Applying Design Science Research to Develop a Process Reference Model for IT Workforce Outsourcing: Preliminary Findings

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ABSTRACT

IT organizations in Brazil increasingly use workforce outsourcing, and it has become a strategic choice, facilitating innovation, flexibility, and effectiveness in the process execution. This paper presents how we created the Process Reference Model for IT Workforce Outsourcing (MR-TFT) using an approach based on Design Science Research. MR-TFT considers typical and critical aspects of IT workforce outsourcing – for both contractors and suppliers – identified from interviews with industry professionals and a mapping study. It adapts important concepts of software engineering to support workforce outsourcing practices. MR-TFT covers the entire life cycle of providing this type of service, including defining the strategy, managing the agreement between the parties, implementing the outsourcing, evaluating the performance and quality of services performed by the outsourced workforce, and continuously improving the related processes. We also present results from a case study in the context of diagnosing the outsourcing practices in which the model was considered useful and viable.

KEYWORDS

IT Workforce Outsourcing, Reference Model, Maturity Model, Outsourcing, Workforce, Design Science Research

1 INTRODUCTION

IT (Information Technology) outsourcing has become a strategic choice for organizations in which IT structures are increasingly necessary to make management processes not only more efficient and economical but also more innovative and flexible, capable of condition effectiveness and efficiency in the processes execution [25]. The great demand for outsourcing began in the early 1990s [35]. According to [14, 23], management and outsourcing decisions are complex, involving many factors, such as: reliability and number of suppliers; relationship with suppliers; monitoring supplier and outsourced workforce performance requirements; monitoring the outsourcing contract and its direct relationship with budgetary, financial planning and outsourcing control.

In workforce outsourcing, the contracted organization is responsible for providing a specialized workforce (i.e., labor) with the requested knowledge, skills and experiences and in the desired quantity, according to a previously established agreement with the contracting organization, which, in turn, is responsible for managing the performed activities and by the workforce made available by the supplier. In Brazil, workforce outsourcing (also commonly known nationwide as 'body shop') was, in practice, only permitted for activities not considered core activities of the contracting organizations. However, Law No. 13,467/2017 [5] modified or repealed several articles of labor law, simplifying and streamlining the hiring process and minimizing conflicts that resulted in legal problems and labor lawsuits. Moreover, the law enabled third parties to perform services, thus meeting a transitory need or complementary demand for services.

Organizations face barriers relating to IT workforce outsourcing business [29]. For example, there may be problems with legal and contractual aspects, and the performance and quality of the services provided by the outsourced workforce may be lower than desired, resulting in software with performance and quality problems, which will significantly affect satisfaction and total costs to meet users' business needs. Furthermore, the service requirements, contractual conditions, capacity, workforce knowledge, and desired service levels are not always formally established between the parties. However, the organizations involved do not often have adequate support to adopt good IT workforce outsourcing management practices.

Organizations and teams use reference models as a guide to improve their processes. A reference model describes implementation suggestions or particularities of a given business area for which it can be used [17]. It comprises process definitions, defined in terms of purposes and outcomes, together with an architecture that describes the relationships among the processes [17]. In the Software Engineering area, experience has shown that the adoption of a reference model based on Software Engineering best practices [22, 34] can positively influence software quality and team productivity [28]. In this sense, a process reference model can help organizations improve their processes for hiring, sourcing, and monitoring IT workforce outsourcing.

This paper presents how we applied Design Science Research (DSR) [11, 36] to develop the Process Reference Model for IT Workforce Outsourcing (MR-TFT – "Modelo de Referência de Processo para Terceirização de Força de Trabalho de TI" – in the Portuguese language). As accessories to the MR-TFT, an assessment guide and implementation scenarios are also presented and are aimed at contracting and IT workforce supplier organizations. The MR-TFT supports adopting IT workforce outsourcing practices from the contracting and supplier perspective, covering the entire life cycle of this type of service provision, from defining the strategy to managing the agreement between the parties and providing outsourcing. It also supports mitigating risks inherent to the adoption of workforce outsourcing and problems with legal and contractual aspects, including the performance assessment and the quality of services undertaken by the outsourced workforce.

The model enhances practitioners' use of software engineering and software quality practices by reinforcing, through its processes' expected outcomes, the adoption of practices associated with strategic planning, project management, portfolio management, process improvement, measurement, configuration management, training,

and people management, among others. MR-TFT enables organizations to be more efficient by, among other things, optimizing the management of outsourced workforce, which can contribute to increasing the development of high-quality software.

To create the MR-TFT, analyses of international standards and reference models were undertaken; IT workforce outsourcing public notices and contracts, main laws, and related Brazilian regulatory instructions; qualitative study with those responsible for defining, managing outsourcing contracts and acting as an IT workforce outsourcing; mapping study on the benefits, challenges and success factors of IT workforce outsourcing. The model was evaluated through peer review, usage scenarios, and, finally, through a case study. Based on the diagnosis conducted in the case study, the MR-TFT was considered useful and viable.

In addition to the introduction, this paper is organized as follows: Section 2 presents the literature review; Section 3 covers the research methodology based on Design Science Research; Section 4 presents the MR-TFT; Section 5 presents the results of our strategy for evaluating the MR-TFT; Section 6 presents a discussion; Finally, Section 7 shows our final considerations.

2 RELATED WORK

Ahmad et al. [2], through a systematic mapping study, identified twelve maturity models used to evaluate IT outsourcing practices in organizations and the main elements used in developing the models[1]. The authors find that most existing models do not have a standard process, and most were produced using a framework with different deliverables and expectations. The analysis of the models cited in [2] sought to capture the key elements of these models so that this information could be compared with the processes and expected results defined for the MR-TFT. Below are examples of some of these models and their respective objectives and focus of action.

- *IT Outsourcing Maturity Model* [1]: It presents a model for evaluating domestic outsourcing, 'nearshore', and 'offshore' outsourcing. The model focuses on budget and finance management, some aspects of outsourcing strategy, the Service Level Agreement (SLA) established in the contract, the roles and responsibilities of the IT workforce outsourcing, the commitment of those involved, the relationship between contracting and supplier, the skills necessary for the IT workforce outsourcing and organizational culture. Of these subjects, only the last one is not addressed in the MR-TFT.
- *Maturity model for IT outsourcing relationships* [10]: The model focuses on managing successful IT outsourcing relationships. It addresses some aspects of the outsourcing strategy (in particular, those related to budget and finance), the focus activities of outsourcing, contract management, monitoring of supplier performance, roles, and responsibilities and the strength of outsourced labor, planning and conducting training, and exploring social exchange. Of these subjects, only the last one is not addressed in the MR-TFT.
- *IT Governance Maturity and IT Outsourcing Degree* [9]: The model focuses on assessing the maturity of IT governance between companies that selectively outsourced their IT function and those that completely outsourced IT functions. The model addresses some aspects of the outsourcing strategy, monitoring risks and opportunities and the contract. When comparing both models, it is noted that in MR-TFT, there is no focus on the development of IT governance.

In general, the models identified by Ahmad et al. [2] assume that the supplier handles the management of service provision. In MR-TFT, the contracting organization is responsible for managing the outsourced workforce. In other words, the models identified generically address service provision and not the supply of workforce. Generic models also do not have distinct views on contracting and supplier organizations. Besides, they do not address some basic processes for managing IT workforce outsourcing, such as Contract Portfolio Management, Measurement, Outsourcing Management, Outsourcing Realization Management, Configuration Management, Human Resources Management, and Outsourcing Legal Management. Issues common to both the generic models and the MR-TFT include commitment of those involved; some aspects of the outsourcing strategy (such as outsourcing focus activities and budget and financial management); formal definition of processes; contract management and SLA; risk and opportunity management; skills needed by the workforce; monitoring the performance and quality of the workforce; roles and responsibilities of the supplier and the workforce; training management; and the relationship between contractors and suppliers.

3 RESEARCH METHOD

The methodological approach was based on Design Science Research (DSR) [13]. The DSR has a double objective: to develop an artifact (design) and to conduct scientific research based on the application of the developed artifact. This approach is based on both Design Science and Behavioral and Social Sciences. This method has been used in research in Information Systems and Software Engineering [13, 36].

A DSR project is organized in an iterative process with three cycles: Relevance Cycle, Design Cycle, and Rigor Cycle [12, 13]. The Relevance Cycle involves (i) defining the problem and motivation to be met and (ii) defining the objectives for a solution to the requirements and criteria for evaluating the results. The Design Cycle involves developing and evaluating artifacts or theories to solve the identified problem, comprising the steps: (iii) Design and Development, (iv) Demonstration, and (v) Evaluation. The Rigor Cycle refers to the use and generation of knowledge, comprising the steps (vi) Communication and the use of knowledge and fundamentals along with the work. Learning iterations [4] were also performed. Learning iterations are composed of empirical studies carried out in iterations that allow the researcher to learn something, which provides useful knowledge for understanding the problem, developing the artifact, and evaluating and improving it. Fig. 1 shows the DSR project followed to conduct this research.

[1]Important to note that we did not identify other models with a similar focus of ours. We searched Google Scholar for terms *'outsourcing maturity model'* and *'outsourcing reference model'* and variations

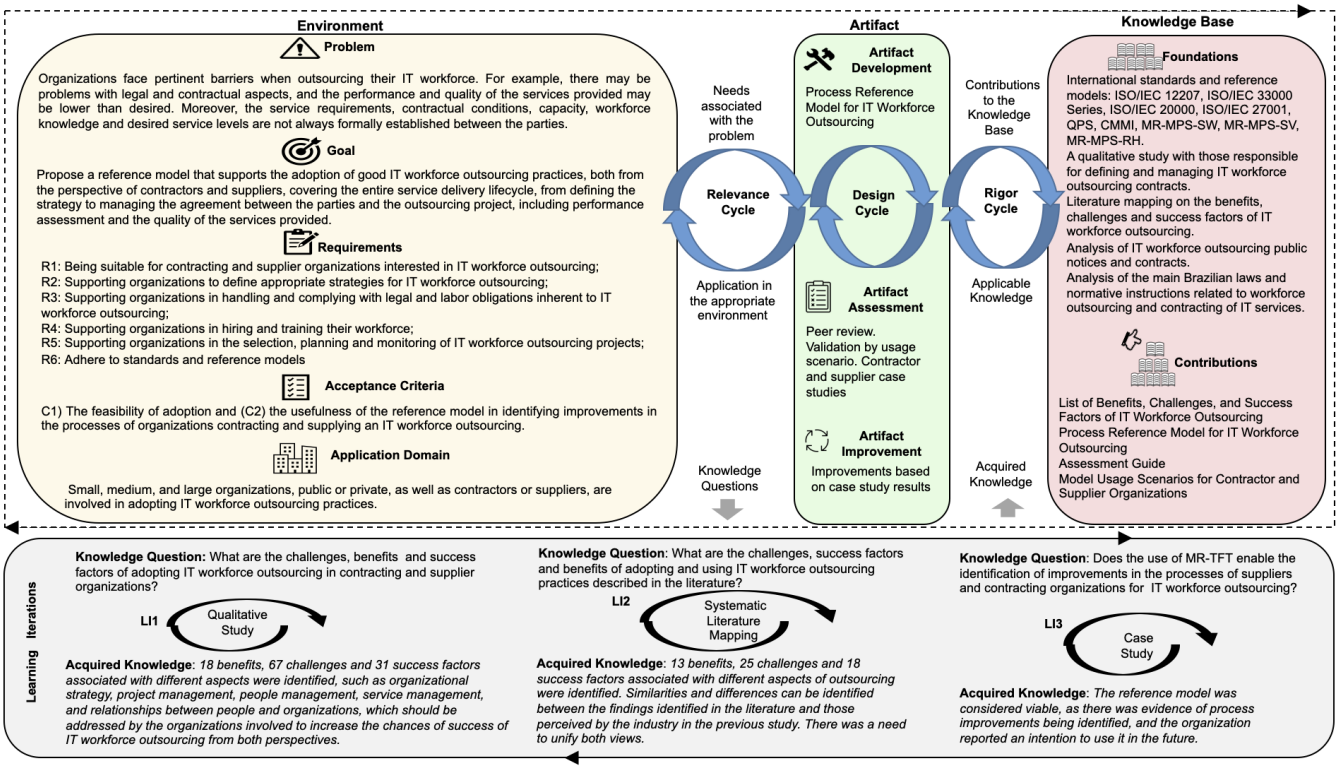

Figure 1: Research Method – Design Science Research

3.1 Relevance Cycle

The problem and motivation are associated with barriers faced by organizations that provide or hire IT workforce outsourcing services. The problem was identified from the experience of the first author, who has been involved in IT workforce outsourcing practices for more than 20 years – working in various profiles. Later, it was confirmed by the execution of two studies [29, 31]. As a way of tackling the problems, in the step of defining the objectives for a solution, we decided to create the Reference Model for IT Workforce Outsourcing (MR-TFT, from the Portuguese language "Modelo de Referência para Terceirização de Força de Trabalho de TI"). Six requirements were defined for drawing up the model (R1, R2, R3, R4, R5, and R6) and two evaluation criteria (C1 and C2), as can be seen in Fig. 1.

The first learning iteration [29] answered the knowledge question: *"What are the challenges, benefits and success factors of adopting IT workforce outsourcing in contracting and supplier organizations?"*.

A qualitative study was conducted using interviews with people involved in IT workforce outsourcing in both contracting and supplier organizations [29]. We conducted 39 interviews, conceived in three different cycles, designed to cover various roles in contracting and supplier organizations. In summary, three strategies were used to conduct the interviews due to the target audience of each one and to increase the range of participants and align the responses with the research objectives. The interpretation of the interviews followed the Thematic Analysis procedure [6], which consists of identifying, analyzing, and describing patterns or themes that enable the data to be presented and organized in a synthesized and consistent way. It was possible to identify 18 benefits, 68 challenges, and 31 success factors.

The second learning iteration [31] aimed to answer the same knowledge question but through a systematic literature mapping. The analysis of the 32 selected articles resulted in findings collected, analyzed, compared with each other, and codified, generating 13 benefits, 24 challenges, and 18 success factors inherent to the workforce outsourcing business.

The results of both studies – published independently – were analyzed and compared aiming at unifying findings with similar meanings or complementary content and arriving at common writing. To harmonize the results, we considered the context, the related subject, and the applicability of each finding. For each one, all others were analyzed regarding the possibility of unification. There was constant discussion and review among the authors of the qualitative analysis. We did not exclude findings but unified them into others, even considering the different types of findings. Depending on how the text is written, challenges, benefits, and success factors can be understood similarly.

In the end, 23 benefits, 67 challenges, and 29 success factors were identified. Table 1 presents some examples of the consolidated findings. The full content is available as supplementary material [32]. The ID column presents the code of benefits (B), challenges (C), and success factors (S). The third column shows the number of

citations to the findings in the qualitative study and the systematic mapping, respectively. The fourth column indicates whether the finding applies to contracting (C) or supplier (S) organizations.

3.2 Design Cycle

In the design and development steps, the MR-TFT was created iteratively. In addition, an assessment process and accessory documents were defined. Fig. 2 shows the path to developing the MR-TFT until its current version. A first version was generated based on the findings of previous studies. Then, different rounds of peer review and validation were interspersed through model usage scenarios by contracting and supplier organizations in the IT workforce. Finally, a case study was conducted to evaluate the ability of MR-TFT to support the diagnosis (i.e., gap analysis) of organizations that supply and acquire IT outsourced workforce.

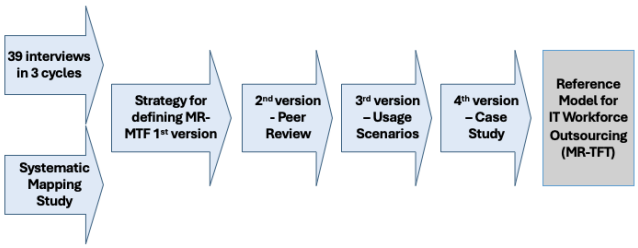

Figure 2: Steps for Defining the MR-TFT

We present the MR-TFT in Section 4 and discuss how we evaluate it in Section 5.

3.3 Rigor Cycle

In this cycle, we used relevant literature, including articles, books, theses, international standards, reference models, and other materials on IT workforce outsourcing, as well as intermediate results from the research project.

For instance, we used the following international standards and reference models:

- ISO/IEC 33000 family of standards. The definition of the processes follows the requirements for a process reference model presented in ISO/IEC 33004:2015 [16], stating the purpose and expected outcomes of its execution. The assessment method and process follow ISO/IEC 33020:2019 [20];
- International standard ISO/IEC/IEEE 12207 [18], which describes software and systems life cycle processes;
- International standard ISO/IEC 20000-1 [19], which aims to provide a common reference standard for any company to offer IT services to internal or external contracting and aligns with ITIL best practices [3].
- International standard ISO/IEC 27001 [21], which presents security techniques and requirements for information security management systems;
- Reference models QPS [8, 26], MPS for Service [33], MPS for Software [34] and CMMI 2.0 [7] that comply with the international standard ISO/IEC 33020:2015 [20].

Also, we used the following Brazilian laws, normative instructions, and ordinances: Normative Instruction No. 4, of September 11, 2014; Law No. 14,133 of April 1st, 2021; Law No. 13,467 and Law No.13,429 of March 31, 2017; Law No. 8,212, of July 24, 1991; SGD/MGI Ordinance No. 750, of March 20, 2023. Although they did not directly influence the definition of any specific process, they contributed to the addition of explanatory notes. Nonetheless, the necessity of complying with legal aspects to avoid legal proceedings led to the establishment of the Legal Outsourcing Management process (see Table 2).

Finally, the communication step involves presenting research results to the academic and industrial communities. Besides this current work, we have published two studies in academic venues [29, 31]. We have also presented the MR-TFT to an industrial audience [30].

4 MR-TFT REFERENCE MODEL

The MR-TFT addresses issues such as defining and monitoring the outsourcing strategy, contract, service level agreements, outsourcing, human resources hiring, training, and financial management. Besides the relationship and integration between the process areas involved, it increases visibility for everyone involved of legal requirements and obligations. IT workforce outsourcing must be viewed broadly, considering the dimensions that group activities inherent to the IT workforce outsourcing business type. The MR-TFT is composed of three dimensions that group such activities: Organizational, Contracting, and Supplier. The Organizational dimension comprises processes common to both the Contractor and Supplier dimensions.

In general, existing reference models focus on isolated aspects such as SLA, customer relationships, contracting or supply in isolation, and strategic alignment of outsourcing. The MR-TFT covers all these subjects comprehensively and interconnectedly. We also instantiate some processes to the specificities of workforce outsourcing. For instance, CMMI [7] and MPS.BR Models [33, 34] and other reference models provide 'generic' acquisition and portfolio management processes. They do not address supply practices explicitly or implicitly. In the MR-TFT, the Contractual Aspects Management (CAM) process instantiates the acquisition process for the specificities of workforce outsourcing. Similarly, the Contract Portfolio Management (CPM) process does the same for the supply and portfolio management processes.

Aligned with models like CMMI [7], MR-MPS models [33, 34] – and several other similar ones – the MR-TFT focuses on what the organization should do and not how. For instance, the MR-TFT expects organizations to define, implement, and improve their processes but does not force them to consider national culture or social exchange exploitation. Such aspects are part of the process implementation strategy chosen by the organizations, so they are not covered explicitly in the model.

The MR-TFT is also organized into three capacity levels (based on the QPS model [8, 26]): Bronze, Silver, and Gold. The initial capability level of the model is Bronze, which comprises the basic practices associated with the supply, hiring, and use of outsourced workforce by organizations. The Silver capability level is the intermediate level, characterized by the evolution of practices related to process execution management, for example, improvement in risk and opportunity management and objective assessment, which

Table 1: Examples of Identified Benefits (B), Challenges (C), and Success Factors (F) Associated with Workforce Outsourcing

ID	Findings	Source	CS
B06	Having access to additional workforce to respond to fluctuations in demand, whether temporary seasonal or not, reducing costs and labor charges arising from hiring and dismissals.	(17; 22)	C
B08	Flexibilizing and facilitating the replacement, search, selection, and allocation of specialized workforce provided by a supplier.	(7; 0)	C
B14	Enabling the supplier to identify new business opportunities with other customers based on the knowledge acquired.	(1; 0)	S
B17	Accessing new knowledge and technologies via the outsourced IT workforce that supports business improvement and performance, processes, and service capacity without the need to train staff.	(4; 2)	C
D08	Developing a hiring plan that encompasses the necessary current knowledge and all the unknown shortcomings that will be encountered in the future, caused by constant technological change.	(6; 16)	CS
D24	Monitoring and mitigating outsourcing risks, such as labor processes, low workforce commitment, and loss of supplier´s reputation if the workforce does not act correctly.	(4; 0)	CS
D37	Avoiding the feeling of non-belonging (that is, not being a member of either the contracting or supplier company), thus reducing one of the causes of high turnover, low motivation, and low workforce performance.	(8; 0)	CS
D44	Avoiding that the supplier has too much power over the contracting party and that the workforce centralizes too much process knowledge, getting the business knowledge only with it.	(5; 8)	C
F01	Having access to an additional workforce with knowledge, skills, and talents required by the organization.	(9; 4)	C
F07	Having a budget that considers the productivity established in the contract and effectively performed, associated with quality and performance indicators.	(1; 0)	S
F13	Having legal follow-up.	(1; 0)	CS
F15	Standardizing operational procedures, including well-structured and dynamic processes.	(15; 2)	CS
F25	Using a specialized workforce at specific times, or for a limited time, for important project parts.	(4; 0)	C

ensures that processes are followed and that work products are produced with quality. The Gold capability level is the advanced level, characterized by the institutionalization of a standard process in the organization. Levels are cumulative. Thus, an organization at the Gold level must also implement all the processes and expected outcomes present at the Bronze and Silver levels.

Table 2 presents the dimensions and processes (including their purposes) that make up the MR-TFT Organizational, Contracting, and Supplier dimensions. The numbers in column 'Outcomes' indicate, respectively, the number of expected outcomes associated with the Bronze, Silver, and Gold capacity levels. The MR-TFT full content is available as supplementary material [32]. Table 3 presents the expected outcomes of the Contractor Outsourcing Strategy process (CSTR) defined for the Contractor Dimension. The first column indicates the number of the expected outcome, while the third indicates its description. The second column indicates the level at which the expected outcome is introduced.

Due to a design decision, we aimed to keep the MR-TFT as simple as possible to implement – without losing focus and coverage of the desired practices – and suitable for organizations of any size. The division into levels (Bronze, Silver, and Gold) allows organizations (Contractor and Supplier) to improve and evolve their processes in smaller steps, which may be more suitable for small businesses by reducing and spreading implementation costs and efforts over time. The adopted strategy plays a very relevant role in ensuring that small companies implement a reference model properly and promptly. Therefore, as mentioned, we aimed to keep the model lean. Additionally, we created scenarios (introduced in Section 4.1) that can help companies (especially small ones) adapt and tailor the envisaged practices to their needs.

4.1 MR-TFT Application Scenarios

To facilitate a better understanding of the reference model and assist in its evaluation, we have created potential scenarios demonstrating its application in organizations involved in IT workforce outsourcing. All MR-TFT processes – and their expected outcomes and associated notes – were considered to develop the scenarios, as well as the findings of benefits, challenges, and success factors from previous studies.

The different scenarios are related to the type of organization (contracting or supplier) and the timing of implementing the IT workforce outsourcing strategy. Fig. 3 lists MR-TFT usage scenarios for a contracting organization. Each scenario is divided into specific parts to facilitate understanding. Similarly, the scenarios for an IT workforce supplier organization have also been defined with appropriate adaptations. For example, the first scenario for this type of organization is "Intention to start outsourcing workforce supply business."

To illustrate, Table 4 shows Part 2, "Supplier Hiring," from the scenario "Starting the implementation of the outsourcing strategy" for contracting organizations. The text in brackets indicates the expected outcomes of the processes that support the implementation of these best practices relating to the Contractual Aspect Management (CAM), Configuration Management (CM), and Process Definition and Management (PDM) processes. The findings of the preliminary studies that are relevant in this context are mentioned in brackets (see Table 1).

The scenarios are not intended to serve as an implementation guide to the model as they do not explain the theoretical intrinsic concepts of the processes or discuss implementation tactics or practices – that remains future work. Nonetheless, they explain how each process and expected outcome intertwine and present them

Table 2: MR-TFT Dimensions and Processes

Dimension	Process Name	Purpose	Outcomes
Organizational	Legal Outsourcing Management (LOM)	Supporting compliance with legislation and other legal aspects relevant to workforce outsourcing.	(3; 1; 0)
	Process Definition and Management (PDM)	Supporting the definition, institutionalization, implementation, and continuous improvement of processes designed to standardize and support the performance of activities concerning workforce outsourcing.	(1; 3; 5)
	Measurement (MSR)	Providing subsidies to support the definition, collection, storage, analysis, and communication of data relating to the execution of processes related to workforce outsourcing, implemented in the organization to support organizational objectives.	(5; 0; 1)
	Training Management (TM)	Supporting the organization in developing and maintaining the workforce with the knowledge and skills appropriate to the business needs, evaluating effectiveness, and proposing improvements in training.	(2; 3; 1)
	Configuration Management (CF)	Supporting the establishment and maintenance of the integrity of processes and work products resulting from the execution of processes and making them available to all those involved.	(3; 2; 0)
Contracting	Contracting Outsourcing Strategy (COSTR)	Supporting the contractor organization in assessing the feasibility of using an outsourced workforce and, if so, defining a strategy that considers the organizational and IT objectives and the analysis of which activities can be the focus of outsourcing.	(6; 3; 1)
	Contractual Aspects Management (CAM)	Supporting the definition of terms of reference, service level agreements, and contracts with workforce suppliers in line with the outsourcing strategy and monitoring the established contracts.	(8; 0; 0)
	Outsourcing Management (OM)	Supporting the planning and monitoring of the use of outsourced workforce, considering organizational needs and what is established in the contract, terms of reference, and service level agreements.	(15; 3; 2)
Supplier	Supplier Outsourcing Strategy (SOSTR)	Evaluating the feasibility of providing an outsourced workforce to be allocated to a contractor and, if so, defining a strategy considering the organizational objectives, possible competitive advantages, and the analysis of which activities will be performed by the outsourced workforce.	(8; 2; 1)
	Contract Portfolio Management (CPM)	Deciding on the participation and maintain IT workforce supply contracts that are necessary, sufficient, and sustainable to meet strategic objectives.	(5; 0; 0)
	Outsourcing Realization Management (ORM)	Supporting the planning and monitoring of the use of the outsourced workforce, considering organizational needs and what is established in contracts, terms of reference, and service level agreements.	(10; 3; 2)
	Human Resources Management (HRM)	Supporting feasibility analysis, hiring, and provision of workforce in accordance with the provisions of the contract, terms of reference, service level agreement, and legal aspects related to outsourced workforce supply.	(4; 1; 1)

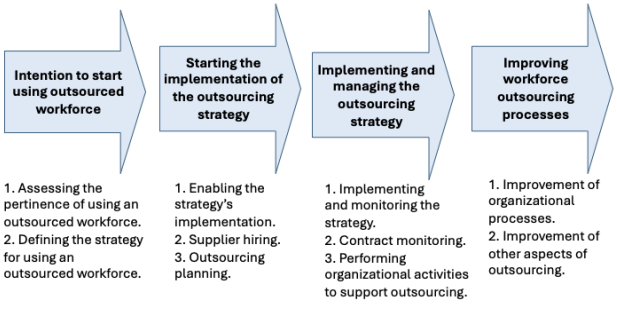

Figure 3: Usage Scenarios in a Contracting Organization

in a possible order of implementation while showing important knowledge in the form of benefits, challenges, and success factors (derived from the findings introduced in Table 1). That knowledge is important, especially to small organizations and those having few financial resources, to hire consultants to help them improve their business processes associated with workforce outsourcing. That can also help them tailor the reference models for their needs by providing means to understand which practices are already implemented and which ones may be more easily adapted beforehand.

4.2 MR-TFT Assessment Method

An assessment method was also proposed to support the use of MR-TFT in diagnosing the processes of interested organizations. Every assessment method contains, in addition to the existing rules for performing assessments, a process that defines the activities necessary to evaluate with their dependencies, the artifacts generated in these activities, and the responsibilities for carrying out these activities [24]. The MR-TFT assessment method complies with the ISO/IEC 33020:2019 [20] standard and was based on the assessment method defined for the QPS reference model [8, 26]. In turn, this

Table 3: Contracting Outsourcing Strategy Process

Outcome	Level	Expected Outcome Description
CSTR 1	Bronze	The feasibility of using an outsourced workforce is assessed by considering business and IT objectives, organizational needs, and the legal aspects related to outsourcing.
CSTR 2	Bronze	Focus activities for outsourcing are identified, considering the profile required for the outsourced workforce.
CSTR 3	Bronze	Risks and opportunities associated with the strategy for using an outsourced workforce are identified and documented.
CSTR 4	Bronze	Costs associated with using an outsourced workforce are estimated, and financial guidelines are defined.
CSTR 5	Bronze	An outsourced workforce strategy aligned with business and IT objectives is established, and senior management involvement is guaranteed.
CSTR 6	Bronze	Material and financial resources required to support the outsourced workforce strategy are guaranteed.
CSTR 7	Bronze	Human resources, responsibilities, competencies, and training to support the outsourced workforce strategy aligned with business and IT objectives are guaranteed.
CSTR 8	Bronze	Outsourced workforce strategy, risks, and opportunities associated with using the outsourced workforce are monitored at planned intervals, and appropriate actions to address deviations are defined, prioritized, selected, implemented, and maintained.
CSTR 9	Silver	Actions for contingency and mitigation of the risks and opportunities associated with using the outsourced workforce are identified, implemented, and monitored to completion. Their results are recorded and communicated to stakeholders.
CSTR 10	Gold	The organization's management critically analyses the outsourced workforce strategy at planned intervals, and an action plan to address improvements is established, implemented, and maintained.

method was based on the master's thesis [24], which also served as the basis for defining the MA-MPS assessment method of the MPS.BR Program. Fig. 4 presents the inputs, activities, and outputs related to the MR-TFT assessment method.

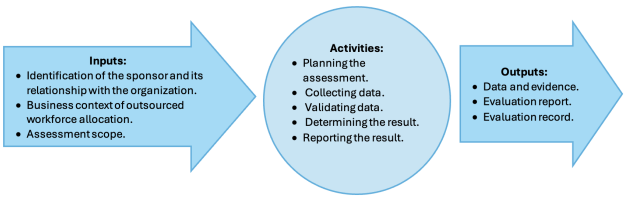

Figure 4: Key elements of the MR-TFT assessment process (adapted from ISO/IEC 33002:2015 [15].

5 MR-TFT EVALUATION

We used a comprehensive approach to assess the MR-TFT. We based our evaluation on compliance with the established requirements (Section 5.1), peer review (Section 5.2), definition of application scenarios (Section 5.3), and case study in industry to evaluate MR-TFT feasibility and usefulness (Section 5.4).

5.1 Compliance with Established Requirements

All the DSR project requirements described in Section 3 were fully met. Requirement R1 influenced the model structure, especially the decision to have three dimensions (namely Organizational, Contracting, and Supplier). R2, R3, R4, and R5 influenced the choice of processes that make up the model. Then, R2 led to the creation of Contracting Outsourcing Strategy (COSTR) and Supplier Outsourcing Strategy (SOSTR) processes, R3 led to the creation of the Legal Outsourcing Management (LOM) process, R4 led to the creation of Training Management (TM) and Human Resources Management (HRM) processes, R5 led to the creation of Contract Portfolio Management (CPM), Outsourcing Realization Management (ORM) and Outsourcing Management (OM) processes. The case study was conducted in contracting and supplying organizations (evaluating R1) and considered all defined processes (thus evaluating R2 to R5). R6 is guaranteed by an adherence analysis conducted by the authors (which is available as supplementary material [32]).

5.2 Peer Review

The MR-TFT was subjected to peer review to evaluate all its elements: capacity levels, processes, expected outcomes, and grades. Professionals with extensive experience in outsourced workforce and the implementation and assessment of the MPS.BR Program reference models and experience with outsourced team management were selected. As a result, processes were reorganized, expected outcomes were reviewed, and notes were simplified.

5.3 MR-TFT Application Scenarios

MR-TFT structure and content were evaluated based on the description of possible scenarios for its application in both contracting and supplier organizations. The development of the scenarios allowed us to identify improvements in processes, expected outcomes, and additional notes. It was observed that the expected outcomes of some processes were directly related to other ones, and, therefore, some of them and expected outcomes could become part of others, reducing the number of processes and improving understanding and simplifying the MR-TFT considerably.

5.4 Case Study for MR-TFT Evaluation

The MR-TFT version resulting from the application of the scenarios was evaluated in a case study [27] aiming at assessing its feasibility

Table 4: Part 2 "Supplier Hiring" from the "Starting the Implementation of the Outsourcing Strategy" Scenario for Contracting Organizations.

When putting the outsourcing strategy into use, the organization must prepare terms of reference and/or public notice with information on the characteristics and needs of outsourcing (CAM 1), as well as identify the relevant service level agreements (CAM 2). The terms of reference and/or public notice may also consider meeting standards requirements that the contracting must be certified or reference models that it must adhere to [F15]. The outsourcing contract must comply with the legislation regarding the usage of the outsourced workforce in the contracting's view and the provision of the outsourced workforce in the supplier's view in the federal, state, and municipal context [F13]. Therefore, the feasibility of notices and terms of reference complying with labor legislation related to workforce outsourcing must be assessed and communicated to interested parties (CAM 3). If necessary, adjustments must be made. In addition, one or more service level agreements (CAM 2) must be defined. With this information, it is possible to initiate contact with potential workforce suppliers (CAM 4). Criteria must be established (CAM 4) that support the decision-making to select (CAM 5) one or more suppliers. From that moment on, the contract aligned with the outsourcing strategy and with the parties involved can be defined (CAM 6) and signed (CAM 7). With the signing of the contract with the selected supplier(s), it is possible to start planning the use of the outsourced workforce in projects, which constitutes the third part of this scenario. The relevant documents (see CM 2) must be placed at the appropriate levels of configuration control, and relevant baselines must be generated (CM 3). For Silver Level organizations, changes must be tracked (CM 4), and configuration audits must be performed (CM 5). Furthermore, the procedures defined to guarantee the quality of products and processes must be applied (PDM 3) in the context of implementing the methods mentioned in this part of the scenario.

to identify improvements in the processes of organizations involved with IT workforce outsourcing. Thus, the third learning iteration was implemented to answer the knowledge question: "Does the use of MR-TFT enable the identification of improvements in the processes of suppliers and contracting organizations for IT workforce outsourcing?"

5.4.1 Case Study Design. The case study *goal* was to evaluate whether the MR-TFT complies with the DSR project's acceptance criteria (see Fig. 1). Therefore, we assessed the MR-TFT feasibility and usefulness. The *study context* was an IT workforce supplier organization (named Org. S). The chosen *participant profile* was responsible for contract management, relationship management, and outsourcing execution.

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One of the applications of the process reference model for IT workforce outsourcing is to enable the organization to identify, based on the processes and expected results defined in the model, points of improvement in the practices currently adopted. Thus, the procedure adopted to perform the case study was based on analyzing the processes of the participating organizations, which is commonly called 'gap analysis.'

For *data collection*, we created a questionnaire comprising questions based on the MR-TFT processes and expected outcomes, simulating an assessment of adherence to processes. For instance, to assess whether the organization implemented the expected outcomes of CSTR 1 and CSTR 2 of the Contracting Outsourcing Strategy process (see Table 3), we asked, "How the feasibility of adopting TFT was analyzed?" and "How were topics such as business objectives, organizational needs, and legal aspects considered?," and "What criteria were used to determine which activities could be outsourced, considering the risks, opportunities, and competitive advantages of outsourcing?", respectively. At the beginning of the interview, an explanation was given about the model, its objective, and how it is structured. For each question, when necessary, the meaning of the expected outcome was explained.

After each question, the interviewee described whether and how the practices represented in the expected outcome were implemented. As needed, we asked to consult additional documentation used to support the claims that were made.

The first author performed *data analysis*. After the interviews, the data was analyzed to identify whether the organizations adhered to the processes and expected outcomes from the model. As a result, a gap analysis report was produced. The second author conducted *data validation*.

5.4.2 Case Study Execution. The participant has 15 years of experience with IT workforce outsourcing, having worked as responsible for contract and outsourced workforce management for more than five years. The interview was conducted virtually for approximately 2 hours. The interview included all the expected results of the Contracting Outsourcing Strategy and Contract Portion Management processes, as the participant considered them the most important for the organization. The Microsoft Teams tool was used, which enabled automatic recording and transcription. Subsequently, the transcription was reviewed by the first author, and the recording was compared. Based on the transcriptions and recordings, the gap analysis report was completed. The second author discussed this report and asked for clarifications before being presented to the participant. The results of the case study were discussed in another meeting between the researcher and the participant.

Table 5 presents the assessment summary of the Contracting Outsourcing Strategy Process. In total, three outcomes were considered Fully Implemented, five outcomes were considered Partially Implemented, and three outcomes were considered Not Implemented. Regarding the Contract Portfolio Management process, all outcomes were considered Partially Implemented. Although the participant indicated the process was executed, no artifact evidencing its execution was presented. Fig. 5 presents the summary of adherence to the

model of practices performed in Org. S. As a result, recommendations for improvement were identified and subsequently presented to organizations. Furthermore, improvements to the MR-TFT processes were identified and reflected in its final version.

Table 5: Assessment Summary of the Contracting Outsourcing Strategy Process in Org. S.

Outcome	Rating	Summary
CSTR 1	FI	The activity execution was successfully evidenced.
CSTR 2	PI	The activity execution and the existence of a standard artifact were successfully evidenced.
CSTR 3	PI	Risks and opportunities are identified; however, no evidence was provided to show that they are systematically documented.
CSTR 4	FI	The activity execution and the existence of a standard artifact were successfully evidenced.
CSTR 5	FI	The activity execution and the existence of a standard artifact were successfully evidenced.
CSTR 6	PI	Material and financial resources are identified, but no evidence of how they are ensured was provided.
CSTR 7	PI	Documentation regarding human resources management was found, but there was no evidence of senior management involvement.
CSTR 8	PI	Evidence of risk management was observed, but no details were provided regarding the actions taken or their documentation.
CSTR 9	NI	No evidence was presented for this outcome.
CSTR 10	NI	No evidence was presented for this outcome.
CSTR 11	NI	No evidence was presented for this outcome.

FI = Fully Implemented; PI = Partially Implemented; NI = Not Implemented

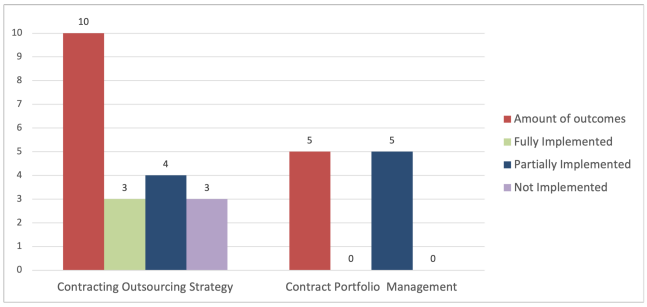

Figure 5: Summary of Org. S's Process Assessment

5.4.3 Case Study Discussion. A process assessment enables the identification of improvements in the practices, processes, and artifacts used by an organization. The results allowed us to assess the feasibility of adopting and using the MR-TFT to identify improvements in the hiring organization's IT workforce processes. Org. S has few formal processes and artifacts to support the performance of activities related to IT workforce outsourcing. According to the participant, the MR-TFT *"allowed to identify important information to understand the requirements necessary for the adoption of outsourced workforce supply practices."* Furthermore, the participant sees it as an opportunity if the organization maintains the continuity of the business line due to new contracts and, even with the current one, to implement and institutionalize the processes and results expected from the model.

Regarding the MR-TFT usefulness, the participant said it *"captured the current situation of the organization"* and that *"the description of the purposes and expected results are relevant and clear enough to understand."* Furthermore, they mentioned that the results present *"great value in supporting the organization's management, decision making, analysis of risks and opportunities and in implementing and improving outsourcing practices, in accordance with the organization's business objectives."*

As follows, we discuss the limitations and threats to validity [27]. The case study was performed in the form of a process assessment. To ensure that the participant's lack of familiarity with the model did not affect the adequate interpretation of the expected results, they were explained by the researcher before asking whether they were implemented in the organization. Questions were created to help interpret the expected results, and the participants were free to ask questions at any time. The researcher who conducted the case study is the author of MR-TFT. To avoid bias in interpreting the organization's adherence to the practices foreseen in the model, another researcher evaluated the transcription of the interviews and audited the preparation of the gap analysis report before being presented to the participant. Furthermore, the participant had the opportunity to question the adherence characterization to the expected results and provide new evidence, if necessary. As we present the result of applying the model in a single organization to conduct gap analysis, the results obtained must be considered preliminary. Future studies should be undertaken to investigate the use of the model in organizations with different characteristics, both to support the execution of processes and to identify improvements in processes already implemented (e.g., through new gap analyses).

6 DISCUSSION

The MR-TFT supports organizations involved in the IT workforce outsourcing business (i.e., workforce supplier organizations) and those that use outsourced labor to execute their IT-related business processes (i.e., contracting organizations). It should be noted that contracting organizations do not need to be IT organizations to use the model, but they require professionals in this area.

Workforce outsourcing has been a reality in the country for several years and has become safer for companies after the enactment of Law 13467:2017 [5]. Many companies, which also include public bodies or mixed-capital companies, adopt it as a means of having IT professionals with good training and flexibility in the allocation and cost control, which might not be possible in other ways. In general, it can be stated that the MR-TFT tackles a real problem faced by Brazilian companies, and there is no other similar reference model with the same purpose (as can be seen in Section 2).

A supplier organization could adopt a reference model for IT service management (for example, MR-MPS-SV [33]) or an international standard (such as ISO/IEC 20000 [19]) to shape its delivery processes of IT workforce supply service. However, such models focus on the provision of a service in which the service management

provided is the supplier, unlike what happens with the allocation of workforce outsourcing. Therefore, such models would need to be adapted to suit workforce outsourcing. For example, the MR-TRT provides specific mechanisms for hiring, managing, and assessing the performance of professionals allocated to the contracting organization, which is not explicitly provided in the MPS-SV. It should also be noted that the standards above do not have a vision adapted for contracting organizations, which is another difference from the MR-TFT.

The MR-TFT is based on the state of the practice and reality of Brazilian organizations (see [29]) and also on the state-of-art associated with good practices, challenges, and success factors in outsourcing around the world (see [31]). These studies allowed us to identify elements that contributed to the structuring of the MR-TFT (in the form of the processes that make up the model) and also to indicate guidelines for the adoption of workforce outsourcing (in the form of usage scenarios, which contain references to the findings of the conducted studies). In this way, the model not only indicates to organizations the best practices that should be followed but also assists in their usage. It should be noted that the MR-TFT is also based on national and international reference standards and models (such as those mentioned above) that are often already known or used by target organizations, which contributes to making their adoption easier.

Using DSR as a framework to structure the research project provided us with the flexibility to combine different research methods to meet each challenge we encountered along the way. The empirical approach entails a qualitative study, systematic literature mapping, and case studies. Each one presented learning iterations that contributed to answering important knowledge questions. The first two learning iterations allowed us to foster our understanding of IT workforce outsourcing from the point of view of practitioners and academic sources, respectively. The third one allowed us to collect evidence of how organizations execute the processes that comprise the MR-TFT and to evaluate its usefulness in that context.

Also, the idea that our knowledge of the subjects regarding the artifact (see, for instance, the description of the Relevance and Rigor Cycles) and the artifact itself evolves during the DSR project execution encourages us to take small steps while challenging us to be creative to choose the next steps. For instance, Fig. 2 shows that, during the Design Cycle, three intermediate versions of the MR-TFT were defined before it was suitable to be applied in an organization. To create each version, we applied different approaches. Had we not used DSR, a different MR-TFT would have emerged.

The results of this research can contribute to academia conducting studies to apply the benefits, challenges, and success factors identified in more practical research and learning activities, which promote greater interaction and partnerships between contracting and supplier organizations involved in IT workforce outsourcing. Further research aimed at extending and adapting the model to other types of outsourcing or specific needs of the types of organizations and professionals involved could also be developed. The description of the DSR project can also inspire others to create a new reference model.

Regarding the contribution to the industry, MR-TFT is expected to support organizations in adopting, evaluating, and improving the adoption of IT workforce outsourcing practices. Besides, it is hoped to contribute to the standardization and understanding of activities, reducing risks inherent to the workforce outsourcing business itself, supporting performance improvement initiatives, and quality and services knowledge delivered by IT workforce outsourcing.

7 CONCLUSIONS

We presented how we applied Design Science Research to develop the Process Reference Model for IT Workforce Outsourcing (MR-TFT), which supports the adoption of outsourcing practices by organizations that provide IT workforce outsourcing and contract IT workforce suppliers for outsourcing. Among other practices, the MR-TFT endorses the definition of business strategy and risk mitigation, including legal and contractual issues, outsourcing and performance management, supplier and IT workforce outsourcing quality, and the improvement of involved processes. Additionally, an assessment method and implementation scenarios for the MR-TFT were also defined and aimed at organizations that contract and supply IT workforce. The MR-TFT was evaluated in industry, which provided evidence that it assists in the diagnosis of processes related to IT workforce outsourcing.

The topics addressed in the MR-TFT – e.g., strategic planning, project management, portfolio management, process improvement, measurement, configuration management, training, people management, etc. – are familiar to a software engineering audience. As mentioned, the MR-TFT instantiates such concepts into the workforce management practice. Also, the MR-TFT target audience comprises many public and private companies that use outsourced workforce to develop software. Therefore, they are not unfamiliar with many concepts addressed in the model. We help such organizations be more efficient in managing how the outsourced workforce contributes to the construction of quality software with the MR-TFT. We believe that this approach can facilitate the models' acceptance and implementation.

The case study results provided initial evidence that the MR-TFT is both feasible and useful. However, the case study described was developed in only one supplier organization, which limits the findings to this context. Hence, the results obtained must be considered preliminary.

In future work, we will be implementing the MR-TFT in organizations that intend to start adopting IT workforce outsourcing practices and in organizations that use such practices; conducting maturity level assessments in contracting and supplier organizations of IT workforce outsourcing; undertake studies to define quality and performance indicators to monitor the implementation of activities by both the supplier and the IT workforce outsourcing; and define new usage scenarios for the model, such as using the IT workforce outsourcing in agile teams.

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