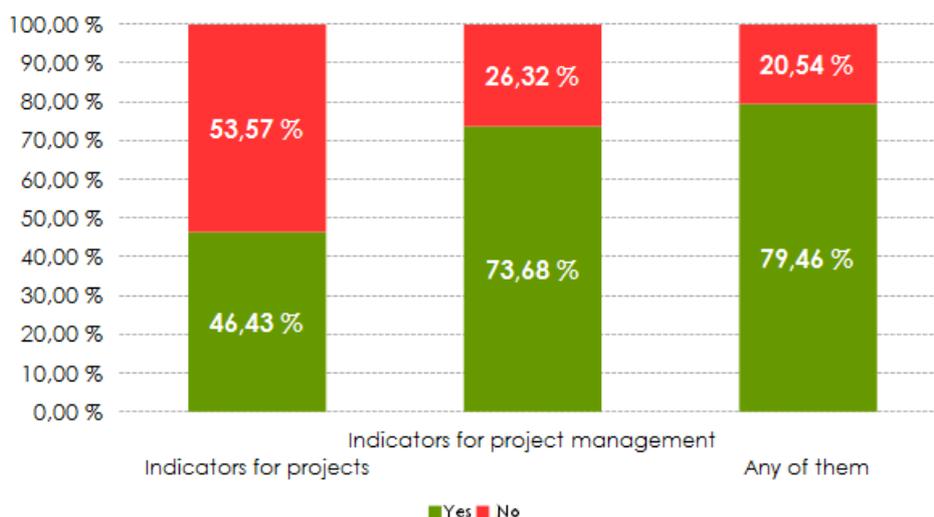
To complete the research in this point, we proceeded to do a study of two variables in a table of contingency, Table 12, crossing the answers obtained in the Table 9 and Table 10. The Table 13 shows the relative frequencies.

Table 12: Contingency table for the use of indicators.

		Use of indicators for project management		
		Yes	No	Total
Use of indicators for projects	Yes	164	264	428
	No	50	320	370
	Total	214	584	798

Table 13: Relative frequencies in the use of indicators.

		Use of indicators for project management		
		Yes	No	Total
Use of indicators for projects	Yes	40.18%	6.25%	46.43%
	No	33.04%	20.45%	53.57%
	Total	73.21%	26.79%	100%

In relation to this point, the McNemar test is applied to check whether there is dependence or not on the answer to these two questions. The focus is on comparing whether the measurements made are the same or whether, on the contrary, there is some significant

change (paired data). The value of the statistic, E, resulting is 144.5 is greater than the value of χ^2, which gets 3.56; So the relationship between the two responses is significant.

Finally, some of the typical metrics of project management have been considered, such as the measurement of progress or delay in projects, the measurement of customer satisfaction, the use of indicators related to risk management And, finally, those related to the analysis of earned value. The Figure 4 shows graphically these results.

Figure 4: Frequency of use of concrete cases of project management indicators.
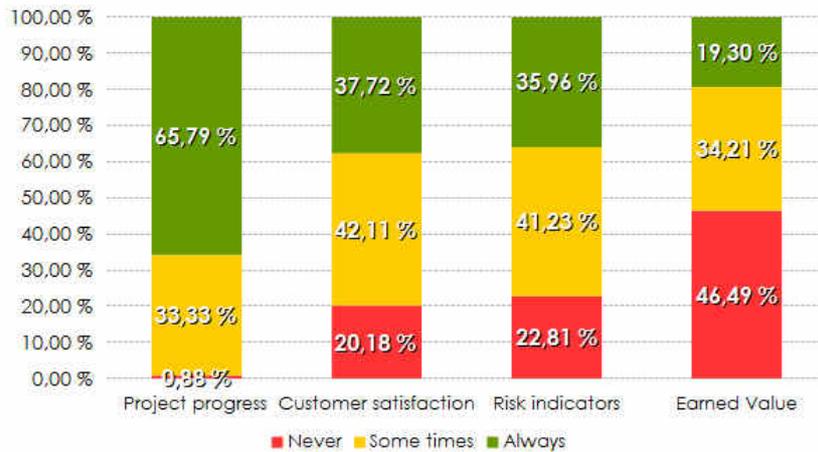
The first bar illustrates the response obtained if indicators are used on the progress or delay of the project; with a majority use (two thirds use them always) or very majority (99%, including cases in which they are sometimes used). The second one shows the measurement of customer satisfaction of projects. As conclusion, their use is broad, but not as resounding as in the previous case. The third one presents the results obtained for another typical example of project management indicators, such as those related to risks. The results are very similar to those obtained for project client satisfaction. Finally, the last bar displays the results to Earned Value Analysis tool. It is evident that it is a less extended methodology. This result confirms the opinion of some authors, who pronounce that this tool has not been generalized in industrial projects (Arthur, 1983; Lukas, 2008).

Table 14: Use of earned value analysis in projects.

Earned Value Analysis	Frequency	
	Absolute	Relative
Never	364	45.61%
Sometimes	273	34.21%
Always	154	19.30%

It seems logical to analyze whether the results obtained on the use of project management indicators are related to those of each of these four metrics. To do this, the Pearson χ^2 test is applied. Table 15 shows the values obtained in the statistics. In none of the calculations performed, the frequency of expected values less than 5 exceeds 20%, so this statistic can be interpreted without any caution.

Table 15: Calculated values of the statistic χ^2.

	Statistic χ^2
Project progress	200.85
Customer satisfaction	34.46
Risk indicators	183.77
Earned Value Analysis	103.91

Considering a level of significance, α, of 0.01%, the calculate for a critical value of χ^2 is equal to 18.42. Therefore, in all cases the hypothesis that the variables are related to the use of project management indicators can be accepted.

5. Conclusions

It should be taken into account that the study was carried out on a non-probabilistic sample, that is, it has been directed towards professionals working in projects and/or project management.

It seems that projects are regularly planned and controlled regularly and systematically, with approximately 60% of the respondents. In addition, the analysis of the response confirms that there is a very strong relationship between both facets of project management.

Almost 80% of them use indicators in their projects; drawing attention to the fact that the most used indicators are those of project management, with almost 75%, compared to those of the project, with 45%. As in the previous case, the analysis of the response confirms a strong relationship between both uses of indicators.

Four different indicators have been identified, considered as those that could be more common or significant, to know if they were used or not. These indicators were:

- Project progress.
- Customer satisfaction.
- Risk indicators.
- Earned Value Analysis.

There is usually unanimous use or sometimes in the case of the use of indicators related to the progress of the project. Almost 80% of respondents are always measured or sometimes customer satisfaction of projects and somewhat less in the case of indicators for risks.

The use of Earned Value Analysis is not as common as in the previous examples, although it is still the majority. It is striking that almost 20% of respondents always use this methodology.

For all of them, a strong relationship with the aforementioned variable of the use of project management indicators is evident.

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