Surveying the Academic Literature on the Use of OKR (Objectives and Key Results) - An Update

Levantando a Literatura Acadêmica sobre o Uso de OKR (Objetivos e Resultados Chave) – Uma Atualização

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Abstract. *OKR (Objectives and Key Results) emerged as a lightweight framework for business objectives measurement and strategic alignment. Although there is growing interest in OKR, academic literature on the subject is still scarce. Most importantly, there is limited knowledge about the difficulties, benefits, and lessons learned from its use. We executed a systematic mapping study. We found 47 studies and identified associated difficulties, benefits, and lessons learned. In general, OKR use is under-documented from a theoretical point of view. Among the topics associated with using OKR are communication, performance evaluation, task planning and prioritization, transparency, team alignment, and goal fulfillment. We found few academic studies addressing the topic in depth. We expect this study to serve as a basis for other researchers to continue to seek and deepen the understanding of how to support the use of OKR and, thus, help build knowledge on the subject.*

Keywords. *OKR; Objectives and Key Results; Software and IT Measurement*

Resumo. *O OKR (Objetivos e Resultados Chave) emergiu como um framework leve para a medição de objetivos empresariais e alinhamento estratégico. Apesar do crescente interesse no OKR, a literatura acadêmica sobre o assunto ainda é escassa. Realizamos um estudo de mapeamento sistemático. Encontramos 47 estudos e identificamos dificuldades, benefícios e lições aprendidas associadas. Em geral, o uso do OKR é pouco documentado do ponto de vista teórico. Entre os tópicos associados ao uso do OKR estão comunicação, avaliação de desempenho, planejamento e priorização de tarefas, transparência, alinhamento de equipes e cumprimento de metas. Encontramos poucos estudos acadêmicos abordando o tema em profundidade. Esperamos que este estudo sirva como base para outros pesquisadores continuarem a buscar e aprofundar a compreensão de como apoiar o uso do OKR e, assim, contribuir para a construção do conhecimento sobre o assunto.*

Palavras-Chave. *OKR; Objetivos e Resultados Chave; Medição de Software e Serviços de TI*

1. Introduction

The lack of alignment and connection between business objectives and the establishment of corporate purposes defined by areas of an organization affects companies of various sizes and segments [Brodbeck and Hoppen 2003]. The Information Technology (IT) area is also affected by this problem. When the organization's priorities are not adequately defined, gaps in the organizational strategy may occur. Thus, it is essential to establish criteria to measure the reach and adherence of actions concerning objectives. An effective measurement process helps organizations understand their capabilities so that they can develop viable plans and execute them to deliver agreed products or services to their customers [Trinkenreich and Santos 2015]. Effective and efficient IT that supports business strategies and processes becomes a cornerstone of a successful company. However, aligning business needs and IT capabilities is a source of concern [Silvius 2007]. A measurement method can be used to monitor the alignment of IT with business objectives, providing helpful information for decision-making [Trinkenreich et al. 2019].

The measurement process supports organizations in defining measurement objectives, identifying, documenting, and maintaining an appropriate set of measures, along defining procedures for collecting, storing, and analyzing data. It also involves collecting, storing, analyzing, and reporting data in a manner that contributes to business objectives [ISO 2017]. An effective measurement process enables organizations to comprehend their capabilities, allowing them to develop viable plans and execute them to deliver agreed-upon products or services to their customers [Trinkenreich and Santos 2015]. A measurement system is a technical system that collects data, performs calculations and presents results to interested parties. Various stakeholders rely on the outcomes of this fact-finding to make crucial decisions for their work and organizations [Staron and Meding 2018].

Different tools, methods, and frameworks have been used to help implement measurement in organizations, for example, PSM [McGarry et al. 2002], ISO/IEC 15939 [ISO 2017], GQM+Strategies [Basili et al. 2014], and KPI [Zhou and He 2018]. Another framework that has attracted attention due to its use in the industry is OKR (or Objectives and Key Results) [Doerr 2019]. OKR emerged as a model to enable Intel's measurement of business objectives in the '70s and was later adopted by Google in the late '90s [Wodtke 2016]. From then on, it began to be widely used and known. Although there is a growing interest in its use in the industry [Trinkenreich et al. 2019], academic sources are still limited. Most importantly, it is unclear what benefits it provides or the difficulties and lessons learned that might impact its use.

We present a mapping study to identify studies that use OKRs to support measurement activities. We sought to identify the context in which OKRs are used, how and why they are adopted, and capture associated difficulties, benefits, and lessons learned. Besides, we also sought to determine which other measurement methods were used alongside OKRs. This work is conducted under the framework of General Systems Theory, focusing on understanding how IT organizations and individuals (i.e., researchers) deal with using or adopting a measurement method.

In a previous study [Silva and Souza 2023], we identified 30 sources. In the current study, we re-executed the searches in digital libraries Scopus, Engineering Village,

Web of Knowledge, IEEE Xplore, Springer, Wiley, and ScienceDirect. Also, we considered ACM DL to broaden search results. Additionally, we performed backward and forward snowballing. We identified 17 new studies not considered before and improved the answers to all research questions. For instance, we identified three new contexts of OKRs use, 12 new bibliographic sources on OKRs cited as sources to present or how to use it, one new measurement approach used alongside OKRs, and two new reported difficulties, four new best practices, and four new benefits of using OKRs. These new additions to the previous study's findings are highlighted in the corresponding sections. Moreover, we extended the discussion on the results and related work accordingly.

The most recurrent areas associated with the identified studies are Information Systems (including Software Development) and Business Management. Many studies only mention OKRs as a measurement mechanism. However, most identified studies present examples of OKRs using experience reports or contextualizing their use in project management. The most frequent reason for using OKRs in studies is that it is a widespread method in the industry, not explicitly for its intrinsic characteristics as a measurement method. These results show the importance of investigating benefits, lessons learned, and difficulties in using OKRs that may inspire other organizations to adopt it as a measurement method.

Aside from this introduction, this article is structured as follows: Section 2 summarises OKRs, Section 3 describes the systematic literature mapping protocol, while Section 4 presents the execution stage, the results obtained and the discussion of the findings, finally, Section 5 presents our final considerations.

2. OKR - Objectives and Key Results

OKR is a management methodology that helps ensure that the entire organization focuses efforts on the same essential issues across the organization [Doerr 2019]. OKR exists to create alignment and define the cadence – an established period for its validity in the organization. The focus is on all staff pursuing the same direction, with clear priorities [Muniz et al. 2022]. OKR is also classified as a framework of critical thinking and continuous discipline that aims to have all the staff working together, focusing their efforts to make measurable contributions that drive the company forward [Niven and Lamorte 2016].

OKR is formed by matching two items: Objectives and Key Results. Objectives describe what must be achieved. They should be clear, qualitative, inspiring, and engaging and are usually expressed in short sentences. They should motivate, challenge, and give a sense of purpose to the organization, the team, and the individuals. Key results are characterized as a small set of measures that help to gauge and benchmark progress against objectives. In other words, it is a way of measuring progress toward the defined goal. Key results should be measurable and quantitative [Muniz et al. 2022]. According to Stray et al. [Stray et al. 2022a], companies using OKR should support their employees, especially in defining key results that align and encourage teams toward a common goal.

According to Wodtke [Wodtke 2016], the primary use of OKRs in companies aims to improve aspects such as focus, alignment, and acceleration, the latter to achieve busi-

ness results more quickly. They allow groups to coalesce around a single strategy. OKRs are known to have short and fast cycles, usually three months since it can compromise the business when it is too long. Because of this, they allow for greater agility through a less committed deadline, more efficiency, and creativity due to the more restricted time and faster evaluation steps that would enable accelerating learning [Muniz et al. 2022].

As a method, OKR can be applied in different contexts and can help ensure that Information Systems are aligned with business goals. For example, when defining an OKR, objectives should be aligned with the organization's primary business aims, and key outcomes should reflect the contribution of Information Systems to achieving those purposes. Thus, if a business goal intends to improve customer satisfaction levels, an objective related to improving the usability of an information system can be defined, which can be measured through key results associated with response time and defect rates, among others.

3. Research Method

A mapping study identifies, evaluates, and interprets the relevant research for a particular research question, topic area, or phenomenon of interest [Kitchenham et al. 2007]. It is recommended when little evidence is available in the literature on a subject [Kitchenham et al. 2007]. To develop this research, we performed three steps [Petersen et al. 2015]: (i) planning, (ii) execution, and (iii) summarization. The planning step is described below. The execution and summary of the results can be seen in Section 4.

3.1. Goal and Research Questions

This mapping study aims to identify academic studies that cite the use of OKRs and investigate how and why the industry has used it. To this end, the following research questions (RQ) were formulated:

- RQ1: What is the context in which OKR is used?
- RQ2: What is the cited bibliographic source?
- RQ3: What other measurement approaches are used alongside OKR?
- RQ4: What is the criterion for using OKR?
- RQ5: What difficulties or disadvantages were reported?
- RQ6: What best practices or lessons learned were reported?
- RQ7: What are the reported benefits or advantages?

3.2. Data Source, Languages and Search Period

We used the digital libraries Scopus, Engineering Village, Web of Knowledge, IEEE Xplore, ACM DL, Springer, Wiley, and ScienceDirect to broaden search results. Moreover, the results obtained were complemented by performing backward and forward snowballing [Mourão et al. 2020, Wohlin 2014] to provide further robustness to the search and increase the number of found works. To perform forward snowballing, we used the software tool Publish or Perish[1] to search Google Scholar.

All studies available in English were included in the mapping scope. An initial publication date has not been set in order to maximize results.

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[1] `https://harzing.com/resources/publish-or-perish`

3.3. Search Expression

After choosing the digital libraries, the definition of the search expression began, based on the PICOC method (Population, Intervention, Comparison, Result, and Context) [Roberts and Petticrew 2006]. Keywords were defined for each PICOC element. However, initial search tests yielded few results. Thus, we decided to define keywords only for the Intervention item (i.e., OKR) to restrict the results as little as possible and, consequently, evaluate each study individually to determine its adequacy to the desired scope. We also considered the following control studies: [Trinkenreich and Santos 2015, Vedal et al. 2021].

Thus, after tests in different digital libraries, the canonical search expression was defined: *(OKR OR "objectives and key results")*.

However, different digital databases necessitated specialized treatment for the search expressions. The adaptations made in each digital database are outlined in Table 1. For instance, ACM DL and Wiley InterScience do not permit simultaneous searches across multiple metadata; thus, we conducted three separate searches and consolidated the results. Similarly, SpringerLink has limited support for Boolean expressions, requiring the amalgamation of results from multiple searches. Additionally, some digital databases enable the inclusion of filters for knowledge areas in the search expression (e.g., Scopus), while others implement filters through the user interface (e.g., ISI Web of Science).

Tabela 1. Search Expression Adaptations in Different Digital Databases

Database	Search String Adaptation
Scopus	*(TITLE-ABS-KEY (okr) or TITLE-ABS-KEY ("objective* and key results")) AND (LIMIT-TO (SUBJAREA, "ENGI") OR LIMIT-TO (SUBJAREA, "COMP")))*
Engineering Village	*(OKR OR "Objective* and key results")* WN KY
IEEE	*(OKR OR "Objective* and key results")* in All Metadata
ISI Web of Science	*TI=(OKR OR "Objective* and key results") OR AB=(OKR OR "Objective* and key results") OR AK=(OKR OR "Objective* and key results")* Areas: Computer Science (Artificial Intelligence, Theory Methods, Interdisciplinary Applications, Software Engineering, Information Systems, Cybernetics) and Management
SpringLink	*objective key results* *objectives key results* *objective and key results* *objectives and key results*
ACM DL	*[Keywords: okr] OR [Keywords: "objective* and key results"]* *[Title: okr] OR [Title: "objective* and key results"]* *[Abstract: okr] OR [Abstract: "objective* and key results"]*
Wiley InterScience	*OKR OR "Objective* and key results"* in Abstract *OKR OR "Objective* and key results"* in Title *OKR OR "Objective* and key results"* in Keywords
Science Direct	Title, abstract, keywords: *OKR OR "objective key results" OR "objectives key results"*

3.4. Inclusion, Exclusion and Quality Criteria

Inclusion and exclusion criteria were defined along with preliminary searches and search expression tests. Due to the few studies identified, only a single inclusion criterion was established: A study mentioning OKR and its use (IC1). The exclusion criteria are: use of the English or Portuguese languages (EC1); duplicate study (EC2); unavailable study (EC3); the study was non-peer-reviewed (EC4); research proposals (EC5); the study that does not mention OKR or its use (EC6); the study mentions OKR but does not detail its use (EC7); preliminary study or conference abstract (EC8); and non-academic documents (EC9).

Quality criteria were established to improve understanding of each study's contribution (refer to Table 2). Consequently, studies were classified and ranked, differentiating those that superficially mention OKR from those that show some level of practical application of the method.

Tabela 2. Quality Criteria Used

QC	Description	Classification
QC1	How is OKR mentioned in the study?	0 - Only citation to OKR, no connection with the study; 0.5 - OKR is mentioned but has no direct connection with the study focus; 1 - OKR is part of the focus of the study.
QC2	Is there a bibliographic source for OKR?	0 - No; 1 - Yes.
QC3	What type of study focuses on OKR?	0 - There is no explicit mention of the type of study; 0.25 - Opinion article; 0.5 - Experience report; 1 - Primary or secondary study.
QC4	Are there OKR-focused research objectives or questions?	0 - No; 1 - Yes.
QC5	Is there a clear chain of evidence among objective, execution and results focusing on OKR?	0 - Study does not focus on OKR or results do not mention OKR; 0.5 - Discussion of results related to OKR is limited; 1 - Yes.

4. Execution

The research protocol was defined jointly and iteratively between the two authors. After approval, searches began in the indicated databases. The study was conducted in two phases. The first phase took place between January and July 2022, while the second phase occurred between September and November 2023. All data were analyzed and consolidated in a Google spreadsheet, which can be found at `https://doi.org/10.6084/m9.figshare.21728630`.
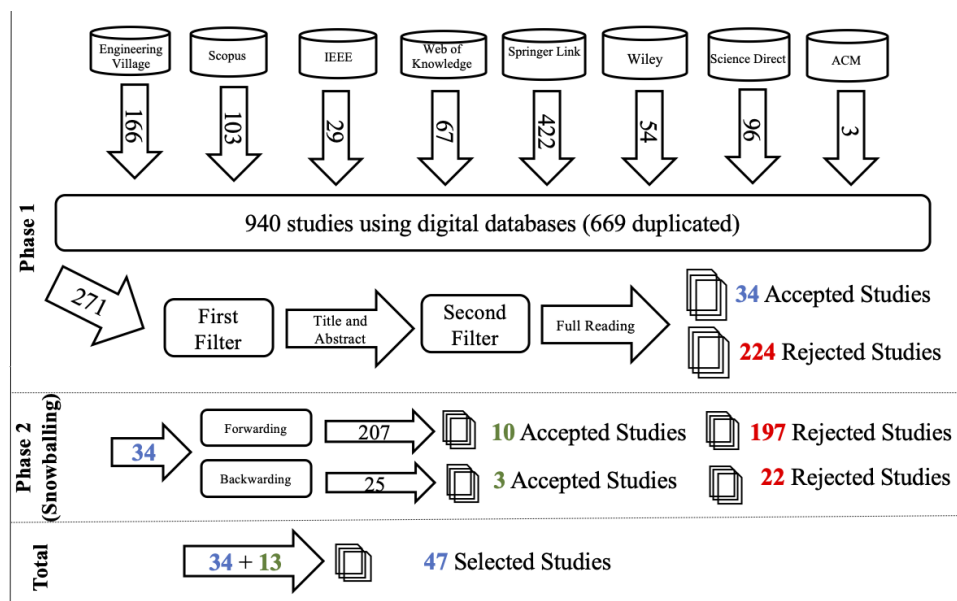

Figura 1. Study Search and Selection Summary

Fig. 1 summarizes the results obtained. A total of 940 studies were identified from the database search, of which only 271 were unique. The first filter was applied to all

articles independently by the two authors, thus not requiring the application of Cohen's Kappa coefficient [Cohen 1960]. The title, abstract and keywords were read to verify whether the studies met the inclusion and exclusion criteria. In the first execution, during the second filter application, the first author read the full text of the studies and extracted the results. A study was accepted in the second filter if it answered at least one of the formulated research questions. The second author audited the extraction. In both cases, comments and justifications for the decisions were recorded. Differences were discussed until a consensus was reached. The second execution was executed only by the second author.

After this step, 24 studies remained. Finally, backward and forward snowballing were applied recursively. Backward snowballing uses a study's references to identify new sources that might be included, and forward snowballing relates to identifying sources that mention previously selected studies [Wohlin 2014]. A further 13 studies were identified. The same procedures were followed for applying the first and second filters.

In the end, 47 studies that met the mapping goal were identified. Table 3 presents the selected studies, how they were evaluated based on the research questions, and the summary of which research questions they helped to answer. According to Petersen et al. [Petersen et al. 2015], quality assessment is not required in systematic maps. The authors emphasize that in systematic reviews, studies proposing solutions without empirical evidence are typically excluded, but in systematic maps, they are important for identifying trends in topics. Therefore, we did not exclude studies based on the application of quality criteria.

Although OKR became better known in the early 2000s, the earliest identified academic study was published in 2012 [S08]. The data indicates a significant rise in interest in OKR. Merely seven studies were published in 2019 or earlier, a number matched by those published in 2020 alone. Additionally, we identified 17 studies published in 2021, 8 in 2022, and 8 in 2023 (it is important to note that we conducted the searches in early September 2023).

As seen in Table 3, the selected studies belong to different areas of knowledge, not being linked only to Information Systems (IS). Both the IT and Business Management area and its subareas (marketing, human resources) contributed to 21 studies. Education, with three studies, and Engineering, with only two studies, are the other areas mentioned. We also identified eighteen studies related to software development and agile software development, categorizing them within the Information Systems and Business Management area.

4.1. Results

Next, we answer the research questions.

4.1.1. What is the context in which OKR is used? (RQ1)

This question aims to identify the circumstances, scenarios or conditions under which OKR was used. Table 4 summarizes our findings.

Tabela 3. Summary of Selected Studies, Compliance with Quality Criteria, and Answers to Research Questions

ID	Ref.	Year	Area (Subarea)	QC1	QC2	QC3	QC4	QC5	Total	RQ1	RQ2	RQ3	RQ4	RQ5	RQ6	RQ7
S01	[Abimaulana et al. 2021]	2021	IS (Software Development)	0	0	0,5	0	0	0,5	✓	✗	✗	✗	✗	✗	✗
S02	[Distante et al. 2022]	2022	IS (Cognitive Computing)	0,5	0	0,25	0	0	0,75	✓	✗	✗	✗	✗	✗	✗
S03	[Kilu et al. 2019]	2019	IS (Software Development)	0,5	1	1	0	0	2,5	✓	✓	✗	✗	✗	✗	✗
S04	[Hoeft 2021]	2021	Business Management (Digital Transformation)	0,5	1	0	0	0	1,5	✓	✓	✗	✗	✗	✗	✗
S05	[Dang et al. 2021]	2021	Business Management (Human Resources)	0	1	1	0	0	2	✓	✓	✗	✗	✓	✗	✗
S06	[Claudiu-Dan 2015]	2015	Business Management (Marketing)	0,5	0	0,25	0	0	0,75	✓	✓	✗	✗	✗	✗	✗
S07	[Wulff and Finnestrand 2022]	2021	IS (Software Development)	0	1	1	0	0	2	✓	✓	✗	✗	✗	✗	✗
S08	[Goldman 2012]	2012	Business Management	0	0	0,25	0	0	0,25	✓	✓	✗	✗	✗	✗	✗
S09	[Scott et al. 2021]	2021	IS (Agile Software Development)	0,5	1	1	0	0	2,5	✓	✓	✗	✓	✓	✗	✓
S10	[Rafidah and Dewi 2020]	2020	Business Management (Human Resources)	0,5	1	1	0	0	2,5	✓	✓	✗	✗	✗	✗	✓
S11	[Zhou and He 2018]	2018	Business Management	1	1	0,25	0,5	0,5	3,25	✓	✓	✗	✗	✗	✗	✓
S12	[Anatolyevna et al. 2020]	2020	Business Management (Human Resources)	1	1	0,25	0,5	0,5	3,75	✓	✓	✗	✓	✗	✗	✗
S13	[Berntzen et al. 2021]	2021	IS (Software Development)	0,5	1	1	0	1	2,5	✓	✓	✗	✗	✗	✗	✓
S14	[Vedal et al. 2021]	2021	IS (Software Development)	1	1	1	1	1	5	✓	✓	✗	✗	✗	✓	✗
S15	[Cao 2021]	2021	Education	1	1	1	1	1	5	✓	✗	✗	✓	✗	✗	✓
S16	[Sowkasem and Kirawanich 2021]	2021	IS (Software Development)	1	0	1	1	1	4	✓	✗	✗	✓	✗	✗	✗
S17	[Rahmah et al. 2020]	2020	Education	1	1	0,5	1	1	4,5	✓	✓	✗	✓	✓	✓	✓
S18	[Mann et al. 2020]	2020	Business Management	0,5	1	1	0	0,5	4	✓	✗	✗	✗	✓	✗	✗
S19	[Mangipudi et al. 2021]	2021	Education	1	1	1	1	1	5	✓	✓	✗	✗	✗	✗	✓
S20	[Koldyshev et al. 2021]	2021	Business Management	0,5	0	0	0	0	0,5	✓	✓	✗	✗	✗	✓	✗
S21	[Klanwaree and Choemprayong 2019]	2019	IS	1	1	1	1	1	5	✓	✓	✗	✓	✗	✗	✗
S22	[Erp et al. 2021]	2021	Business Management	0,5	1	0,5	0	0,5	2,5	✓	✓	✗	✓	✗	✓	✗
S23	[Ferreira et al. 2018]	2018	Business Management (Project Management)	0,5	1	0,25	0	0	1,75	✓	✓	✗	✓	✗	✓	✓
S24	[Mikalsen et al. 2020]	2020	Business Management	0,5	1	1	0	0,5	3	✓	✓	✗	✓	✗	✓	✓
S25	[Stray et al. 2022b]	2022	IS (Agile Software Development)	1	1	1	1	1	5	✓	✓	✗	✓	✗	✓	✗
S26	[Stray et al. 2022a]	2022	IS (Agile Software Development)	1	1	0,75	1	1	4,75	✓	✓	✓	✓	✓	✓	✗
S27	[Berntzen et al. 2022]	2022	IS (Agile Software Development)	0,5	1	1	0	0,5	3	✓	✓	✗	✓	✗	✓	✓
S28	[Rojas-Chipana et al. 2021]	2021	Engineering (Operations Management)	1	1	1	1	1	5	✓	✓	✗	✗	✗	✓	✗
S29	[Belfort et al. 2021]	2021	Business Management	1	1	0,5	1	1	4,5	✓	✓	✓	✓	✓	✓	✓
S30	[Trinkenreich et al. 2019]	2019	IS (IT Alignment)	1	1	1	1	1	5	✓	✓	✓	✓	✗	✓	✗
S31	[Costa et al. 2023]	2023	Business Management	1	1	1	1	0,5	4,5	✓	✗	✗	✗	✗	✓	✗
S32	[Mäntylä et al. 2022]	2022	IS (Agile Software Development)	0	0	1	0	0	1	✓	✗	✗	✗	✗	✗	✓
S33	[Kovynyov et al. 2021]	2021	Business Management (Agile Transformation)	0	0	1	0	0	2	✓	✓	✗	✓	✗	✓	✗
S34	[Schüll et al. 2023]	2023	Business Management (Agile Transformation)	0,5	0	1	0	0	2,5	✓	✓	✗	✓	✗	✗	✗
S35	[Trieflinger et al. 2020]	2020	IS (Agile Software Development)	0,5	1	0,25	0	0	2,5	✓	✗	✗	✓	✗	✗	✗
S36	[Tkalich et al. 2022]	2022	IS (Agile Software Development)	0,5	1	1	0	0	1,5	✓	✗	✗	✗	✗	✗	✗
S37	[Bowring and Paasivaara 2021]	2021	IS (Agile Software Development)	0,5	0	0	0	0	0,5	✓	✓	✗	✗	✓	✗	✓
S38	[Rompho 2023]	2023	Business Management	1	1	1	1	1	5	✓	✓	✗	✗	✗	✗	✓
S39	[Berntzen et al. 2023]	2023	IS (Agile Software Development)	1	1	1	1	1	5	✓	✓	✗	✓	✓	✓	✗
S40	[Nag 2022]	2022	Business Management (Education)	1	1	0,5	1	0,5	4	✓	✗	✗	✓	✗	✗	✓
S41	[Gudigantala et al. 2023]	2023	IS (Artificial Intelligence)	1	1	0,5	1	1	4,5	✓	✓	✓	✓	✗	✗	✓
S42	[Wibawa et al. 2021]	2021	IS (Software Development)	1	1	0,5	0	0,5	3	✓	✓	✗	✗	✗	✗	✗
S43	[Chen et al. 2022]	2022	Business Management	1	1	0,25	1	0,5	3,75	✓	✓	✗	✓	✗	✓	✓
S44	[van Erp and Rytter 2023]	2023	Engineering (Operations Management)	1	1	1	1	1	5	✓	✓	✓	✓	✗	✗	✓
S45	[Higgins and Madai 2020]	2020	IS (Artificial Intelligence)	1	0	0	0	0,5	1,5	✓	✗	✗	✗	✗	✗	✓
S46	[Azhar and Dewi 2023]	2023	Business Management	1	1	1	1	1	5	✓	✓	✗	✗	✗	✗	✓
S47	[Sultan 2023]	2023	Business Management	1	1	0,25	0,5	1	3,75	✓	✓	✗	✗	✗	✓	✓

Studies S01 to S30 are already included in our prior study [Silva and Souza 2023].
Studies S04, S05, S10, S12, S18, S19, S25, S26, S27, S28, S43, S46, and S47 were discovered through snowballing.

Tabela 4. Context of OKR use (RQ1)

Context of Use	Studies
Citation as a measurement mechanism	S01 S02 S03 S04 S05 S06 S07 S08 S09 S10 S32 S43
Comparing OKR and other measurement approaches	S11 S12 S47
Experience report on using OKR	S13 S14 S15 S16 S17 S19 S40 S41
Creating performance indicators exemplified as OKR	S20 S31 S36 S37 S41 S42
Using OKR as a knowledge-sharing mechanism	S21
Using OKR in project management	S22 S23 S24 S25 S26 S27 S39 S44 S45
Using OKR to support strategic alignment	S28 S35 S36
Measurement method based on OKR	S29 S30 S31
Using OKR to measure strategy performance (*)	S18
Using OKR as a performance appraisal system (*)	S46
Citation as an agile practice (*)	S33 S34
Study on how OKRs support performance measurement (*)	S38

(*) Context not presented in [Silva and Souza 2023].

Twelve studies were categorized within a context where OKRs are only cited in other studies as a contribution or a starting point as a mechanism to support measurement. These are studies where OKRs are under-explored and are not part of the study's main subject, despite being mentioned. An example is the case study described by Kilu et al. [S03], in which OKRs are used as a management tool to define team objectives and also as a way to measure their results. In [S06], OKRs are mentioned as a reference and starting point in preparation for constructing a KPI that will effectively be used to establish measures related to online marketing activities. In [S32], the authors mention that the leadership defined a set of OKRs for the next quarter to be implemented by the product development teams, with a focus on meeting investor goals.

In three studies, OKR is compared to other measurement mechanisms. In [S12], OKR is presented as a new methodology for managing and planning personnel work for companies in various sectors. In [S11], OKR is compared to KPI (Key Performance Indicators). The authors discuss the disadvantages and advantages of each method, in addition to dealing with differences and similarities. In [Sultan 2023], OKR is compared to both KPI and KRI (Key Result Indicators). According to the authors, KRI differs from a KPI in that it is more focused on tracking the progress of predefined actionable goals and objectives, rather than measuring the overall performance of an organization.

Eight studies presented the experience and applicability of OKR reports. Among them, In [S13] and [S14], OKR is used to improve coordination among software development teams, managing dependencies (knowledge, requirement, history, business processes, and entities). Besides, OKR applicability favors team communication, improving transparency and predictability, which are vital in complex projects with high uncertainty levels. In [S20], OKR is used together with KPI to create an indicator to measure the effectiveness of human resource management considering socioeconomic, innovation, management, and internal factors. As a result, the authors state that companies could control the cost of salaries and bonuses and improve revenue by increasing labor productivity. Klanwaree and Choemprayong [S21] present a case study where OKR is used to help promote knowledge sharing in an IT consulting organization. Gudigantala et al. [S41] employ OKR as a performance management system to ensure that business and AI (Artificial Intelligence) goals and objectives are well-defined, tightly aligned, and transparent across the company, and the AI efforts are approached in an integrated manner by the

different parts of a firm.

Other prominent categories include using OKRs to support management activities and strategic alignment. For instance, Berntzen et al. [S39] mention the use of OKRs as a coordination tool. First, OKRs were tested OKRs with the product owners. Due to promising results, its use was expanded to involve the team leaders, the architects, and the management group. Trieflinger et al. [S35] advocate using OKRs to support product roadmap alignment aiming to foster alignment with shared vision and goals.

4.1.2. What is the cited bibliographic source? (RQ2)

To answer this research question, we searched for references to books, articles, and websites cited as sources to present OKRs or how to use them. As seen in Table 5, nineteen sources were identified, six books, six scientific articles, and seven websites. Only one article (i.e., [Herkenrath et al. 2023]) is not in the scope of the mapping as it is considered related work and, therefore, discussed in Section 4.2.1. We also identified eight studies citing seven websites as reference sources. In addition, nine identified studies do not cite any bibliographic reference for OKR. This may indicate a lack of rigor and care, which may affect the credibility and contribution of the studies.

Tabela 5. Used References (RQ2)

Type	Used Reference	Studies
Book	[Doerr 2019]	S07 S14 S17 S18 S24 S25 S26 S29 S30 S31 S38 S41 S42 S43 S47
Book	[Niven and Lamorte 2016]	S03 S09 S11 S13 S14 S21 S25 S26 S27 S30 S31 S33 S34 S38 S39
Book	[Wodtke 2016]	S11 S14 S22 S23 S30 S43
Book	[Grove 2020] (*)	S40
Book	[Vellore 2022] (*)	S38
Book	[den Haak 2021] (*)	S38
Article	S30 - [Trinkenreich et al. 2019]	S10 S14 S25 S26 S28
Article	S11 - [Zhou and He 2018]	S04 S05 S12
Article	S25 - [Stray et al. 2022b]	S26 S27 S38 S39
Article	S21 - [Klanwaree and Choemprayong 2019]	S28
Article	S47 - [Sultan 2023] (*)	S46
Article	[Herkenrath et al. 2023] (*)	S46
Website	[Quantive 2023a] (*)	S22
Website	[Quantive 2023b] (*)	S22
Website	[Weekdone 2023] (*)	S03 S09
Website	[Boudon 2022] (*)	S18
Website	[Harke 2020] (*)	S35
Website	[Castro 2018] (*)	S41
Website	[Workpath 2022] (*)	S44
-	(No OKR citation)	S01 S08 S16 S19 S20 S32 S36 S37 S45

(*) Reference not presented in study [Silva and Souza 2023].

4.1.3. What other measurement approaches are used alongside OKR? (RQ3)

When reading the studies, we found citations to only two other measurement methods, KPI [Zhou and He 2018] and GQM+Strategies [Basili et al. 2014], as shown in Table 6.

KPIs (Key Performance Indicators) are a type of performance evaluation tool. They measure the success of an organization or a specific activity (project, program, product) [Zhou and He 2018]. Zhou and He [S11] present an opinion article discussing the

Tabela 6. Other measurement approaches used with OKRs (RQ3)

Measurement Approach	Studies
KPI [Zhou and He 2018]	S11 S36 S40 S41 S47
KRI (*) [Sultan 2023]	S47
GQM+Strategies [Basili et al. 2014]	S30

(*) Measurement approach not presented in [Silva and Souza 2023].

similarities, differences, advantages, and disadvantages of using OKR and KPI as performance evaluation tools. According to the authors, both can assess the success of an organization or a particular activity, such as a project, program, product, or initiative. Rafidah and Dewi [S10] mention OKRs use alongside KPI as a performance evaluation system in human resources. Koldyshev et al. [S20] propose a new metric, using OKR and KPI together, aiming to evaluate human resources management from the point of view of efficiency. KRIs (Key Result Indicators) [Sultan 2023] are explained in Section 4.1.1.

GQM+Strategies is an extension of GQM (Goal Question Metric) [Caldiera and Rombach 1994], an approach to align an organization's goals and strategies across different units through measurement. This model relates objectives and processes at various organizational levels [S30]. Trinkenreich et al. [S30] propose the combined use of OKR and GQM+Strategies [Basili et al. 2014] to support IT alignment. More information about this study can be seen in Section 4.1.6.

4.1.4. What is the criterion for using OKR? (RQ4)

Only nineteen studies explain the criteria for choosing OKRs, as shown in Table 7. Most studies justify the adoption of OKRs because it is a well-known approach, widely used by large and renowned organizations such as Google, Amazon, and Intel [S17]. However, the majority of these works do not provide any technical criteria. The only exceptions are [S39] and [S46], which also mention the alignment of OKRs with the agile philosophy and organizational alignment, respectively.

Tied as the second most mentioned criteria are OKRs' support in team performance management and organizational alignment. A possible reason is its aid in making goals more focused, keeping them clear and leveled, and allowing a more precise definition of goals and objectives [S15].

Tabela 7. Used criteria for the adoption of OKR (RQ4)

Adoption criteria	Studies
Method widespread and widely used by industry including globally known companies	S02 S11 S17 S21 S22 S29 S30 S39 S41 S43 S46
Support for balancing business value and measurability compatibility with agile philosophy and collaboration	S14 S39
Replacement for another measurement method	S15
Support for the creation of achievable and measurable objectives and the promotion of alignment between IT area and business objectives	S30 S34 S35 S36 S46
Support for measuring the performance of people or teams	S11 S16 S22 S25 S38

4.1.5. What difficulties or disadvantages were reported? (RQ5)

Incorrectly defining objectives, key results, or both can lead to poor operational or business results. Therefore, clarity and focus are needed when defining measurement objectives so that they are clear and specific. As a positive impact of each item, the proper definition of each O, KR, or even OKR aims to help better decision-making, promote organizational alignment through teams around a shared vision, and transparency and accountability of people and groups around objectives and performance to improve results [Doerr 2019]. Table 8 summarizes the difficulties reported according to their impact on the definition of measurement objectives (O), key results (KR), or both (OKR) and also during OKR implementation and use.

Tabela 8. Reported difficulties in using OKR (RQ5)

Impact	Reported Difficulties	Studies
OKR	How to set good OKR.	S14 S26
	Confusion and lack of understanding (*)	S38
	Subjectivity in the OKR definition.	S05
	Focusing only on its own goal, without paying much attention to others' goals (*)	S38
	Poorly defined OKR can compromise the process.	S05
O	Properly writing down the measurement objectives.	S30
	Use of qualitative terms that make it difficult to measure the achievement of the objectives.	S30
KR	Formulation of key results text.	S14 S25
	Identifying appropriate key results associated with objectives.	S30
	Quantifying objectives through key results.	S14 S25
Use of OKR	How to use OKR in everyday work.	S26
	Lack of understanding by senior and non-senior professionals on achieving key results.	S30
	OKR uses associated with an authoritarian leadership style.	S11

(*) Difficulty not present in [Silva and Souza 2023].

Only the study by Zhou and He [S11] presents disadvantages of using OKR: (i) OKR requires qualified employees to prepare it, and, besides, it needs to have high responsibility and creativity to meet quantitative requirements such as achieving up to five key results per objective; (ii) OKR can lead to a lack of teamwork since individuals can focus too much on their OKR rather than team-level OKR; (iii) The cost for small businesses to implement OKR is too high. In addition, according to the authors, there is a difficulty associated with managers' management skills and leadership style. According to the authors, authoritarian leadership is challenged, as the authoritarian management style is unsuitable for a management model based on OKR.

4.1.6. What best practices or lessons learned were reported? (RQ6)

Table 9 presents the identified best practices and lessons learned categorized according to the phase in which they are most prominent: OKR definition, institutionalization, and use.

The most recurrent best practice was the adoption of training practices. For example, Stray et al. [S26] mention training professionals to define OKRs better. At the same time, workshops are suggested to help build OKR [S27] and to manage the use experience, and discussions about it [S14]. The importance of supporting the definition of OKR

Tabela 9. Best Practices and Lessons Learned (RQ6)

Phase	Best Practices and Lessons Learned	Studies
Defining	Goals should be multi-level and multi-faceted (*)	S43
	Using OKR alongside GQM+Strategies.	S30
	Not defining OKR that could be seen as subjective	S05
	Defining OKR that can be flexible to changes to suit new needs	S19 S43
	Establishing distinct levels of OKRs at the organizational, team, and individual levels (*)	S43
	Integrating a bottom-up and top-down approach to define OKRs (*)	S43
Institutionalizing	Getting leadership support	S19 S25
	Providing OKR training	S14 S25 S26 S27
	Supporting teams during OKR definition	S12
	Establishing OKR-based measurement culture	S30 S43
	Instituting OKR Master role	S14
	Getting support from the team who use OKR	S19
	Regularly monitoring and reviewing the OKRs (*)	S43
Using	Establishing OKR at the strategic or senior management level	S23
	Supporting the OKR use in the organization	S12 S26
	Using OKR to challenge the team to deliver above expectations	S23
	Using OKR to support stakeholder engagement and communication	S24
	Not using OKR to evaluate employees	S12
	Increasing visibility (transparency and publicity) of OKRs to enhance follow-up	S27 S35 S43

(*) Best practice or lesson learned not present in [Silva and Souza 2023].

and its use by the teams [S12, S26] must be highlighted.

The work of Trinkenreich et al. [S30] was one of the few that explicitly identified practices to support the definition and monitoring of OKR and strategies to achieve them. To this end, the authors were inspired by GQM+Strategies and suggested a process encompassing the phases: (i) What do we want?; (ii) What is behind this objective?; (iii) Where are we going?; (iv) How do we get there?; (v) Shall we consolidate?; (vi) Are we getting there? According to the authors, both approaches (OKR and GQM+Strategies) work in a complementary way: OKR has an agile appeal, while GQM+Strategies provides complementary knowledge to perform the activities besides aligning objectives and strategies through measurement. GQM+Strategies helps solve some processes where OKR is seen as deficient by, for example, guiding deriving initiatives (strategies) to achieve organizational objectives. The authors also highlight the importance of establishing a culture of creating measurable objectives that are disseminated throughout the organization.

The involvement and participation of all are essential for the success of a measurement program. In this sense, the participation of the leadership [S19, S25] and the awareness of all hierarchical levels help in the involvement and alignment of all those involved (managers and employees) [S19]. Mikalsen et al. [S24] highlight the use of OKR to set objectives and communicate with the rest of the organization. According to the authors, good OKR communication can facilitate the engagement and involvement of the business side of organizations and improve communication between business areas and cross-functional teams. Moreover, Ferreira et al. [S23] highlight that establishing OKR at the strategic or top management level favored direction, in addition to allowing teams to challenge themselves more with deliveries above expectations.

Study [S43] contributed the most number of best practices shown in Table 9. It is important to note, however, that the study is an opinion paper, and therefore, the authors' claims, although relevant, are not supported by empirical evidence.

4.1.7. What are the reported benefits or advantages? (RQ7)

To answer this question, we sought to identify elements in the studies that mention any benefits or positive points for adopting OKR. Table 10 presents our findings. Most of the benefits of using OKR relate to improvements obtained in aspects related to management, such as alignment, focus, communication, and decision-making. The most frequently cited aspects were the improvement in objective alignment and transparency, with eight and five citations, respectively.

Tabela 10. Benefits or advantages of OKR using (RQ7)

Benefits or Advantages	Studies
Support in people performance management	S11 S12 S23
Fostering creativity to achieve objectives or key results	S11 S21 S38
Improved focus on measurement-based management	S12 S23 S26 S38
Improved communication	S24 S25
Improved response to change	S23 S38
Improved decision-making	S12 S38
Improved transparency	S11 S12 S23 S26 S34
Enhanced visibility into the current scenario	S13 S21 S38 S41
Improved measurement objectives visibility	S17 S24 S30 S38
Improved strategic vision visibility (*)	S35
Improved organizational alignment	S11 S16 S25 S27 S30 S38 S41 S47
Improved knowledge sharing	S25 S26 S46
Improved process performance	S16 S41 S47
Improved organizational performance (*)	S46
Improved involvement in the organization's management and goals	S12 S24 S35
Improved the organization's management focus	S11 S38 S44
Improved coordination (*)	S27
Improved knowledge dependencies management (*)	S27

(*) Benefit or advantage not present in [Silva and Souza 2023].

Study [S38] is significant for this research question as it presents the results of a survey aimed at determining whether and how OKRs can address performance measurement issues encountered by organizations. The author interviewed 204 staff members from 26 Thai organizations that adopted OKRs. Five senior executives and five operational staff members with experience using OKRs were selected from each organization.

The study's first research question investigated whether OKRs mitigate the issue of employees not accepting their performance indicators. While some executives and operational staff members found OKRs beneficial for providing clearer goals and enhanced flexibility, others reported no discernible differences in resolving issues with existing performance indicators. However, a comparison of opinions between executives and operational staff indicated that the latter group experienced more benefits from OKRs in this regard than executives. This discrepancy can be attributed to the fact that OKRs tend to contribute more to operational autonomy for staff members, especially those who may experience a greater increase compared to executives, who often already possess a certain degree of autonomy before adopting OKRs.

The study's second research question investigated whether OKRs promote alignment between performance indicators and an organization's strategies. Both executives and operational staff members concurred that OKRs facilitate a better alignment of measurements with organizational strategies. This finding holds particular significance for operational staff, as the emphasis on alignment in OKRs led to increased relevance in

their work. Consequently, both executives and operational staff members reported experiencing greater intrinsic motivation.

The study's third research question investigated whether OKRs reduced the problem of improper target settings. Both executives and operational staff members agreed that OKRs reduced the target-setting problem somewhat. OKRs can increase autonomy because both executives and operational staff members have the freedom to design their own OKRs. Relatedness also increased since both executives and operational staff members can see clear alignment. The target was set according to their competence, and executives and operational staff members were not concerned with their performance evaluation. This increases their intrinsic motivation to work.

4.2. Discussion

Information systems (IS) and organizations have common objectives. An IS must be aligned with the company to provide information to interested parties and provide benefits to it according to the technology used. The IT area that deals daily with systems and development faces everyday challenges concerning software development, such as, for example, lack of planning, lack of quality control, delivery times, and project and people management. These challenges can be addressed with the help of OKR.

OKR contributions to the Information Systems area concern interventions and improvements related to strategic alignment, focus on results, continuous improvement, monitoring and performance management, and team communication and engagement. The results of this mapping study can help IT organizations justify the use of OKR and influence its adoption more effectively.

This paper investigated seven research questions to understand how the use of OKR has been reported in the literature.

First, we identified the contexts in which OKRs (RQ1) are used. Studies on OKRs come from different areas, and they can be used to contribute to aspects of communication [S12, S14, S24, S25], coordination [S39], planning [S12, S16], objective management [S01, S04, S07, S13, S15, S16, S17, S24, S27, S33, S34], task prioritization [S07, S16], process improvement [S01, S05, S16, S27, S16], transparency [S11, S12, S23, S26], performance [S05, S08, S10, S16, S19, S21, S23, S25, S42, S44, S46], alignment [S09, S16, S19, S26, S30, S35], and indicators definition [S32, S36, S37].

Although several studies mention books and articles about OKRs (RQ2), the explanation for choosing OKRs is not always based on academic justifications or evidence. It is noteworthy that some studies do not present any bibliographic reference on OKR. A potential risk of using a decision criterion like this is the failure to implement OKR by not considering the essential and differentiating characteristics provided by this measurement approach. We also identified that some studies and most websites used as reference sources only present basic concepts associated with OKRs. Moreover, in several studies, how OKR was defined, implemented, and monitored is also unclear. Still, some of them just cite OKR and try to relate them to the central theme without success or relevant contribution.

One of the objectives of RQ3 was to see if OKR was used alongside other measu-

rement methods and, from the results, find out if there is any usage pattern. Some results showed associations of use or comparisons between OKRs and KPIs [S10, S11, S15, S36, S40, S41, S47], and OKRs and GQM+Strategies [S30]. Based on these findings, it is possible to state that OKR is a flexible methodology capable of being combined with others, sometimes filling a gap and enhancing the use of both.

During the analysis of the proposed questions, we identified that some companies adopted OKR (RQ4) simply because they were already known, presented as a successful methodology, or were initially adopted by large technology companies in Silicon Valley (see Table 7). Although this is not intrinsically bad, we expected to see more prominent and explicit technical criteria. As mentioned before, the only studies that cite this reason combined with others are [S39] and [S46], which also mention the alignment of OKRs with the agile philosophy and organizational alignment, respectively.

Another raised aspect is that some reports of difficulties or problems in the implementation of the OKR were found (RQ5), which shows that its implementation is not foolproof and occurs without problems. One of the reported difficulties concerns the ideal type of management to implement OKR. Due to its characteristics, it requires managers who act more as facilitators and supporters [Muniz et al. 2022]. This management style promotes a more collaborative and transparent working environment. An authoritarian and non-participatory management style may face more resistance and promote the failure of the initiative [S11].

Although we found lessons learned (RQ6) and benefits (RQ7) of using ORKs, the findings are still limited, denoting the lack of experience reports showing how OKRs are used and the results obtained in depth. Therefore, further research is needed to better understand the benefits and challenges in implementing OKRs and how their use can be improved in the IS area. Regarding RQ6, most of the identified experience reports (see Table 2) present examples of OKRs and describe how they were defined or used. Therefore, they can provide insights for future OKR implementation. Concerning RQ7, a notable study is [S38], which is described in Section 4.1.7.

Although we identified 47 academic studies within the scope of this mapping study, few delve into OKR in depth. We suggest those interested in learning more about OKR to use our results as an index to explore the selected studies. For instance, Tables 7 to 10 can be utilized to identify a study that addresses a specific topic. Below, we highlight contributions from some studies.

As mentioned earlier, study [S38] presents the results of a survey with OKR practitioners. The study can assist in motivating OKR use and provides insights into its benefits. It discusses whether OKRs (i) mitigate the problem of employees not accepting their performance indicators, (ii) promote alignment between performance indicators and an organization's strategies, and (iii) reduce the problem of improper target settings. The authors argue that combinations of autonomy, competence, and relatedness were found in the OKRs, explaining why both executives and operational staff members were generally more satisfied after adopting OKRs. Moreover, they emphasize that when employees have autonomy, competence, and relatedness, it increases their intrinsic motivation and eventually leads to success within the organization.

Those interested in understanding the basic differences between OKRs and a more established measurement approach can read [S11]. In this opinion study, the authors (i) compare OKRs with KPIs, a well-known traditional performance appraisal tool; (ii) present the characteristics of OKR and its operational mechanism; (iii) discuss the advantages and disadvantages of KPIs and OKRs; and (iv) present similarities and differences between OKRs and KPIs.

A comparison between OKR and GQM+Strategies [Basili et al. 2014] can be found in [S30]. The results also assist those interested in performing organizational alignment in an IT organization. The authors present the results of a case study to define OKRs and quantitatively monitor the achievement of goals using GQM+Strategies as support. As a result, the following process to support defining and monitoring OKRs and strategies to achieve them was proposed: (i) Define (meaningful, significant, concrete, actionable and inspirational) objectives to be achieved; (ii) Gather rationale, context factors and assumptions behind each goal and find measurable aspects; (iii) Explore abstract terms by asking questions as 'why', 'how', 'for what'; (iv) Use measurable aspects and build verifiable Key Results; (v) Collect data about current values to establish baseline; (vi) Define challenging (where do we want do go) but also realistic (where we are able to go) targets; (vii) Elicit strategies to achieve key results; (viii) Break each strategy into granular initiatives, projects or actions that can be executed and monitored; (ix) Elaborate a grid with OKRs and respective strategies to detect and remove any conflicts; (x) Align, adjust if needed and communicate the grid; (xi) Define a monitoring process in short cycles (maximum quarterly); (xii) Execute the monitoring plan an measure key results; and (xiii) Review objectives and create new OKRs when is necessary.

OKRs are usually associated with agile settings. For those interested in how to define and use OKRs along with possible examples in the context of agile software development, we suggest reading [S16], [S25], and [S26].

Study [S16] presents a case study on implementing an OKR-based Scrum framework to support software development management in the context of a railway project. The authors also provide some examples of OKRs.

In [25], the authors present a case study in which they examined two teams in a large-scale agile project using OKRs and the collaboration tool Slack. The results showed that the use of OKRs facilitated knowledge sharing, helped the teams align their goals, and provided inter-team insights.

In [S26], the authors investigated how OKRs are used in large-scale agile contexts. They identified four strategies that the agile teams applied to make OKRs work for the teams and the organization: Top-down & Bottom-up, Competence building, Tooling, and Continuous improvement. Additionally, they found that the framework helped the teams develop goals through a structured process in which they agreed on objectives.

Moreover, for those interested in creating or adopting performance management systems (PMS), we suggest reading Herkenrath et al. [Herkenrath et al. 2023], although it is not within the scope of this mapping study — instead, it is considered related work (see Section 4.2.1). The authors discuss that the existing OKR frameworks do not address

the described criteria necessary for a successful implementation of PMS and recommend the adaptation of existing OKR implementation concepts.

4.2.1. Related Work

We identified two other secondary studies about OKR: [Troian et al. 2022, Herkenrath et al. 2023].

Troian et al. [Troian et al. 2022] present OKR as a management and change tool. The research question seeks to identify possible OKR application contexts and the organizational impacts of its implementation. Sixteen studies published up to 2021 were selected, including books and academic papers, such as a master's thesis. Only two digital libraries were used. The results show an increasing use of OKR. The study also points to ordinary gains with the application of OKR, such as greater transparency within organizations, improvement of team performance, and increased engagement around the organizations' global goals. The scope of the research questions is also limited. As stated above, in [Troian et al. 2022], only one research question is investigated. In the current work, we also investigated factors such as reported difficulties, best practices, and benefits arising from implementing OKR and their relationship with aspects of Information Systems and how OKR contributes to the IS area.

Herkenrath et al. [Herkenrath et al. 2023] seeks to answer the research question "Do existing OKR implementation frameworks address the needs of organizations for successful OKR implementation?" under the lenses of Performance Management Systems. They found 15 studies by searching SCOPUS, Springer Link, IEEE Xplore, and Google Scholar. They also considered books [Doerr 2019, Niven and Lamorte 2016], technical reports [Lannoo and Parlour 2021], and Google Scholar, which we did not. The study contribution is the analysis of OKR implementation frameworks according to the phases of the PMS implementation: Sensitize management for need of PM, Define/ concrete vision, objectives & strategies, Knowledge management, Allocation of resources, Define key objectives in consideration of vision, Define KPIs for all areas, Risk management, Adapt management system, Change management, Pilot project, Communication management, Implement measures & KPIs, Raise acceptance, Evaluate project implementation, Evaluate communication, Reviewing objectives, KPIs & measures.

4.2.2. Limitations and Threats to Validity

The validity of a mapping study is directly related to the reliability of its execution [Petersen et al. 2015].

A limitation of the work is related to the low number of academic works that mention OKR, which meant that some questions had little evidence to be answered. As a treatment, searches were conducted in eight digital libraries, and subsequent complementation of the results using snowballing. In addition, we tried to characterize the use of OKR as much as possible, not discarding studies due to the quality criteria applied. Another limitation is the selection of only peer-reviewed publications. Thus, for example,

some works identified in [Troian et al. 2022, Lannoo and Parlour 2021] were considered in the current study. We restricted our searches to studies within Computer Science and Information Systems areas. In ISI Web of Science, we additionally included the Management area, as we identified some Information Systems studies within that category.

A research protocol and a data extraction form were created to reduce the threat to *descriptive validity*. Both were discussed between the authors. Research questions and specific inclusion and exclusion criteria were established. Adjustments were made over time to ensure the adequacy of the research objectives. We created a form that objectively directed the extraction process and allowed for reviewing and auditing the collected information. To address threats related to *theoretical validity*, two researchers participated in the selection and extraction process. No studies were excluded because of quality criteria.

During the second filter application, similar papers were classified as duplicates. For instance, [Fernandes et al. 2021] and [Belfort et al. 2021] would contribute with the same answers to the research questions, therefore, only the latter was accepted (as [S29]. Conversely, for instance, studies [S25, S27, S39] share some authors and scope but have been accepted because provide different answers to the research questions.

The first author performed the application of filters and data extraction. The second author verified all the steps involved. Possible disagreements were discussed until a consensus was reached. In addition, a spreadsheet with the steps followed and the extraction performed is available, which allows scrutiny by other researchers. The second execution of this study was carried out solely by one researcher, which poses a potential threat to its reliability. Nevertheless, the researcher double-checked all steps to mitigate this threat.

Regarding *generalization validity*, in general, mapping studies do not show generalizable results. This type of threat is more common when few studies are selected, and there is insufficient evidence for such [Petersen and Gencel 2013]. An *interpretative validity* threat refers to the researcher's interpretation bias. Both authors minimized it by constantly reviewing the results identified.

5. Final Considerations

This work had as its primary motivation to survey the available academic studies on OKR. A literature mapping was completed to fulfill this objective, and 47 studies were selected from digital libraries Scopus, Engineering Village, Web of Knowledge, IEEE Xplore, Springer, Wiley, ScienceDirect, and ACM DL. Also, we performed backward and forward snowballing. The studies led us to identify various subjects associated with OKR, such as communication (interlocution and interaction aspects), performance evaluation (tool), task planning and prioritization, transparency, focus, and team alignment. All of these themes have been used by both IT and non-technology teams. However, in some research, OKRs are only cited or worked superficially in an attempt to relate or contribute to the central theme, but in practice, they bring little or no contribution.

The above result suggests that there is an open field to continue creating and developing works that relate OKR to these topics. For example, reflecting on which aspects

OKR promotes alignment, understanding how it favors elements such as focus or even under what circumstances it can be helpful to teamwork and communication, and how this can improve deliveries in the IT area, either systems or services.

We expect this study to serve as a basis for other researchers to continue to seek and deepen the understanding of how to support the use of OKR and, thus, help build knowledge on the subject. In future work, we intend to investigate how OKRs can help create a measurement culture, besides a multivocal literature review and a field study with companies that use OKRs. Also, we intend to create a method combining OKRs, GQM+Strategies [Basili et al. 2014] and SINIS [Trinkenreich et al. 2018] to support IT alignment [Trinkenreich et al. 2019].

6. Acknowledgement

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